ORIGINAL REPORT

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PREDICTING ADMISSION TO POST-ACUTE INPATIENT REHABILITATION IN PATIENTS WITH ACUTE STROKE

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Objective: To identify predictors of admission to post-acute inpatient rehabilitation settings following acute care for stroke survivors in Taiwan.
Design: Prospective observation study.
Participants: Stroke survivors (*n* = 558) admitted to acute care wards for inpatient rehabilitation (62% male; mean age 60.0 ± 12.2 years).
Methods: The primary outcome was whether survivors were admitted to post-acute inpatient rehabilitation settings after discharge from acute care wards. Logistic regression model was adopted to examine the predictors of admission to post-acute inpatient rehabilitation. A receiver operating characteristic curve was drawn to compute the ability of the predictors to discriminate the outcome.
Results: Multivariate analysis results indicated Activity Measure Post-Acute Care "6-Clicks" Basic Mobility score to be the only significant predictor of admission to post-acute inpatient rehabilitation (odds ratio = 0.44, 95% confidence interval: 0.34–0.56). Receiver operating characteristic curve analysis results indicated that the cut-off point for Basic Mobility was 13 (standardized score: 33.99). This yielded a sensitivity value of 0.98 and a specificity value of 0.96 for determining the admission to post-acute inpatient rehabilitation.
Conclusion: Activity Measure Post-Acute Care "6-Clicks" Basic Mobility subscale scores at admission for acute care can predict admission to post-acute inpatient rehabilitation for stroke survivors in Taiwan. This tool can aid clinicians in formulating adequate discharge plans at an early stage, and thus improve the quality of care.

Key words: post-acute care; outcome assessment; quality of care; subacute care; rehabilitation; stroke.

LAY ABSTRACT

This study aimed to identify predictors of admission to post-acute inpatient rehabilitation settings following acute care for stroke survivors in Taiwan. This was a prospective observation study. The sample comprised 558 stroke survivors admitted to acute care who received inpatient rehabilitation. The results indicate that a functional measure, the Activity Measure Post-Acute Care "6-Clicks" Basic Mobility score, was the only significant predictor of admission to post-acute inpatient rehabilitation. Stroke survivors who scored lower than 13 on this tool were more likely to be referred to inpatient rehabilitation settings. Given the short lengths of stay in acute care, the Activity Measure Post-Acute Care "6-Clicks," a fast and reliable measurement tool, can help clinicians to formulate adequate discharge plans at an early stage, and thus minimize inappropriate referrals and improve quality of care.

Stroke is a leading cause of death and a major cause of life-long disability (1). The World Health Organization (WHO) has reported that 15 million people a year experience a stroke, 5 million of whom are permanently disabled as a result (2). Those who survive strokes often experience substantial functional loss. Rehabilitation can aid in maximizing the functional independence of these survivors (3). Furthermore, timely inpatient rehabilitation services can effectively reduce levels of mortality and disability (4, 5). However, the duration of acute care is often limited. The mean length of stay for patients with a stroke in acute care facilities in the USA is 5.3 days (6). By comparison, the mean length of stay in acute care is 5.9 days in the UK, 4.1 days in Australia, and 16 days in Japan (7). In Taiwan, the mean length of stay in acute care for patients with stroke is 22 days (8), which means that clinicians have more time to make discharge plans. Nevertheless, the time pressure remains intense, and clinicians must make professional judgements to provide the required services as soon as patients are admitted to hospital. Ensuring timely formulation of adequate discharge plans in order to enable patients to transit to the next stage of care is a substantial challenge for acute care clinicians (9).

The care provided after discharge from acute care wards is referred to as post-acute care (PAC) and is intended to enhance patients' functions and support their transition from hospital to home (10). PAC rehabilitation is crucial for recovery of stroke survivors; however, services vary widely across countries. In the USA, PAC

rehabilitation facilities include inpatient rehabilitation facilities (IRFs), skilled nursing facilities, long-term care hospitals, and home health agencies (11). In Taiwan, PAC rehabilitation is implemented in inpatient settings only (12). Patients in Taiwan receiving acute inpatient rehabilitation who have the potential to improve (based on physiatrists' judgements) and who agree to receive further inpatient rehabilitation are referred to local hospitals for PAC rehabilitation (12).

There is substantial evidence to support the effectiveness of implementing PAC in IRFs (10, 13). However, no consistent guidelines are available for determining whether a stroke patient in acute care should be referred for post-acute inpatient rehabilitation (11, 13). Admission to IRFs depends on multiple factors, such as stroke severity, physical and cognitive functions, psychological status, medical comorbidities, social support, likelihood of returning to the community, personal characteristics and preferences, as well as external systems, such as policy, sources of finance, and the funding of facilities (10, 11, 14). However, published evidence is mixed, and no consensus has been reached (11, 14). Without well-defined criteria, clinicians' referral decisions can be subjective and diverge across settings (11).

This study aimed to identify clinical predictors of admission to post-acute inpatient rehabilitation services after acute care for patients in Taiwan who have had a stroke. This will help to stimulate the development of referral criteria for inpatient rehabilitation. The findings will enable clinicians to rapidly identify patients who require subsequent inpatient care, and thereby optimize the quality of care.

METHODS

Settings

This was a prospective observation study of a convenience sample of patients diagnosed as having stroke, who were admitted to acute care wards and referred to inpatient rehabilitation at 3 clinical settings (an academic medical centre, a metropolitan hospital, and a local community hospital) in the greater Taipei area. These patients were referred by rehabilitation clinicians to the research staff between August 2016 and December 2017. Patients admitted to acute care wards in these hospitals typically remain in hospital for no more than 28 days. The cost of inpatient rehabilitation services provided by these hospitals was covered by National Health Insurance (NHI), a single-payer, universal programme in which 99% of the Taiwanese population are enrolled.

Patients

Inclusion criteria were: patients aged ≥ 20 years; medically stable; a primary diagnosis of cerebrovascular diseases with The International Statistical Classification of Diseases and Related Health Problems (ICD)-10 codes I60–I69; had undergone first admission to an acute care ward since their first stroke episode; and referred

for acute inpatient rehabilitation (physical therapy, occupational therapy, or both). Patients who had unstable vital signs or who could not provide informed consent were excluded. The study protocols were reviewed and approved by the institutional review boards of the associated university and all recruitment sites.

Measures

Outcome variable. The outcome of interest was admission to hospitals for post-acute inpatient rehabilitation following discharge from acute care wards. Data were extracted from medical records documented by case managers. A dichotomized response (yes/no) was used for the analysis.

Independent variables. Trained research staff collected background information on patients and clinical measures within 3 days of their admission to acute care. Clinical variables, such as diagnoses and comorbidities, were extracted from patients' medical records. The National Institutes of Health Stroke Scale (NIHSS) (15) was used to evaluate stroke severity, whereas the Montreal Cognitive Assessment (MoCA) (16) was used to assess patients' global cognition. The Center for Epidemiologic Studies-Depression (CES-D) (17), a 20-item self-report measure, was used to evaluate the frequency of depressive symptoms over the previous week. CES-D scores range from 0 to 60, with higher scores indicating greater depressive symptoms. Other variables, such as social support and living situation, were measured using a demographic questionnaire.

The Mandarin version of the Activity Measure Post-Acute Care (AM-PAC) "6-Clicks" was used to measure patients' functional status. Occupational and physical therapists, who had received full training in rating the AM-PAC "6-Clicks," were asked to complete this measure as part of routine documentation during their initial visit with the patients at admission. The AM-PAC "6-Clicks" is a validated tool designed to measure patients' capacity for executing functional activities in acute care settings (18, 19). The measure comprises 3 subscales: Basic Mobility, Daily Activity, and Applied Cognition. Each subscale consists of 6 items, rated by occupational or physical therapists either through direct observation of a patient performing an activity or clinical judgement regarding that patient's likely capability. A scale of 1 (unable to do) to 4 (no difficulty at all) was used to evaluate the amount of difficulty the patient exhibited in completing a task (18). The total score for each subscale ranged from 6 to 24, and all scores could be transformed into standardized *t*-scores. A lower score indicates a lower level of function (18). The AM-PAC "6-Clicks" was translated into Mandarin, a version that has demonstrated strong reliability and validity in patients in acute care settings in Taiwan (20).

Data analysis

First, descriptive statistics were calculated. Bivariate analyses (Student *t*-test and χ^2 analyses) were then used to explore associations between independent variables and the outcome variable. Variables significantly associated with the outcome variable ($p < 0.05$) were then entered into a logistic regression model. The goodness-of-fit for the logistic regression model was verified using Pregibon's Link Test to check for model specification (21).

To further test the performance of the model, a receiver operating characteristic (ROC) curve was drawn to depict the true-positive and false-positive rates of predictions by plotting sensitivity and [1 − specificity] along the y and x axes (22). The area under the ROC (AUC) was used to compute the ability of the predictors to discriminate the outcome: an AUC of ≥ 0.9 indicates highly discriminative, 0.7–0.9 moderately discriminative,

0.5–0.7 poorly discriminative, and <0.5 non-discriminative (22). For continuous variables, such as AM-PAC scores, Youden's index (23) was used to determine the cut-off score to predict the outcome. An iterative numerical method was used to identify the Youden's index and the corresponding cut-off point. The standard error of the cut-off point was estimated using a bootstrap method (500 bootstrap samples) (24). All analyses were conducted using SAS (version 9.4; SAS Institute, Cary, NC, USA).

RESULTS

Of the 636 stroke patients admitted to acute care wards for inpatient rehabilitation in the hospitals collaborating in this study, 587 met the eligibility criteria, 29 of whom withdrew from the study before the acute care admission assessment. Of the remaining 558 patients who completed the admission assessments, 58 had data missing on the discharge outcomes; therefore, a sample of 500 patients was used for analysis. The demographic characteristics of patients who completed the admission assessments and those with missing data on the discharge outcome are shown in Table I. No significant differences in characteristics were observed between the 2 samples. The mean length of hospital stay of the 500 patients was 23.8±9.2 days.

Of the patients discharged from acute care wards, 296 (59.2%) were admitted to post-acute inpatient rehabilitation and 204 (40.8%) received no further inpatient rehabilitation treatment. Bivariate analysis results are shown in Table II. The side of the stroke, previous stroke, NIHSS score, aphasia, neglect, MoCA

Table II. Results of bivariate analysis

Variable	Admission to inpatient care *t*-test	
	t-value	*p*-value
National Health Institutes Stroke Scale	−15.4	<0.0001
Montreal Cognitive Assessment Test	12.48	<0.0001
Center for Epidemiological Studies-Depression	0.07	0.94
AM-PAC Basic Mobility admission score	30	<0.0001
AM-PAC Daily Activity admission score	24.04	<0.0001
AM-PAC Applied Cognition admission score	11.97	<0.0001
	χ^2	*p*-value
Age (<65, ≥65 years)	2.27	0.13
Sex	0.44	0.51
Stroke type	1.16	0.28
Stroke side	34.4	<0.0001
Previous stroke	4.5	0.03
Marital status	2.06	0.15
Education	5.54	0.06
Employment status prior to stroke	1.91	0.17
Monthly household income	5.41	0.14
Aphasia	87.85	<0.0001
Neglect	39.63	<0.0001
Number of comorbidities	0.25	0.61

AM-PAC: Activity Measure Post-Acute Care.

Table I. Patients' characteristics

Characteristics	Baseline sample (*n* = 558)	Missing data on the discharge outcome (*n* = 58)	*p*-value
Sex, female, *n* (%)	212 (38)	22 (37.9)	0.10
Age, years, mean (SD)	59.95 (12.22)	59.79 (12.81)	0.61
Stroke type, infarction, *n* (%)	389 (69.7)	41 (70.6)	0.89
Stroke side, left, *n* (%)	277 (49.6)	24 (41.4)	0.36
Previous stroke, yes, *n* (%)	43 (7.7)	9 (15.5)	0.18
National Institutes of Health Stroke Scale, mean (SD)	11.72 (4.49)	12.21 (4.41)	0.52
Days from admission to first visit, mean (SD)	3.48 (2.43)	5.21 (3.50)	0.26
Number of comorbidities, mean (SD)	1.20 (1.08)	1.09 (1.00)	0.44
Education, *n* (%)			
Below high-school	292 (52.3)	30 (51.7)	0.98
High-school graduate	173 (31.0)	17 (29.3)	
College graduate or higher	93 (16.7)	11 (19.0)	
Employment status prior to stroke, employed	286 (51.3)	35 (60.3)	0.79
Marital status, *n* (%)			
Married/with a partner	426 (76.3)	48 (82.8)	0.26
Single/widowed/separated/divorced	132 (23.7)	10 (17.2)	
Monthly household income (NTD), *n* (%)			
<30,000	45 (8.1)	2 (3.4)	0.54
30,000–49,999	147 (26.3)	8 (13.8)	
50,000–79,999	254 (45.5)	32 (55.2)	
≥80,000	112 (20.1)	16 (27.6)	
Barthel Index (0–100), mean (SD)	36.78 (31.15)	33.19 (33.43)	0.88
Montreal Cognitive Assessment (0–30), mean (SD)	12.55 (9.31)	12.43 (9.77)	0.70
Center for Epidemiological Studies-Depression, mean (SD)	4.76 (4.91)	4.58 (4.41)	0.90
AM-PAC "6-Clicks" standardized score, mean (SD)			
Basic Mobility admission score (16.59–57.68)	31.67 (12.11)	32.84 (13.00)	0.39
Daily Activity admission score (17.07–57.54)	30.57 (11.40)	31.63 (11.97)	0.29
Applied Cognition admission score (7.69–62.21)	30.44 (16.91)	31.09 (17.56)	0.91
Discharge destination (N=500), *n* (%)			
Post-acute inpatient rehabilitation settings	296 (59.2)	NA	NA
Home	204 (40.8)	NA	NA

NTD: New Taiwan dollar; AM-PAC: Activity Measure Post-Acute Care. Note: Mean exchange rate in 2017 US$1.00 ≈ NT$30.44.

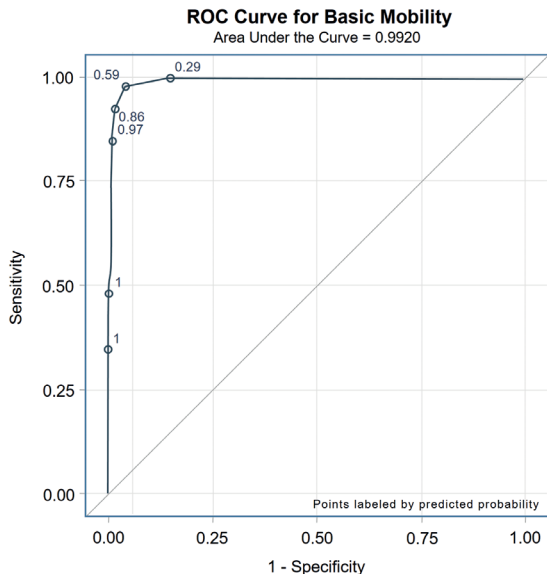**ROC Curve for Basic Mobility**
Area Under the Curve = 0.9920

Fig. 1. Receiver operating characteristic (ROC) curve of the baseline Activity Measure Post-Acute Care (AM-PAC) Basic Mobility score in predicting inpatient rehabilitation.

score, and AM-PAC admission scores were significantly correlated with outcome ($p < 0.05$).

The logistic regression analysis results are shown in Table III. Among the significant variables in the bivariate analyses, the admission score on AM-PAC Basic Mobility was the only significant predictor of post-acute inpatient rehabilitation (odds ratio = 0.44, 95% confidence interval (95% CI): 0.34–0.56). This variable explained 44.24% of the variance in post-acute inpatient rehabilitation.

The ROC curve of baseline AM-PAC Basic Mobility score in predicting post-acute inpatient rehabilitation is shown in Fig. 1. The AUC for the AM-PAC Basic Mobility was 0.99 (95% CI 0.98–1) and is therefore highly discriminative; its cut-off point was 13 (standardized score 33.99), yielding a sensitivity value of 0.98 and a specificity value of 0.96 in determining the outcome.

Table III. Multivariate and logistic regression results

Variables	Admission to inpatient care	
	OR	95% CI
National Health Institutes Stroke Scale	1.08	(0.88–1.32)
Montreal Cognitive Assessment Test	1.04	(0.95–1.14)
AM-PAC Basic Mobility admission score	0.44*	(0.34–0.56)
AM-PAC Daily Activity admission score	1	(0.85–1.19)
AM-PAC Applied Cognition admission score	0.96	(0.90–1.02)
Stroke side	1.28	(0.17–9.85)
Aphasia	1.52	(0.13–17.51)
Neglect	1.83	(0.30–11.33)

*Statistically significant ($p < 0.05$ or 95% CI does not include 1).
Link test (specification error test): predictor: $p = 0.0005$; predictor^2: $p = 0.23$.
95% CI: 95% confidence interval; OR: odds ratio; Std: standardized. AM-PAC: Activity Measure Post-Acute Care.

DISCUSSION

The effectiveness of inpatient rehabilitation for stroke patients at the post-acute stage has been demonstrated in numerous studies (13, 25, 26). However, in practice, inpatient rehabilitation needs were often underestimated (27). Early identification of patients requiring inpatient rehabilitation is imperative. In this study, the AM-PAC "6-Clicks" Basic Mobility admission score in acute care was the dominant predictor of subsequent inpatient rehabilitation for patients with stroke in Taiwan. This finding is in line with studies conducted in the USA in which physical function has been found to be a strong predictor of discharge destination for acute patients (28, 29). Other factors, such as age, cognition, and social support, which have sometimes been identified as predictors of the need for inpatient rehabilitation care, did not exhibit a significant association with admission to inpatient rehabilitation in the current prediction model (10, 14). This is possibly because mobility is a key predictor of stroke recovery and a critical indicator of independence (30, 31). By using data on mobility functions at admission, clinicians can infer whether a referral to PAC is needed and prepare the patients for further inpatient rehabilitation. This result does not imply that other variables are unimportant in the referral of PAC rehabilitation. On the contrary, variables such as cognitive impairments and psychosocial conditions are often overlooked in rehabilitation, given that they are less obvious than physical functions (32). Clinicians must therefore monitor patients' integral need for further support during the AC and PAC rehabilitation process.

Although most related studies have used conventional functional measures, such as the Barthel Index (33) and Functional Independence Measure (34), to assess patients' physical function, the AM-PAC "6-Clicks" was adopted because it is a straightforward and sophisticated assessment that measures different functional domains. It also has competitive advantages in that it can be completed quickly by clinical staff and can be used throughout different stages of stroke care (acute care, inpatient rehabilitation, and outpatient care) (9). The findings of the current study supported the use of the AM-PAC "6-Clicks" in predicting stroke patients' post-acute outcome, and suggested that patients with more mobility limitations were more likely to be admitted to inpatient rehabilitation settings after hospitalization for acute care.

To explicate the ability of the AM-PAC "6-Clicks" Basic Mobility subscale to predict inpatient rehabilitation vs a non-inpatient rehabilitation outcome, we conducted an ROC analysis, which indicated that the Basic Mobility score had strong discriminative ability.

According to the ROC curve analysis, patients who scored < 33.99 on Basic Mobility at admission to acute care were more likely to receive post-acute inpatient rehabilitation than those who scored ≥ 33.99. This cut-off score is somewhat different from that reported in the USA, where the cut-off scores on the AM-PAC "6-Clicks" Basic Mobility that predicted discharge destination (home vs institutional settings) were 44.16 and 42.9, respectively (9, 35). The differences might be attributable to the large number of differences in acute care and PAC services between Taiwan and the USA. As reported earlier, PAC rehabilitation services in Taiwan are implemented only in inpatient settings and are completely covered by the NHI, whereas PAC rehabilitation services in the USA are extremely heterogeneous in terms of availability, type of care settings, intensity, duration, and insurance coverage (10). The mean length of acute care in Taiwan is also much longer than that in the USA, which can have a substantial impact on discharge outcomes. For example, patients discharged from acute care in the USA are possibly at a more unstable stage compared with patients discharged from acute care in Taiwan, and discharge planning may be influenced by a greater number of factors. Given these external influences, identifying the admission criteria for PAC rehabilitation within each unique context is critical. The findings identified in this study may provide a valuable reference for countries aiming to establish similar PAC systems.

A global review of inpatient rehabilitation for patients who have had a stroke reported a lack of available evidence upon which to establish guidelines for the admission of patients to inpatient rehabilitation services after the initial acute hospital stay, even in developed countries (36). Moreover, the guidelines developed in one country may be more applicable to the local healthcare system; generalizing such guidelines to countries with different systems may thus be difficult (37, 38). Developing guidelines within a regional system to address context-specific issues is therefore required (36). The current study responded to this global need by providing evidence to support the use of a standardized measurement tool to predict admission to PAC inpatient rehabilitation for patients with a stroke in Taiwan. Based on the assessment results at admission to acute care, clinicians can rapidly determine whether further inpatient rehabilitation might be required and make pre-arrangements, thus minimizing the cost and complications associated with unnecessary hospital stays.

Study limitations

This study has several limitations that must be addressed. First, a convenience sample was recruited from the greater Taipei area, where medical resources and hospitals are in greater abundance than elsewhere in Taiwan. The mean age of patients in the study sample was approximately 60 years, slightly less than the mean age of post-acute stroke patients in Taiwan (63 years) (12). This may be because the population in urban areas is generally younger. Consequently, our results might not be generalizable to all stroke survivors in the country. Additional studies conducted in different areas are required to validate the findings. Secondly, although it was possible to account for most of the potential outcome predictors suggested in the literature, some variables were not considered. For instance, there was no data on pre-stroke mobility and urinary continence, which may be potential predictors of admission to PAC inpatient rehabilitation (10, 39). Non-clinical factors, such as patients' preferences and service availability, may also have affected patients' decisions (29, 39). Future studies could therefore expand the findings by including additional variables in their analyses. Despite these limitations, the strengths of this study include its prospective design, the large sample size, the involvement of multiple centres, and the adoption of validated measures to collect predictive and outcome variables.

Conclusion

AM-PAC "6-Clicks" Basic Mobility score at admission to acute care rehabilitation was found to predict the admission of patients with a stroke to post-acute inpatient rehabilitation in Taiwan. A cut-off score of 13 (standardized score = 33.99) for Basic Mobility at admission provides high accuracy in predicting admission to inpatient rehabilitation. Given the short lengths of stay in acute care, the AM-PAC "6-Clicks," a fast and reliable measurement tool, can help clinicians formulate adequate discharge plans at an early stage, and thus minimize inappropriate referrals and improve the quality of care. The findings of this study can also contribute to the development of international stroke rehabilitation guidelines.

REFERENCES

1. World Health Organization. World health report 2007. Geneva: WHO; 2007.
2. World Health Organization (WHO). The atlas of heart disease and stroke. Geneva: WHO; 2015 [cited 2015 Sep 23]. Available from: http://www.who.int/cardiovascular_diseases/resources/atlas/en/.
3. Mueller M, Grill E, Stier-Jarmer M, Strobl R, Gutenbrunner C, Fialka-Moser V, et al. Validation of the comprehensive ICF Core Sets for patients receiving rehabilitation interventions in the acute care setting. J Rehabil Med 2011; 43: 92–101.
4. Kalra L. Facilitating recovery: evidence for organized stroke care. J Rehabil Med 2007; 39: 97–102.
5. Lin IH, Tsai HT, Wang CY, Hsu CY, Liou TH, Lin YN. Effectiveness and superiority of rehabilitative treatments in enhancing motor recovery within 6 months poststroke: a systemic review. Arch Phys Med Rehabil 2019; 100: 366–378.
6. Hall MJ, Levant S, DeFrances CJ. Hospitalization for stroke in U.S. hospitals, 1989-2009. NCHS Data Brief 2012; (95): 1–8.
7. The Organisation for Economic Co-operation and Development (OECD). Health at a Glance 2019. OECD Indicators. Paris: OECD Publishing, 2019.
8. Lee H-C. Inpatient rehabilitation utilization for acute stroke under a universal health insurance system. Am J Manag Care 2010; 16: e67–e74.
9. Jette DU, Stilphen M, Ranganathan VK, Passek SD, Frost FS, Jette AM. AM-PAC "6-Clicks" functional assessment scores predict acute care hospital discharge destination. Phys Ther 2014; 94: 1252–1261.
10. Winstein CJ, Stein J, Arena R, Bates B, Cherney LR, Cramer SC, et al. Guidelines for adult stroke rehabilitation and recovery. Stroke 2016; 47: e98–e169.
11. Longley V, Peters S, Swarbrick C, Bowen A. What factors affect clinical decision-making about access to stroke rehabilitation? A systematic review. Clin Rehabil 2019; 33: 304–316.
12. Lai C-L, Tsai M-M, Luo J-Y, Liao W-C, Hsu P-S, Chen H-Y. Post-acute care for stroke - a retrospective cohort study in Taiwan. Patient Prefer Adherence 2017; 11: 1309–1315.
13. Chan L, Sandel ME, Jette AM, Appelman J, Brandt DE, Cheng P, et al. Does postacute care site matter? A longitudinal study assessing functional recovery after a stroke. Arch Phys Med Rehabil 2013; 94: 622–629.
14. Hakkennes SJ, Brock K, Hill KD. Selection for inpatient rehabilitation after acute stroke: a systematic review of the literature. Arch Phys Med Rehabil 2011; 92: 2057–2070.
15. Cincura C, Pontes-Neto OM, Neville IS, Mendes HF, Menezes DF, Mariano DC, et al. Validation of the National Institutes of Health Stroke Scale, modified Rankin Scale and Barthel Index in Brazil: the role of cultural adaptation and structured interviewing. Cerebrovasc Dis 2009; 27: 119–122.
16. Nasreddine ZS, Phillips NA, Bedirian V, Charbonneau S, Whitehead V, Collin I, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriat Soc 2005; 53: 695–699.
17. Radloff LS. The CES-D Scale: A Self-Report Depression Scale for Research in the General Population. Appl Psychol Meas 1977; 1: 385–401.
18. Jette DU, Stilphen M, Ranganathan VK, Passek SD, Frost FS, Jette AM. Validity of the AM-PAC "6-Clicks" Inpatient Daily Activity and Basic Mobility Short Forms. Phys Ther 2014; 94: 379–391.
19. Jette DU, Stilphen M, Ranganathan VK, Passek S, Frost FS, Jette AM. Interrater Reliability of AM-PAC "6-Clicks" Basic Mobility and Daily Activity Short Forms. Phys Ther 2015; 95: 758–766.
20. Hou W-H, Chiou H-Y, Chang F-H. Validation of the Mandarin version of the activity measure for post-acute care (AM-PAC) "6-Clicks" among patients in acute rehabilitation. Am J Occup Ther 2020; 74: 1–9.
21. Pregibon D. Goodness of link tests for generalized linear models. J Royal Statist Soc: Series C (Applied Statistics) 1980; 29: 15–24.
22. Bewick V, Cheek L, Ball J. Statistics review 13: receiver operating characteristic curves. Critical Care (London, England) 2004; 8: 508–512.
23. Youden WJ. Index for rating diagnostic tests. Cancer 1950; 3: 32–35.
24. Dagher JH, Richard-Denis A, Lamoureux J, de Guise E, Feyz M. Acute global outcome in patients with mild uncomplicated and complicated traumatic brain injury. Brain Inj 2013; 27: 189–199.
25. Deutsch A, Granger CV, Heinemann AW, Fiedler RC, DeJong G, Kane RL, et al. Poststroke rehabilitation: outcomes and reimbursement of inpatient rehabilitation facilities and subacute rehabilitation programs. Stroke 2006; 37: 1477–1482.
26. Kalra L, Langhorne P. Facilitating recovery: evidence for organized stroke care. J Rehabil Med 2007; 39: 97–102.
27. Chou M-Y, Liang C-K, Lin Y-T, Chen L-K, Peng L-N, Liu L-K, et al. Screening postacute care needs of hospital inpatients in Taiwan: a hospital-based study. J Clin Gerontol Geriatr 2012; 3: 132–135.
28. Ilett PA, Brock KA, Graven CJ, Cotton SM. Selecting patients for rehabilitation after acute stroke: are there variations in practice? Arch Phys Med Rehabil 2010; 91: 788–793.
29. Stein J, Bettger JP, Sicklick A, Hedeman R, Magdon-Ismail Z, Schwamm LH. Use of a standardized assessment to predict rehabilitation care after acute stroke. Arch Phys Med Rehabil 2015; 96: 210–217.
30. Denti L, Agosti M, Franceschini M. Outcome predictors of rehabilitation for first stroke in the elderly. Eur J Phys Rehabil Med 2008; 44: 3–11.
31. Chumney D, Nollinger K, Shesko K, Skop K, Spencer M, Newton RA. Ability of Functional Independence Measure to accurately predict functional outcome of stroke-specific population: systematic review. J Rehabil Res Dev 2010; 47: 17–29.
32. Slenders JPL, Verberne DPJ, Visser–Meily JMA, Van den Berg-Vos RM, Kwa VIH, van Heugten CM. Early cognitive and emotional outcome after stroke is independent of discharge destination. J Neurol 2020 Jun 24. [Epub ahead of print].
33. Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. Md State Med J 1965; 14: 61–65.
34. Ottenbacher KJ, Hsu Y, Granger CV, Fiedler RC. The reliability of the functional independence measure: a quantitative review. Arch Phys Med Rehabil 1996; 77: 1226–1232.
35. Chang FH, Ni P, Jette AM. Does activity limitation predict discharge destination for postacute care patients? Am J Phys Med Rehabil 2014; 93: 782–790.
36. Lynch EA, Cadilhac DA, Luker JA, Hillier SL. Inequities in access to inpatient rehabilitation after stroke: an international scoping review. Top Stroke Rehabil 2017; 24: 619–626.
37. Platz T. Evidence-based guidelines and clinical pathways in stroke rehabilitation-an international perspective. Front Neurol 2019; 10: 200–200.
38. Kuptniratsaikul V, Kovindha A, Massakulpan P, Permsirivanich W, Kuptniratsaikul PS. Inpatient rehabilitation services for patients after stroke in Thailand: a multi-centre study. J Rehabil Med 2009; 41: 684–686.
39. Labberton AS, Barra M, Rønning OM, Thommessen B, Churilov L, Cadilhac DA, et al. Patient and service factors associated with referral and admission to inpatient rehabilitation after the acute phase of stroke in Australia and Norway. BMC Health Serv Res 2019; 19: 871.