Access to rehabilitation for patients with stroke in Australia

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The known: Rehabilitation reduces the patient's risk of death and disability after a stroke.

The new: One in ten people admitted to hospital after a stroke are not offered goal-directed rehabilitation during their acute admission without an evidence-based reason for not providing such treatment.

The implications: To maximise their recovery of function and independence, people who have had strokes need best practice stroke unit care as early as possible. The inadequate provision of acute and post-acute rehabilitation leads to a greater burden of dependence and care for the patient and their carers, as well as for community and aged care services.

Abstract

Objective: To identify factors associated with receiving acute goal-directed treatment, being assessed for ongoing rehabilitation, and receiving post-acute rehabilitation after having a stroke.

Design: Retrospective analysis of National Stroke Audit data for patients with acute stroke treated at Australian hospitals during 1 September 2014 – 28 February 2015.

Setting, participants: 112 Australian hospitals that admit adults with acute stroke.

Main outcomes: Associations between patient-related and organisational factors and the provision of rehabilitation interventions.

Results: Data for 3462 patients were eligible for analysis; their median age was 74 years, 1962 (57%) were men, and 2470 (71%) had received care in a stroke unit. 2505 patients (72%) received goal-directed treatment during their acute admission; it was not provided to 364 patients (10.5%) who were responsive, had not fully recovered, and did not refuse treatment. Factors associated with higher odds of receiving goal-directed treatment included goal-setting with the patient and their family (odds ratio [OR], 6.75; 95% CI, 5.07–8.90) and receiving care in a stroke unit (OR, 2.08; 95% CI, 1.61–2.70). 1358 patients (39%) underwent further rehabilitation after discharge from acute care; factors associated with receiving post-acute rehabilitation included care in a stroke unit (OR, 1.73; 95% CI, 1.34–2.22) and having an arm or speech deficit. Dementia was associated with lower odds of receiving acute goal-directed treatment (OR, 0.49; 95%, 0.33–0.73) and post-acute rehabilitation (OR, 0.43; 95%, 0.30–0.61).

Conclusions: Access to stroke units and to early and ongoing rehabilitation for patients after stroke can be improved in Australia, both to optimise outcomes and to reduce the burden of care on underresourced community and primary care providers.

Rehabilitation for adults with stroke improves both immediate and long term function and increases independence,[1] irrespective of age, stroke severity, stroke type, and recurrence.[2,3] Rehabilitation — interventions for reducing disability and handicap, selected after a problem-solving process[4] — should commence during the first few days after a stroke[5] and be tailored to the individual's goals.[4] Clinicians working with patients who have had strokes must therefore assess the nature of their rehabilitation needs individually. The median length of stay in acute hospital care after stroke is less than 7 days in most Western countries,[6] so people requiring more than a week of rehabilitation should be transferred to a rehabilitation service in an inpatient or outpatient facility or in the patient's home.

Despite international clinical guidelines recommending that rehabilitation should commence during acute care for patients with rehabilitation needs,[7] audit data indicate that rehabilitation needs are not always assessed and that people who need rehabilitation do not always receive it,[6,8] increasing the risk of functional dependence and the subsequent burden on informal carers and social care services. Strategies that facilitate change in professional practices for assessing and referring patients to rehabilitation services are needed, as are systems that optimise the accessibility of these services.

Multiple, complex and interrelated factors can be barriers to improving stroke care practice.[9] Organisational factors, such as the lack of a specialist stroke unit, and personal factors, including the attitudes and knowledge of clinicians, can cause lower quality of care.[10] Provision of care may be influenced by patient characteristics, such as stroke severity,[11] age,[12] and ethnic background.[13] Factors that influence the provision of stroke rehabilitation must be identified so that quality improvement initiatives can be targeted accordingly.

Audit and feedback is a quality improvement strategy that can achieve small but potentially valuable improvements in professional practice.[14] In Australia, the Stroke Foundation undertakes biennial national audits of adherence to the care recommendations of their *Clinical guidelines for stroke management*.[7] The audit comprises an organisational survey of resources available to hospitals providing stroke care and a retrospective clinical audit of the medical records of consecutively admitted patients with stroke. Audit summaries are published on the Stroke Foundation website,[15] and data for the individual sites are communicated to the participating hospitals.

The primary aims of our study were to identify factors associated with a patient receiving goal-directed treatment during acute hospitalisation for stroke, their need for ongoing rehabilitation being assessed, and their having access to post-acute rehabilitation care.

Methods

Recruitment of participating hospitals

Participating hospitals in previous audits and hospitals nominated by clinicians or administrators were invited to participate in the 2015 National Stroke Audit — Acute Services

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(organisational survey and clinical audit); participation was voluntary. Only data from hospitals contributing to both the organisational survey and clinical audit were included in our analysis.

Data collection

Data on at least 40 consecutive cases admitted from 1 September 2014 and discharged by 28 February 2015 were collected at each participating site for the retrospective audit, undertaken from 1 June 2015 to 31 August 2015. Staff trained in the use of the Australian Stroke Data Tool[15] collected data on the patients' characteristics and their receiving recommended processes of care during their acute hospital admission, usually encompassing the first week after their stroke.[15] The outcomes of interest were documentation of their receiving goal-directed therapy during the acute hospitalisation, assessment of their need for ongoing rehabilitation, and their accessing rehabilitation after they were discharged from the acute stroke service.

Data analysis

Data from the organisational survey and clinical audit were merged and analysed in SPSS Statistics 23 (IBM). Responses of "unknown" for process outcomes or patient factors for which "yes" or "no" were options were re-coded as "no" responses. Modified Rankin Scale scores (measuring the degree of disability or dependence in the daily activities of people who have had a stroke) were categorised as dependent (score ≥ 2) or independent (score < 2). Data for people who died in hospital or were on a palliative care pathway were excluded.

Descriptive statistics for patient and organisational characteristics are presented. A generalised linear mixed model with hospital as a random effect (cluster) and patient and organisational characteristics as fixed effects was generated to identify factors associated with the three outcomes of interest. Variables for which $P < 0.05$ were included in multivariable analyses, after testing for collinearity of significant patient and organisational characteristics in the univariable analyses. Factors included in the univariable and multivariable analyses, and information regarding collinearity, are included in the Supporting Information.

Ethics approval

Ethics approval for our analysis was granted by the University of South Australia Human Research Ethics Committee (reference, 0000035355). The Stroke Foundation approved access to their dataset for our analysis.

Results

One hundred and eighty-five sites completed the organisational survey, 112 of which also participated in the clinical audit. Data from 4087 patient medical records were collected. After excluding 517 patients who died or received palliative care, 92 patients with transient ischaemic attacks, and 16 records that were inaccurate (patient age > 700 years) or were for children, data for 3462 adults who had had strokes were analysed; their median age was 74 years (interquartile range [IQR], 64–83 years), and 1962 (57%) were men (Box 1).

There were participating sites in each Australian state. Most hospitals had specialist stroke units (88 of 112, 79%) and dedicated multidisciplinary teams specialised in stroke care (99, 88%). At 109 sites (97%), the acute multidisciplinary team decided whether to refer patients for further rehabilitation. All sites had access to ongoing rehabilitation services, usually provided in inpatient or outpatient facilities (Box 2).

1 Characteristics of the 3462 patients for whom data was colected by the 2015 National Stroke Audit — Acute Services

Patient factor	Number
Demographic information	
Age (years), median (IQR)	74 (64–83)
Sex (men)	1962 (56.7%)
Aboriginal or Torres Strait Islander	1002 (2.9%)
Patient has carer	770 (22.2%)
Requires interpreter	205 (5.9%)
Health before stroke	
Prior stroke	752 (21.7%)
Previous transient ischaemic attack	453 (13.1%)
Diabetes	857 (24.8%)
Dementia	252 (7.3%)
Lived at home (alone or with others) before stroke	3211 (92.7%)
Independent* before admission	2508 (72.4%)
Clinical information (admission)	
Ischaemic stroke	2807 (81.1%)
Sensory deficit	1170 (33.8%)
Speech or communication impairment	1861 (53.8%)
Cognitive deficit	960 (27.7%)
Incontinent of urine/required catheter within 72 hours	959 (27.7%)
Visual deficit	920 (26.6%)
Perceptual deficit	611 (17.6%)
Nutrition problems	423 (12.2%)
Hydration problems	358 (10.3%)
Arm problem	1984 (57.3%)
Independent* within 72 hours of admission	885 (25.6%)
Unresponsive or in coma	56 (1.6%)
Independent* on discharge	1092 (31.5%)
Care received	
Treated in stroke unit	2470 (71.3%)
Received thrombolysis	212 (6.1%)
Physiotherapy	3190 (92.1%)
Occupational therapy	2999 (86.6%)
Speech pathology	2818 (81.4%)
Social worker	1562 (45.1%)
Dietitian	1426 (41.2%)
Psychologist	64 (1.4%)
Team met with patient/family to discuss management	2724 (78.7%)
Goals set with input from patient/family	2613 (75.7%)
Complications during admission	
Severe complications	236 (6.8%)
Urinary tract infection	218 (6.3%)
Falls	214 (6.2%)
Aspiration pneumonia	163 (4.7%)

IQR = interquartile range. * Modified Rankin Scale score of 0 or 1. ◆

2 Organisational factors for the 112 fully participating sites in the 2015 National Stroke Audit — Acute Services

Organisational factor	Number
Hospital has stroke unit	88 (79%)
Consultant physician with specialist knowledge of stroke has formal responsibility for patients with stroke	74 (66%)
Hospital has co-located beds for stroke	92 (82%)
Dedicated multidisciplinary team for patients with stroke	99 (88%)
Stroke management education program for staff	96 (86%)
Staff involved in stroke-specific quality improvement activities during preceding 2 years	91 (81%)
Hospital has stroke management clinical care pathway	93 (83%)
Regular multidisciplinary meetings for exchange of information about patients with stroke	106 (95%)
Protocols for referring stroke patients to:	
Physiotherapist	109 (97%)
Speech pathologist	109 (97%)
Occupational therapist	109 (97%)
Social worker	102 (91%)
Locally agreed assessment protocols for assessing:	
Consciousness level	108 (96%)
Motor impairment	98 (88%)
Visual impairment	83 (74%)
Sensory impairment	87 (78%)
Executive functions	85 (76%)
Activities of daily living	100 (89%)
Mood	64 (57%)
Communication	100 (89%)
Party responsible for deciding to refer to rehabilitation	
Acute multidisciplinary team	109 (97%)
Acute care and rehabilitation teams	73 (65%)
Acute physician only	1 (1%)
Post-acute physician and nurse	1 (1%)
Acute and post-acute physicians	1 (1%)
Standardised process for assessing suitability for further rehabilitation	86 (77%)
Site has access to:	
Ongoing inpatient rehabilitation	103 (92%)
Outpatient rehabilitation/day hospital	103 (92%)
Rehabilitation provided in the home	96 (86%)
Team routinely involves patient and family in:	
Clinical management	109 (97%)
Goal setting	93 (83%)
Planning for discharge	111 (99%)

Goal-directed treatment received (acute care)

A total of 2505 patients (72.4%) received treatment based on rehabilitation goals identified during their acute hospitalisation; most patients (2144, 85.6% of those receiving goal-directed treatment) commenced rehabilitation within 48 hours of allied health assessment. The reasons for which no goal-directed treatment was provided included return to pre-morbid function (482 patients, 13.9%), advanced care directive (46, 1.3%), refused treatment (43, 1.2%), and coma (23, 0.7%); 364 patients (10.5%) did not receive goal-directed treatment for unspecified "other" reasons.

The patient-related factors most strongly associated in multivariable analyses with receiving goal-directed treatment were setting of goals by the team in consultation with the patient or their family, being seen by allied health professionals, living at home before the stroke, and receiving care in a stroke unit. Being independent within 72 hours of admission or having dementia were each associated with significantly lower odds of receiving goal-directed treatment. No organisational factor was significantly associated with receiving goal-directed treatment (Box 3).

Ongoing rehabilitation needs assessed

The ongoing rehabilitation needs of 1978 patients (57.1% of all patients) were assessed, most of whom (1564, 79%) had been treated in stroke units. Only 397 patients (11.5% of the population) were assessed with the nationally recommended Assessment for Rehabilitation Tool;[16] it was not clear which criteria were used to assess the rehabilitation needs of most patients. Rehabilitation needs were identified for 1609 of the 1978 assessed patients (81.3%; 46.5% of the total population). However, a total of 1806 patients (52.2%) were referred to rehabilitation services; 197 patients were referred to rehabilitation services without documented assessment of their rehabilitation needs.

Patient factors positively associated with being assessed included being seen by allied health professionals, living at home before the stroke, setting goals with the team, and receiving care in a stroke unit; being independent within 72 hours of admission or having dementia were negatively associated with assessment. Organisational factors associated with higher odds of being assessed were the hospital having a stroke unit and access to outpatient rehabilitation services (Box 4).

Access to ongoing rehabilitation

Most referred patients were accepted for rehabilitation (1598 of 1806, 88.5% of those referred); ongoing rehabilitation was accessed by 1358 patients (39.2% of all patients). Patients accessed rehabilitation in inpatient rehabilitation facilities (968, 71%), outpatient or community rehabilitation centres (204, 15%), at home (155, 11%), or in "other" settings (32, 2%). The audit collected reasons for 50 patients not being accepted for rehabilitation despite having identified rehabilitation needs (service full, two patients; service unable to cope with severity of disability, one; patient or family declined rehabilitation offered, 13; other, 34), but not for why rehabilitation was not taken up by patients accepted for rehabilitation; 47 patients who had previously lived at home were discharged to residential care despite having been accepted for rehabilitation programs.

Patient factors significantly associated with higher odds of receiving post-acute rehabilitation included living at home before the stroke, being seen by allied health professionals, receiving care in a stroke unit, and having an arm or speech deficit; being independent within 72 hours of admission and having dementia were each associated with lower odds of accessing further rehabilitation. The odds of accessing ongoing rehabilitation were higher for patients admitted to hospitals with access to home rehabilitation (Box 5).

3 Multivariate analysis of factors that influenced whether patients received goal-directed rehabilitation: factors with statistically significant effects

Factor	Odds ratio (95% CI)
Patient factors*	
Goals set with patient/family	6.75 (5.07–8.90)
Seen by an allied health professional	6.17 (4.29–8.88)
Living at home (alone or with others) before the stroke	2.32 (1.59–3.38)
Treated in stroke unit	2.08 (1.61–2.70)
Information provided to family	1.58 (1.25–2.01)
Arm deficit	1.38 (1.12–1.71)
Age (per year)	0.99 (0.98–0.99)
Staff met with patient/family	0.72 (0.52–0.99)
Dementia	0.49 (0.33–0.73)
Independent† within 72 hours of admission	0.34 (0.27–0.43)

CI = confidence interval. * Factors included in the multivariate analysis that had non-significant effects: received thrombolysis; sensory deficit; cognitive deficit; visual deficit; perceptual deficit; speech/communication deficit; nutrition problem; incontinent of urine or requiring a catheter; patient has a carer. The organisational factors included all had non-significant effects: stroke unit; co-located beds; stroke pathway; unit involved in continuing education. † Modified Rankin Scale score of 0 or 1. ◆

4 Multivariate analysis of factors that influenced whether the needs of patients for ongoing rehabilitation were assessed: factors with statistically significant effects

Factor	Odds ratio (95% CI)
Patient factors*	
Seen by an allied health professional	5.74 (3.79–8.69)
Lived at home (alone or with others) before the stroke	3.10 (2.15–4.48)
Goals set with patient/family	2.61 (1.99–3.41)
Treated in stroke unit	1.81 (1.41–2.32)
Information provided to patient/family	1.68 (1.36–2.06)
Arm deficit	1.45 (1.21–1.75)
Speech or communication deficit	1.30 (1.09–1.55)
Incontinent or urine or requiring catheter	1.30 (1.05–1.62)
Dementia	0.66 (0.46–0.94)
Independent† within 72 hours of admission	0.23 (0.18–0.29)
Organisational factors‡	
Stroke unit	2.11 (1.04–4.28)
Access to outpatient or day rehabilitation services	1.93 (1.01–3.67)

CI = confidence interval. * Factors included in the multivariate analysis that had non-significant effects: age; independent before the stroke (modified Rankin Scale score of 0 or 1); received thrombolysis; sensory deficit; cognitive deficit; visual deficit; perceptual deficit; hydration problem; nutrition problem; staff met with patient/family; patient has a carer. † Modified Rankin Scale score of 0 or 1. ‡ Factors included in the multivariate analysis that had non-significant effects: co-located beds; involvement of patients in clinical management; involvement of patients in planning for discharge; unit involved in quality improvement activities. ◆

Discussion

Evidence for the benefit of rehabilitation for people who have had a stroke is clear. Rehabilitation is therefore recommended by clinical guidelines, but implementation of this recommendation has not been straightforward. In our study, only 2505 patients (72%) commenced goal-directed rehabilitation during their acute care, although it is recommended that "all stroke patients should commence mobilisation (out-of-bed activity) within 48 hours of stroke onset unless otherwise contraindicated".[7] Further, goal-directed treatment was not provided to 10.5% of patients who were responsive, had not fully recovered, and were not refusing treatment. The audit data did not allow investigation of why recommended care was not provided, and this is an important area for further investigation.

The odds of receiving recommended rehabilitation processes of care were significantly greater for people living in the community at the time of their stroke than for people in residential care. This may indicate that we are not providing our older citizens with adequate quality care. Australian guidelines do not advise taking into account a person's living situation before or after their stroke when planning rehabilitation, but our analysis is consistent with earlier reports that clinicians in Australian hospitals prioritise rehabilitation for patients who are expected to be discharged to the community[8,17] despite evidence that rehabilitation can improve the independence and quality of life of people in various types of residential care.[18]

There is consistent, strong evidence that stroke unit care reduces death and disability, irrespective of stroke type and severity.[2] Our findings provide further evidence that adherence to recommended care is significantly greater in stroke units than on other wards. However, in Australia only 67% of patients received care in stroke units in 2015, and only 39% spent at least 90% of their hospital admission in a stroke unit.[15] It is unclear whether more stroke unit beds are required, or clinicians and managers need to improve efficiency by developing protocols for transferring patients to hospitals with stroke units and streamlined systems that expedite patient movements to stroke unit beds and from the stroke unit to home or inpatient rehabilitation. In one Australian state, the effectiveness of financial incentives for increasing access to stroke units is being evaluated.[19]

Being seen by allied health professionals increased the odds of receiving early rehabilitation 6.2-fold. It is reassuring that having an arm deficit was associated with higher odds of receiving rehabilitation, but it is worrying that having a communication deficit was not associated with receiving goal-directed treatment during acute care. Management of people with aphasia is not standardised in Australian hospitals, and factors such as the confidence and self-efficacy of individual speech pathologists can influence whether early aphasia therapy is provided.[20] Further, speech pathologists report that resources in acute care settings are inadequate for providing daily aphasia therapy, and that they are restricted to assessing communication problems.[20] To ensure that recommended rehabilitation therapies are provided to patients as soon as possible after their stroke, it is therefore important that hospitals are adequately staffed, that the recommended processes of care are known, and that staff receive appropriate support.

Having dementia and being independent within 72 hours of admission were each negatively associated with receiving goal-directed treatment, being assessed for ongoing rehabilitation

5 Multivariate analysis of factors that influenced whether patients underwent ongoing rehabilitation: factors with statistically significant effects

Factor	Odds ratio (95% CI)
Patient factors*	
Living at home (alone or with others) before the stroke	2.61 (1.84–3.72)
Seen by an allied health professional	2.20 (1.47–3.28)
Goals set with patient/family	1.75 (1.33–2.30)
Treated in stroke unit	1.73 (1.34–2.22)
Arm deficit	1.52 (1.27–1.82)
Information provided to patient/family	1.31 (1.07–1.60)
Speech or communication deficit	1.26 (1.06–1.50)
Dementia	0.43 (0.30–0.61)
Independent† within 72 hours of admission	0.18 (0.14–0.23)
Organisational factors‡	
Access to home rehabilitation	1.85 (1.13–3.04)

CI = confidence interval. * Factors included in the multivariate analysis with non-significant effects: age; treated in stroke unit; received thrombolysis; sensory deficit; cognitive deficit; visual deficit; perceptual deficit; hydration problem; nutrition problem; incontinent of urine or requiring catheter; team met with patient/family; patient has carer. † Modified Rankin Scale score of 0 or 1. ‡ No further organisational factors were included in the multivariate analysis. ◆

needs, and accessing ongoing rehabilitation. While people who were independent may not have received treatment because they had recovered their pre-stroke level of function and therefore did not require further rehabilitation,[16] people who have had mild strokes often experience difficulties in domains such as high level cognition and community ambulation[21] that tend to be overlooked in low challenge hospital settings if the patients are not carefully assessed.[22] These undetected and untreated impairments may have long lasting negative effects by precluding people from returning to work or recreational activities. To determine whether they need to be referred to a community or home-based rehabilitation program, anyone who has survived a stroke should be comprehensively assessed for their rehabilitation needs with the Assessment for Rehabilitation Tool, developed and evaluated in Australia specifically for this purpose.[16]

Cognitive deficits after stroke can be ameliorated by rehabilitation,[23] so people with dementia should not be excluded from rehabilitation. Clinicians treating patients who have not had strokes also report difficulties in providing care to people with dementia, partly because of their limited knowledge and understanding of dementia.[24] Dementia is associated with a spectrum of behavioural and psychological symptoms,[25] and patients' rehabilitation needs should be evaluated according to their individual presentation. Education, training, and institutional support are needed to overcome problems associated with comorbid dementia when planning and delivering post-stroke rehabilitation, particularly as the number of people with dementia is increasing.

The fact that the ongoing rehabilitation needs of 43% of patients in our study were not assessed, most of whom were consequently not referred to rehabilitation services, suggests that implicit decisions that rehabilitation is not indicated for particular individuals or groups of patients are being made without documentation or clear rationale. Stroke service providers seeking to improve access to rehabilitation for patients during the acute and post-acute phases need to consider patient-related factors as well as their own organisational features. Access to stroke units should be improved and systems established that promote assessing the rehabilitation needs of all patients.

Limitations

The National Stroke Audit was a snapshot based on self-reported data and did not provide information about the quality of outcomes. However, the processes employed in the audit are well established and accepted across Australia. Although our patient sample was large and representative, our analysis identified associations between factors and indicators but could not determine causation. For example, our investigation did not identify reasons that explained why ongoing rehabilitation was not accessed by all people accepted by rehabilitation services; this question should be further explored by stroke service providers. Finally, our analysis accommodated missing data for individual variables, but not for several variables at once. We did not impute missing values, and this was a limitation of our multivariable analyses.

Conclusion

Stroke service providers should adopt the features of best practice stroke units and ensure that all patients have access to these units with their multidisciplinary teams and the patient and their family as team members. All patients, including those with dementia or in residential care, should receive appropriate rehabilitation.

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Supporting Information

Additional Supporting Information may be found online in the supporting information tab for this article.