# Quality of Acute Care and Long-Term Quality of Life and Survival

## The Australian Stroke Clinical Registry

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***Background and Purpose***—Uncertainty exists over whether quality improvement strategies translate into better health-related quality of life (HRQoL) and survival after acute stroke. We aimed to determine the association of best practice recommended interventions and outcomes after stroke.

***Methods***—Data are from the Australian Stroke Clinical Registry during 2010 to 2014. Multivariable regression was used to determine associations between 3 interventions: received acute stroke unit (ASU) care and in various combinations with prescribed antihypertensive medication at discharge, provision of a discharge care plan, and outcomes of survival and HRQoL (EuroQoL 5-dimensional questionnaire visual analogue scale) at 180 days, by stroke type. An assessment was also made of outcomes related to the number of processes patients received.

***Results***—There were 17 585 stroke admissions (median age 77 years, 47% female; 81% managed in ASUs; 80% ischemic stroke) from 42 hospitals (77% metropolitan) assessed. Cumulative benefits on outcomes related to the number of care processes received by patients. ASU care was associated with a reduced likelihood of death (hazard ratio, 0.49; 95% confidence interval, 0.43–0.56) and better HRQoL (coefficient, 21.34; 95% confidence interval, 15.50–27.18) within 180 days. For those discharged from hospital, receiving ASU+antihypertensive medication provided greater 180-day survival (hazard ratio, 0.45; 95% confidence interval, 0.38–0.52) compared with ASU care alone (hazard ratio, 0.64; 95% confidence interval, 0.54–0.76). HRQoL gains were greatest for patients with intracerebral hemorrhage who received care bundles involving discharge processes (range of increase, 11%–19%).

***Conclusions***—Patients with stroke who receive best practice recommended hospital care have improved long-term survival and HRQoL. **(*Stroke*. 2017;48:1026-1032. DOI: 10.1161/STROKEAHA.116.015714.)**

**Key Words:** hospitals ■ quality of health care ■ quality of life ■ stroke ■ survival



Stroke is a leading cause of death and adult disability, worldwide. Variability in the care provided to patients admitted to hospital with acute stroke can affect their recovery and is inefficient.[1,2] Most studies of the outcomes after hospital care have focused on survival, discharge destination, or disability in the short term. Research on the quality of hospital

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care and outcomes in the longer term, in particular for health-related quality of life (HRQoL) is limited.[3–8]

We aimed to determine the relationship between receiving combinations of 3 recommended processes of acute care in hospital (referred herein as quality indicators) and patient outcomes ≤180 days after the onset of stroke, assessing the differences by stroke type.

## Methods

The data were from 42 hospitals participating in the Australian Stroke Clinical Registry (AuSCR) between 2010 and 2014. Staff from participating hospitals enter the data prospectively using the online system. Information includes patient characteristics, quality indicators, and health outcome measures.[9,10] Longer-term patient outcomes are obtained centrally by AuSCR staff using survey methods (eg, for HRQoL) or annual data linkage to national death registrations.

Eligible patients were aged ≥18 years with a diagnosis of ischemic stroke, intracerebral hemorrhage (ICH), or stroke of undetermined cause recorded by clinicians in the AuSCR database. For this study, the preference was to use the clinician-assigned diagnosis rather than the International Classification of Diseases 10th Revision primary discharge diagnosis code (usually assigned by qualified administrative coders in Australia). However, where the clinical diagnosis was classified as undetermined or was missing, the International Classification of Diseases 10th Revision discharge code was used where it differentiated between infarct and ICH. Cases of subarachnoid hemorrhage are excluded from the registry because they are generally managed surgically and have different outcomes to other stroke types. Socioeconomic position was derived using the Index of Relative Advantage and Disadvantage using patient postcodes[11] and reported as predetermined quintiles, whereby a higher quintile indicated greater socioeconomic advantage.

### Quality of Care Indicators and Eligibility Criteria

The national AuSCR minimum data set includes 4 quality indicators recommended in Australian clinical guidelines.[12] The indicators were selected using a consultative process and involving consumers, clinicians, administrators, and researchers, to identify a minimum agreed stroke care bundle to assess quality of care in Australia.[9] Additional quality indicators are collected in Queensland to permit historical comparisons after joining the program in 2012 but are not reported here. In this study, we chose to not report on the use of intravenous thrombolysis in ischemic stroke because the sample size for analysis was inadequate for multivariable outcome analyses (<10% of total sample), and patient eligibility criteria were unavailable to provide a reliable denominator. For this study, the following indicators were used (further detail is provided in Table I in the online-only Data Supplement):

1. Management in an acute stroke unit (ASU): a geographically defined unit with a dedicated interprofessional team with a special interest in stroke. All patients admitted with stroke were eligible to receive ASU care.
2. Prescribed an antihypertensive agent at discharge from hospital (including to subacute hospitals). Because few patients with stroke have contraindications for taking antihypertensive medications at time of discharge (≈4%, based on unpublished national audit data) and contraindications are not collected in AuSCR, all patients discharged from hospital were considered eligible.
3. Received a comprehensive discharge care plan developed with the patient and family if discharged from acute care directly to the community (ie, to a home setting or institutional residential aged care and not transferred to another hospital, that is, for rehabilitation). This is not the discharge summary written by hospital clinicians for the primary care doctor. This discharge care plan should include information for transition to home, such as arrangements for community support services, information on risk factor management, equipment to be purchased, and follow-up appointments.

We assessed 4 care bundle combinations of these indicators. A care bundle is a small set of evidence-based interventions for a discrete patient population and care setting that, when implemented together, is hypothesized to result in significantly better outcomes than when implemented individually.[13] The 4 care bundles were (1) received ASU care (all patients) because this reflects an acute mega-bundle of evidence-based interventions[2,7,14] and captures processes of care we were unable to measure individually, (2) receiving ASU care plus prescription of antihypertensive medication at discharge (for patients discharged from acute care), (3) receiving ASU care plus provision of a discharge care plan for patients discharged to the community, and (4) receiving ASU care plus prescription of antihypertensive medication at discharge and provision of a discharge care plan for patients discharged to the community. Consistent with earlier literature,[7] ASU care was included in all bundles assessed because those that received ASU care were more likely to receive the other indicators (Table II in the online-only Data Supplement).

### Patient Outcomes

Survival status was obtained for all patients using linkage to the National Death Index registry held by the Australian Institute of Health and Welfare with ≈99% specificity/sensitivity achieved.[15] We also report deaths to 180 days for the first recorded admission (95%), since patients may have had more than one admission.

The collection of patient-reported outcomes occurred between 90 and 180 days after the index event using survey methods.[10] Only the first event was followed up (95% of episodes), and where patient data were provided by hospitals after 180 days, these patients were deemed ineligible (≈15%). A questionnaire was posted to eligible patients, and if not returned after 2 attempts, the patient or next of kin was contacted by telephone.[10] HRQoL was assessed with the EuroQoL 5-dimensional questionnaire (ie, EQ-5D-3L)[16] which is applicable to most conditions, designed to be self-administered, and has good reliability for telephone administration.[17] Responses for proxy and patients at 6 months after stroke are similar.[18] In this study, we reported the EQ-5D visual analogue scale (VAS) as an overall measure of HRQoL. The VAS provides a single index value for health status in which respondents self-rate their health from 0 to 100 with zero being worst imaginable health state and 100 best imaginable health state.[19] For patients who had died within 180 days, we coded the VAS as zero.

### Data Analysis

Patients transferred from another hospital were excluded (13%) because they may already have received some of the quality indicators. Hospitals with <20 patients were also excluded (n=3 hospitals contributing 33 admissions). Descriptive statistics are reported as appropriate for the distribution and nature of the data. To minimize the impact of missing data for multivariable models, those with missing sex, age, or stroke type were excluded (0.9%).

Adherence to the quality indicators was determined by calculating the number of admissions in which patients received the indicator divided by the number of admissions for patients eligible for that indicator. Indicator data with a response of no, unknown, or missing were recoded as negative. Missing indicator data ranged from none (ASU indicator) to 7% (discharge care plan). A sensitivity analysis, in which those who received intravenous thrombolysis drug were excluded from these analyses, was also performed to assess the potential influence of this treatment on HRQoL outcomes.

Analysis of the outcome data was by individual patients and not separate admissions, since some patients had multiple admissions. Cox proportional hazards regression (survival) and quantile regression (EQ-5D VAS) were used to describe the association between the number of quality indicators received for patients discharged to the community, as well as for each of the different care bundles and outcome. Models were adjusted for factors known to be associated with outcome: age, sex, whether or not they were born in Australia, previous stroke, stroke type (where applicable), ability to walk on

admission (as a validated measure of stroke severity),[15,20] socioeconomic position, in-hospital stroke, and for correlations among patients within individual hospitals.

### Ethics

Each hospital provided ethics approval for data collection, as well as the Australian Institute of Health and Welfare to conduct the linkage with national death registration data. To reduce sampling biases, AuSCR obtains patient data using an opt-out procedure or there is a waiver of consent for patients who die while in hospital.[9] Each year for 2010 to 2014, between 2% and 6% of registrants opted out.

## Results

There were 17 585 admissions from 16 665 patients included in the analysis. The median age was 77 (quartile 1, quartile 3: 66, 85), and 47% were female. Ischemic stroke was the most common diagnosis (80%; Table 1).

HRQoL information was available for 7629 of 10 723 (74%) survivors eligible to be surveyed. Those who completed the survey (median time poststroke 101 days, Q1: 96, Q3: 107) were similar to those ineligible or unable to be contacted. Exceptions were those who were followed up were older (75 versus 73 years) and more likely to have had an ischemic stroke (86% versus nonresponders 81%) compared with eligible participants not followed up.

Most of the hospitals contributing patient data were located in major cities (77%) and had >300 acute care beds (80%). There were differences between the stroke types for several patient characteristics and receipt of quality indicators (Table 1). Fewer patients with undetermined stroke received the quality indicators and more often had a history of previous stroke and a worse socioeconomic position. Fewer patients with ICH accessed ASUs or received antihypertensive therapy at time of discharge. Overall, the patients managed on ASUs were less often discharged to institutional residential aged care (6% ASU versus 11% other wards, $P<0.001$) and more often accessed inpatient rehabilitation (37% ASU versus 22% other wards, $P<0.001$).

**Table 1. Characteristics of Patients for All Stroke Admissions and by Stroke Type**

| Variable | All Stroke, n (%) | Ischemic, n (%) | ICH, n (%) | Undetermined, n (%) | *P* Value |
|---|---|---|---|---|---|
| Total admissions registered | 17 585 (100) | 14 104 (80) | 2637 (15) | 844 (5) | |
| Patient characteristics | | | | | |
| Age median (Q1, Q3) | 77 (66, 85) | 77 (66, 85) | 77 (67, 85) | 78 (67, 85) | 0.03 |
| Female | 8189 (47) | 6513 (46) | 1260 (48) | 416 (49) | 0.09 |
| Born in Australia | 11 222 (64) | 9003 (64) | 1584 (60) | 635 (75) | <0.001 |
| Previous stroke/TIA | 3927 (24) | 3196 (24) | 562 (24) | 169 (30) | 0.003 |
| Able to walk on admission | 5576 (35) | 4845 (37) | 524 (22) | 207 (39) | <0.001 |
| In-hospital stroke | 760 (4) | 620 (4) | 92 (3) | 48 (6) | <0.015 |
| Socioeconomic status | | | | | <0.001 |
| IRSAD 1 | 2738 (16) | 2111 (15) | 404 (16) | 223 (27) | |
| IRSAD 2 | 3614 (21) | 2875 (21) | 495 (19) | 244 (29) | |
| IRSAD 3 | 2173 (13) | 1778 (13) | 309 (12) | 86 (10) | |
| IRSAD 4 | 3707 (21) | 3026 (22) | 523 (20) | 158 (19) | |
| IRSAD 5 | 5148 (30) | 4157 (30) | 872 (34) | 119 (14) | |
| Processes of care for eligible patients | | | | | |
| Acute Stroke Unit care | 14 170 (81) | 11 928 (85) | 1759 (67) | 483 (57) | <0.001 |
| Discharged on antihypertensives | 10 613 (70) | 9086 (72) | 1161 (63) | 366 (53) | <0.001 |
| Discharge care plan provided | 3970 (52) | 3413 (53) | 370 (51) | 187 (41) | <0.001 |
| Discharge information | | | | | |
| Length of stay median (Q1, Q3) | 5 (3, 10) | 5 (3, 10) | 5 (2, 10) | 4 (2, 8) | <0.001 |
| Destination | | | | | <0.001 |
| Died in hospital | 1947 (11) | 1171 (9) | 694 (27) | 82 (11) | |
| Home | 6603 (39) | 5664 (41) | 546 (22) | 393 (51) | |
| Rehabilitation | 5181 (30) | 4389 (32) | 705 (28) | 87 (11) | |
| Institutional care | 1014 (6) | 777 (6) | 176 (7) | 61 (8) | |
| Hospital readmission within 90–180 d* | 1577 (20) | 1354 (20) | 154 (19) | 69 (23) | 0.4 |

ICH indicates Intracerebral hemorrhage; IRSAD, Index of Relative Advantage and Disadvantage; Q1 and Q3, quartile 1 and quartile 3; and TIA, transient ischemic attack.

*Self-reported at follow-up interview.

## Long-Term Patient Outcomes

Survival and HRQoL incrementally improved with each additional quality indicator received. Those who received 2 or 3 indicators had clinically and statistically significant better HRQoL compared with those who received none (Table 2). Those who received all 3 indicators compared with those who received none had a 70% reduced hazard of death at 180 days (hazard ratio, 0.30; 95% confidence interval [CI], 0.18–0.47; Figure).

Receiving care bundle (a) (ASU care) was strongly associated with greater 180-day survival (hazard ratio, 0.49; 95% CI, 0.43–0.56; Table 3) and HRQoL (Table 4). Those who received bundle (a) on average had a 21% greater EQ-5D VAS score than those who did not (coefficient, 21.34; 95% CI, 15.50–27.18; Table 4). For those who survived to discharge from acute care, there was an apparent survival benefit of having received care bundle (b) (ASU care+antihypertensives) compared with not having received both components of this bundle, with a reduced hazard of death at 180 days (hazard ratio, 0.45; 95% CI, 0.38–0.52) compared with those who received care bundle (a). This benefit was consistent across stroke subtypes.

In terms of HRQoL, many clinically meaningful improvements were observed, but the effects of different care bundles were mixed. The greatest influence was noted in the subgroup of patients with ICH. For example, in relation to care bundle (d) (ASU care+antihypertensive+discharge care plan), a 13-point greater EQ-5D VAS score was found compared with those with ICH who were discharged to the community and did not receive care bundle (d) (Table 4).

## Discussion

We present new information from a large cohort, representative of all major types of stroke, providing evidence that the quality of acute stroke care in hospitals affects long-term survival and HRQoL. Regardless of the patient groups assessed, there was a 40% to 60% lesser hazard of death within 180 days, as well as clinically meaningful differences in overall HRQoL,[21] mainly attributable to ASU access. Improvements in survival and HRQoL were associated with receiving increased numbers of quality indicators.

For the survival outcome, our findings were consistent with other similar studies despite differences in the types of care processes included.[6,22,23] Reassuringly, in all of these studies,

**Table 2. Association Between the Number of Processes Received and 180-Day Outcomes**

| Reference Is 0 Processes | 180-d Hazard of Death, Hazard Ratio (95% CI) | 90- to 180-d HRQoL, Coefficient (95% CI) |
|---|---|---|
| 1 process | 0.63 (0.41 to 0.97) | 12.53 (−2.22 to 27.28) |
| 2 processes | 0.46 (0.31 to 0.68) | 16.67 (0.30 to 33.05) |
| 3 processes | 0.30 (0.18 to 0.47) | 18.70 (1.86 to 35.55) |

Models include only the first admission registered in the Australian Stroke Clinical Registry. Models adjusted for age, sex, socioeconomic position, country of birth, type of stroke, history of previous stroke, ability to walk on admission, and in-hospital stroke. CI indicates confidence interval; EQ-5D-3L, EuroQoL 5-dimensional questionnaire; and HRQoL, health-related quality of life (measured with EQ-5D-3L[16] visual analogue scale with deaths coded as zero).

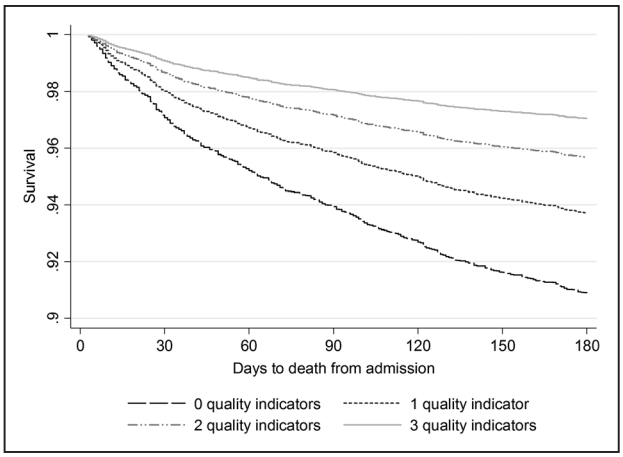


**Figure.** Survival by the number of processes received for those discharged to the community.

ASU was one of the care process assessed. The cumulative improvements observed indicate that the number of processes received rather than the type may also be an indicator of the overall quality of care received. These results highlight that even within an ASU, it is important that patients receive all of the care processes for which they are eligible.

Care on an ASU remains the most generalizable intervention among patients with stroke that is applicable to all stroke types. An additive effect was demonstrated when prescription of antihypertensive medication was added to ASU care. However, this was not the case for ASU care plus receipt of a discharge care plan. The discharge planning indicator is focused on management in the community rather than discharge medication. As it is possible for these 2 processes to occur independently (ie, 23% of those who received a care plan were not prescribed antihypertensive medications at discharge), it is likely that prescription of antihypertensive prevention medication at discharge influenced survival more (as illustrated in Table 3). Nevertheless, to our knowledge, this is the first study in which the influence of care bundles containing discharge processes on posthospital mortality have been investigated.[6,22,23] Therefore, our work makes an important contribution to this area of research.

As described by Kim et al,[21] the minimally important differences in the EQ-5D range between 8 and 12 points in determining whether an intervention is worthwhile in patients with stroke. Studies on the influence of care bundles within the context of HRQoL are rare and, to our knowledge, have not been assessed in subgroups of patients with stroke (eg, ICH or those discharged directly to the community from acute care). Care bundle (a) (ASU care) was shown in our models to have the largest clinically meaningful[21] and statistically significant association with HRQoL at median 101 days after stroke. Unlike survival, HRQoL was not markedly different for those who received care bundles (b), (c), or (d) compared with those who did not receive these bundles. However, there were some exceptions among ICH patients, whereby care bundle (b) for those who survived their acute hospital admission or care bundle (c) and (d) for those discharged directly to the community provided 11 to 19 more points on the VAS compared with ICH patients who did not receive these bundles. The

**Table 3. Multivariable Analysis for Receiving Care Bundles and Survival to 180 Days**

| | All Admissions, HR (95% CI) | Discharged From Acute Care Hospital, HR (95% CI) | Discharged to the Community, HR (95% CI) |
|---|---|---|---|
| All stroke types | n=14 334 | n=12 571 | n=6338 |
| ASU care only (a) | 0.49 (0.43–0.56) | 0.64 (0.54–0.76) | 0.59 (0.48–0.73) |
| Care bundle (b) | | 0.45 (0.38–0.52) | 0.55 (0.47–0.63) |
| Care bundle (c) | | | 0.63 (0.52–0.77) |
| Care bundle (d) | | | 0.55 (0.45–0.66) |
| Ischemic stroke | n=11 895 | n=10 702 | n=5494 |
| ASU care only (a) | 0.55 (0.48–0.62) | 0.65 (0.54–0.78) | 0.58 (0.48–0.70) |
| Care bundle (b) | | 0.47 (0.41–0.54) | 0.55 (0.46–0.65) |
| Care bundle (c) | | | 0.64 (0.52–0.79) |
| Care bundle (d) | | | 0.56 (0.45–0.71) |
| ICH | n=2015 | n=1504 | n=578 |
| ASU care only (a) | 0.41 (0.32–0.53) | 0.61 (0.40–0.94) | 0.65 (0.36–1.17) |
| Care bundle (b) | | 0.35 (0.23–0.52) | 0.53 (0.36–0.76) |
| Care bundle (c) | | | 0.65 (0.38–1.13) |
| Care bundle (d) | | | 0.48 (0.28–0.82) |
| Undetermined | n=424 | n=365 | n=266 |
| ASU care only (a) | 0.42 (0.29–0.61) | 0.54 (0.31–0.94) | 0.50 (0.14–1.84) |
| Care bundle (b) | | 0.47 (0.30–0.74) | 0.46 (0.20–1.06) |
| Care bundle (c) | | | 0.46 (0.17–1.24) |
| Care bundle (d) | | | 0.55 (0.22–1.35) |

Models include only the first admission registered in the Australian Stroke Clinical Registry adjusted for age, sex, socioeconomic position, country of birth, type of stroke, history of previous stroke, ability to walk on admission, and in-hospital stroke. Acute Stroke Unit (ASU) model includes all registrants: Care bundle (a), ASU care only; Care bundle (b), ASU care+prescribed antihypertensive medication at discharge model includes only patients discharged from hospital; Care bundle (c), ASU care+received a care plan, model includes only patients discharged to home or institutional care; Care bundle (d), ASU care+prescribed antihypertensive medication at discharge+received a care plan, model includes only patients discharged to home or institutional care. CI indicates confidence interval; HR, hazard ratio; and ICH, intracerebral hemorrhage.

effect on HRQoL may have been more apparent in those with ICH compared with other stroke types because their baseline stroke severity was greater, and this provided more capacity to improve. However, there is a need for caution with the interpretation of these results given the wide CIs. It is also likely that those with worse HRQoL at 6 months will have more unmet needs at ≥12 months.[24]

Similarly, those with milder stroke may have been more likely to be discharged directly to the community from acute care (only 13% in this subgroup went to residential aged care institutions). This may account for why the strength of the association for each of the bundles was lower in this group. It is likely that those discharged from hospital (which included discharge to home, rehabilitation, or another hospital) included patients with moderate–severe stroke who may have achieved greater benefit from receiving optimal care than those discharged directly to home.

Strengths of our work include the large sample size and the prospective and systematic collection of outcome data which provided a unique opportunity to make a full assessment of the system of care for acute stroke in Australia. The quality indicators used in this analysis were purposefully chosen through national consensus, to concisely represent the most important aspects of care quality. Sensitivity analyses that excluded missing indicator data and excluded those who received thrombolysis did not influence the results.

Registry data may be subject to several forms of bias. This includes referral or selection bias if patients registered are mainly those admitted to neurology or ASUs,[10] or response biases where clinicians with an interest in stroke more reliably complete the data. There may also be selection bias among those who do and do not get access to the ASU; however, we were able to account for the main factors (eg, age, stroke type, and stroke severity) in our multivariable models. When establishing the AuSCR, a broad process of hospital recruitment was undertaken. Nevertheless, the hospitals are mainly from metropolitan locations and those with ASUs. This is likely to provide an overestimation of the proportion that received ASU care in our study (67% received ASU care in the latest national audit of acute hospitals).[25]

Other limitations are that the covariates used in multivariable analysis were restricted to those available in AuSCR. Because clinical quality registry data often require manual collection, it is impractical to collect a large number of processes of care indicators in all patients. Therefore, only a limited number of quality indicators were available for this study, and other indicators known to be associated with improved stroke outcomes were unavailable for inclusion in our analyses. Further, our validated measure of stroke severity (ability to walk on admission) may not be as sensitive as other commonly used measures such as the National Institutes of Health Stroke Scale. However, we are reassured by recent validation work that simple variables such as ability to walk perform similarly well to prediction models that use National Institutes of Health Stroke Scale and age.[26] We were also unable to account for the types of postdischarge care (eg, community rehabilitation) which may contribute to HRQoL outcomes, as well as long-term adherence to secondary prevention medication.

**Table 4. Multivariable Analysis for Quality-of-Life Outcomes Between 90 and 180 Days**

| | All Admissions, Coefficient (95% CI) | Discharged From Hospital, Coefficient (95% CI) | Discharged to the Community, Coefficient (95% CI) |
|---|---|---|---|
| All stroke types | n=9787 | n=8026 | n=4034 |
| ASU care only (a) | 21.34 (15.50 to 27.18) | 9.54 (3.50 to 15.59) | 6.79 (1.06 to 12.52) |
| Care bundle (b) | | 8.00 (4.79 to 11.23) | 3.97 (1.34 to 6.60) |
| Care bundle (c) | | | 4.11 (1.58 to 6.63) |
| Care bundle (d) | | | 3.59 (1.20 to 5.99) |
| Ischemic stroke | n=8071 | n=6938 | n=3550 |
| ASU care only (a) | 20.56 (12.11 to 29.02) | 9.07 (3.15 to 15.00) | 6.77 (0.51 to 13.05) |
| Care bundle (b) | | 7.09 (4.03 to 10.15) | 3.63 (0.95 to 6.31) |
| Care bundle (c) | | | 3.48 (0.72 to 6.24) |
| Care bundle (d) | | | 3.03 (0.53 to 5.53) |
| ICH | n=1454 | n=882 | n=332 |
| ASU care only (a) | 4.95 (0.25 to 9.65) | 14.58 (–2.75 to 31.92) | 4.76 (–21.02 to 30.55) |
| Care bundle (b) | | 19.58 (4.50 to 34.66) | 5.73 (–7.99 to 19.45) |
| Care bundle (c) | | | 11.28 (–0.25 to 22.80) |
| Care bundle (d) | | | 13.29 (1.70 to 24.88) |
| Undetermined | n=262 | n=206 | n=152 |
| ASU care only (a) | 16.84 (5.31 to 28.36) | 5.01 (–10.69 to 20.71) | 6.27 (–7.17 to 19.71) |
| Care bundle (b) | | 7.79 (–8.26 to 23.85) | 6.25 (–8.97 to 21.49) |
| Care bundle (c) | | | –0.45 (–14.41 to 13.50) |
| Care bundle (d) | | | 6.40 (–4.63 to 17.44) |

Quality-of-life measured using the EQ-5D-3L[16] visual analogue scale with deaths included and coded as zero. Models include only the first admission registered in the Australian Stroke Clinical Registry. Models adjusted for age, sex, socioeconomic position, country of birth, type of stroke, history of previous stroke, ability to walk on admission, and in-hospital stroke. Acute Stroke Unit (ASU) model includes all registrants, Care bundle (a), ASU care only; Care bundle (b), ASU care+prescribed antihypertensive medication at discharge model includes only patients discharged from hospital; Care bundle (c), ASU care+received a care plan, model includes only patients discharged to home or institutional care; Care bundle (d), ASU care+prescribed antihypertensive medication at discharge+received a care plan, model includes only patients discharged to home or institutional care. Models (b) to (d) were also adjusted for hospital readmissions between discharge and follow-up. CI indicates confidence interval; EQ-5D-3L, EuroQoL 5-dimensional questionnaire; and ICH, intracerebral hemorrhage.

However, prescription of prevention medicines at discharge is associated with long-term adherence.[27]

## Conclusions

This work emphasizes the need for continued efforts to reduce care gaps in hospitals to ensure a greater likelihood of survival and improved HRQoL ≤180 days after stroke for all stroke types. It is essential that all patients with acute stroke receive all interventions for which they are eligible. To address areas of underperformance effectively, we need to have a greater understanding of factors that underlie these gaps and implement evidence-based interventions that support clinician behavior change such as reminders or audit and feedback programs.

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## Disclosures

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