International Journal of General Medicine Dovepress

Open Access Full Text Article ORIGINAL RESEARCH

Exploring Predictors of Long-Term Care Facility Admissions in Stroke Survivors: Insights from a Taiwanese Hospital-Based Study

Kuan-Hsien Lu[1], Huey-Juan Lin[1], Chung-Han Ho[2], Kuan-Hung Lin[1]

[1]Department of Neurology, Chi Mei Medical Center, Tainan, Taiwan, Republic of China; [2]Department of Medical Research, Chi Mei Medical Center, Tainan, Taiwan, Republic of China

Correspondence: Kuan-Hung Lin, Department of Neurology, Chi Mei Medical Center, No. 901, Zhonghua Road Yongkang Dist, Tainan City, 71004, Taiwan, Republic of China, Tel +886-6-2812811 ext. 57110 or 53744, Email bbrick0326@gmail.com

Purpose: Acute stroke significantly increases the risk of long-term care facility (LTCF) admission, due to sudden functional impairments. This study aims to identify risk factors associated with LTCF admission among stroke patients, specifically targeting those who transitioned from independence to disability after stroke.

Patients and Methods: We retrospectively enrolled 2027 stroke patients admitted between 2017 and 2022 from the Chi Mei Medical Center's stroke registry in Southern Taiwan, focusing on those with pre-stroke modified Rankin Scale (mRS) scores ≤ 2 and post-stroke mRS scores ≥ 3. Patients were categorized into LTCF and non-LTCF groups. Stroke severity, comorbidities, and discharge outcomes were evaluated, using logistic regression analyses to identify LTCF admission risk factors.

Results: Of the 2027 patients, 343 (16.9%) were admitted to LTCFs post-discharge. The LTCF group exhibited higher discharge mRS and National Institute of Health Stroke Scale scores, and lower Barthel Index scores. Factors linked to LTCF admission included higher discharge mRS scores, lower Barthel Index scores, nasogastric tube placement at discharge, and longer hospital stays. Barthel Index scores showed no significant change from admission to discharge in the LTCF group.

Conclusion: Stroke severity, post-stroke functional status and nasogastric tube placement are significant predictors of LTCF admission in stroke patients. Early recognition of these factors is crucial for effective discharge planning and reducing the need for institutionalization. The study emphasizes the need for personalized interventions targeting these risk factors to improve patient outcomes and optimize medical resource utilization.

Keywords: institutionalization, health care facilities, cerebrovascular accident, risk factors, patient discharge

Introduction

Acute stroke constitutes a significant risk factor for admission into long-term care facilities (LTCFs), primarily attributable to sudden functional impairments in activities of daily living.[1–3] For those non-disabled before stroke, a disabling stroke has a relatively greater impact on the care burden and socioeconomic needs. Data from the literature suggest that the incidence of LTCF admissions among stroke survivors varies widely, ranging from 7% to 39%.[2] Notably, the Taiwan Stroke Registry reports a rate of 7%.[4] Extended hospital stays often occur while preparing for transition to LTCF, not only increasing healthcare costs but also negatively affecting patients' psychological and physical health.[1,5–8] Although numerous studies have sought to identify predictive risk factors for LTCF placement post-stroke, a definitive predictive model remains elusive.[2–4] Early identification and intervention targeting modifiable risk factors, such as early rehabilitation to enhance functional recovery, can reduce the need for long-term institutionalization and increase the chances of home return.[9,10] For non-modifiable risk factors, early recognition of patients at higher risk for LTCF admission enables timely discharge planning and coordination of appropriate care settings. Addressing these risk factors proactively leads to more efficient healthcare resource utilization and smoother transitions to suitable post-acute care residency.

Received: 27 June 2024
Accepted: 23 October 2024
Published: 30 October 2024

Hence, our research focuses on identifying the risk factors for long-term institutionalization in stroke patients, specifically targeting those who transitioned from independence to disability as a result of the stroke.

Materials and Methods

Patient Selection and Definitions

This study sourced data from the hospital-based prospective stroke registry at Chi-Mei Medical Center, a teaching hospital with more than 1200 beds in Southern Taiwan. The stroke registry has been approved by the Ethics Committee of Chi-Mei Medical Center and conformed to the criteria of the nationwide Taiwan Stroke Registry.[11] In brief, the registry enrolled patients admitted within 10 days of stroke onset, using International Classification of Diseases-10 codes: I63 for ischemic stroke, G45 for transient ischemic attack, I61 and I62 for nontraumatic intracerebral hemorrhage, and I60 for nontraumatic subarachnoid hemorrhage. Patient characteristics, including demographic data, medical history, comorbidities, stroke severity, treatments, hospital course, and complications, were collected according to a pre-defined system. Stroke severity was assessed with National Institutes of Health Stroke Scale (NIHSS). Functional status before the stroke event and at discharge was categorized with the modified Rankin Scale (mRS) and Barthel index scores. The mRS ranges from 0 (no symptoms) to 6 (death), indicating different levels of disability and dependency. The Barthel Index is an ordinal scale that measures a person's ability to perform activities of daily living, with scores ranging from 0 to 100, where higher scores indicate better functional ability. We restricted our cohort to patients aged 18 years or above and diagnosed with any type of stroke, either first-ever or recurrent, within the time frame of January 1, 2017, to December 31, 2022. Stroke was defined in accordance with the recommendations of the World Health Organization and categorized into either ischemic or hemorrhagic stroke, confirmed through computed tomography and/or magnetic resonance imaging. Patients who had a pre-admission mRS score of 3 or higher, or who were already residing in an LTCF before the stroke event, as well as those who had an mRS score of 2 or less at the time of discharge, or who died prior to hospital discharge, were excluded. For stroke survivors, the discharge disposition was recorded as home, nursing home, respiratory care ward, transition to hospital, or Post-Acute Care. Since 2014, Taiwan's National Health Insurance has implemented a Post-Acute Care program for stroke patients, aimed at enhancing functional recovery through rehabilitation in regional or community hospitals. We defined nursing home and respiratory care ward as long-term care facilities (LTCF), and the rest as the non-LTCF group.

This study followed the Declaration of Helsinki and was approved by Chi-Mei Medical Center's Institutional Review Board. As the study was retrospective in nature, the need for informed consent was waived. Patient data confidentiality was strictly maintained.

Statistical Analysis

Continuous variables are delineated as medians accompanied by interquartile ranges or mean accompanied by standard deviation, whereas categorical variables are expressed as frequencies and percentages. LTCF group and non-LCTF group were compared using the Mann–Whitney *U*-test for continuous data and either Pearson's chi-square or Fisher's exact test for categorical data. We assessed changes in Barthel Index scores from admission to discharge within groups and differences between LTCF group and non-LCTF group. Box plots visualized score distributions, central tendency, and variability. Logistic regression was employed to estimate the associations between LCTF admission and variables, presented as odds ratios (ORs) along with 95% confidence intervals (CIs). Significant predictors of LCTF admission ($p < 0.05$) identified in univariable analyses were further scrutinized using multivariable logistic regression. All statistical procedures were conducted using SAS software (version 9.4; SAS Institute, Cary, NC, USA), with a significance level set at $p < 0.05$.

Results

Our study, conducted from 2017 to 2022, initially included 6967 hospitalized stroke patients. After applying exclusion criteria, 4940 patients were excluded, leaving 2027 eligible for further analysis (Figure 1). Among the 2027 stroke patients enrolled in the study, 343 resided in LTCFs post-discharge (LTCF group), while 1684 did not (non-LTCF group).

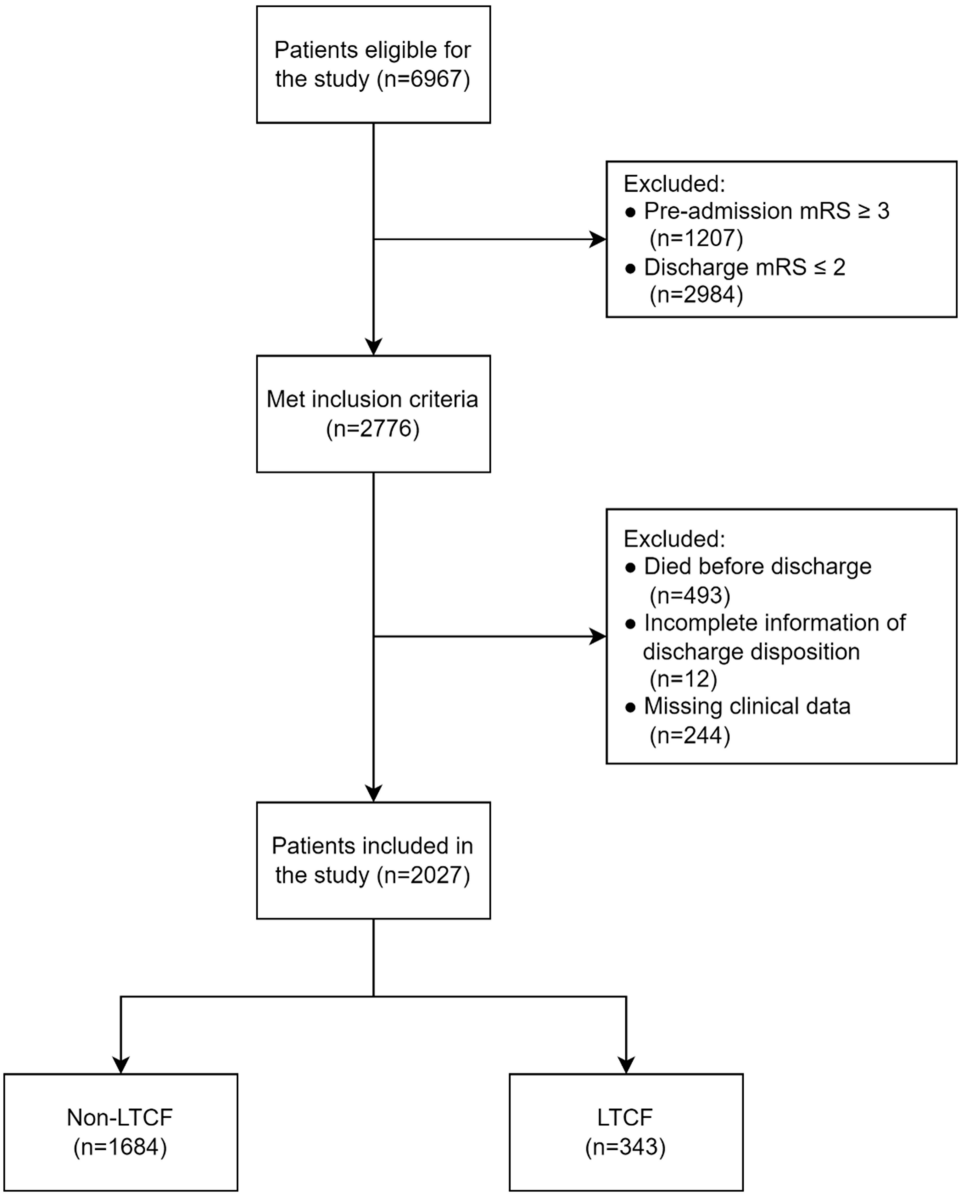

Figure 1 Flowchart of patient selection in this study.

The baseline characteristics indicated that the LTCF group was generally older ($p < 0.001$) and had a higher proportion of NG tube ($p < 0.001$) and Foley catheter ($p < 0.001$) placement at discharge compared to the non-LTCF groups (Table 1). However, no significant differences were observed in comorbidities between the two groups, apart from dyslipidemia ($p = 0.021$) and atrial fibrillation ($p = 0.035$).

Table 2 showed that patients in the LTCF group exhibited higher discharge mRS scores and NIHSS scores, along with lower Barthel Index scores and GCS scores. The mRS scores prior to the stroke event did not significantly differ between the LTCF group and the non-LTCF group.

As depicted in Figure 2, Barthel Index scores remained statistically unchanged from admission to discharge in stroke survivors residing in LTCFs ($p = 0.329$), whereas a significant increase was observed in those not in LTCFs ($p < 0.001$). Comparative analysis revealed that the LTCF cohort had lower Barthel Index scores both at admission and discharge, relative to the non-LTCF cohort ($p < 0.001$).

In univariable logistic regression, those characteristics associated with discharge to LTCFs included age ($p = 0.006$ for ≥ 80 years), atrial fibrillation ($p = 0.035$), stroke subtype ($p < 0.001$ for hemorrhagic vs ischemic stroke), higher discharge mRS

Table 1 Demographic and Clinical Characteristics of Included Patients

Variables	Non-LTCF n = 1684	LTCF n = 343	*p* value
Characteristics			
Age (years), median (IQR)	67.00 (57.00–76.00)	68.00 (59.00–79.00)	0.004
Age (years)			0.006
<80	1402 (83.3)	264 (77.0)	
≥80	282 (16.8)	79 (23.0)	
Sex			0.532
Female	639 (38.0)	124 (36.2)	
Male	1045 (62.1)	219 (63.8)	
Smoking			0.310
Never	1151 (68.4)	244 (71.1)	
Ever/current	533 (31.6)	99 (28.9)	
Alcohol			0.633
Never	1381 (82.0)	285 (83.1)	
Ever/current	303 (18.0)	58 (16.9)	
Length of hospital stay (days)			< 0.001
< 14	881 (52.3)	56 (16.3)	
≥ 14	803 (47.7)	287 (83.7)	
ICU admission	259 (15.4)	73 (21.3)	0.007
Stroke subtype			< 0.001
Ischemic stroke	1242 (73.8)	213 (62.1)	
Hemorrhagic stroke	442 (26.3)	130 (37.9)	
Comorbidities			
Previous CVA	334 (19.8)	66 (19.2)	0.802
Hypertension	1271 (75.5)	247 (72.0)	0.178
Dyslipidemia	1350 (80.2)	256 (74.6)	0.021
Diabetes	682 (40.5)	129 (37.6)	0.319
Cancer	106 (6.3)	19 (5.5)	0.596
CKD	18 (1.1)	6 (1.8)	0.276
Atrial fibrillation	226 (13.4)	61 (17.8)	0.035
Treatments			
NG tube at discharge	298 (17.7)	238 (69.4)	< 0.001
Foley catheter at discharge	257 (15.3)	125 (36.4)	< 0.001

Abbreviations: LTCF, long-term care facility; IQR, interquartile range; ICU, intensive care unit; CVA, cerebrovascular accident; CKD, chronic kidney disease; NG tube, nasogastric tube.

Table 2 Stroke Severity Scales and Functional Status of Included Patients

Variables	Non-LTCF n=1684	LTCF n=343	*p* value
Pre-admission mRS			0.090
0	1172 (69.6)	230 (67.1)	
1	260 (15.4)	46 (13.4)	
2	252 (15.0)	67 (19.5)	
Discharge mRS			< 0.001
3	868 (51.5)	35 (10.2)	
4	696 (41.3)	133 (38.8)	
5	120 (7.1)	175 (51.0)	
Admission Barthel index, mean (SD)	44.70 (30.65)	15.77 (23.52)	< 0.001
Discharge Barthel index, mean (SD)	54.23 (27.66)	16.98 (22.25)	< 0.001

(*Continued*)

Table 2 (Continued).

Variables	Non-LTCF n=1684	LTCF n=343	*p* value
Admission NIHSS			< 0.001
0–7	942 (55.9)	67 (19.5)	
8–15	428 (25.4)	81 (23.6)	
16–42	314 (18.7)	195 (56.9)	
Discharge NIHSS			< 0.001
0–7	1159 (68.8)	69 (20.1)	
8–15	380 (22.6)	107 (31.2)	
16–42	145 (8.6)	167 (48.7)	
GCS			< 0.001
3–8	84 (5.0)	64 (18.7)	
9–12	226 (13.4)	91 (26.5)	
13–15	1374 (81.6)	188 (54.8)	

Abbreviations: LTCF, long-term care facility; mRS, modified Rankin Scale; SD, standard deviation; NIHSS, National Institutes of Health Stroke Scale; GCS, Glasgow Coma Scale.

score ($p < 0.001$), lower Barthel Index score ($p < 0.001$), NIHSS score ≥8 ($p < 0.001$), GCS score ≤12 ($p < 0.001$), NG tube at discharge ($p < 0.001$), Foley catheter at discharge ($p < 0.001$), length of hospital stay ($p < 0.001$ for ≥ 14 days) and ICU admission ($p = 0.007$) (Table 3). Dyslipidemia was associated with decreased likelihood of LTCF disposition ($p = 0.022$).

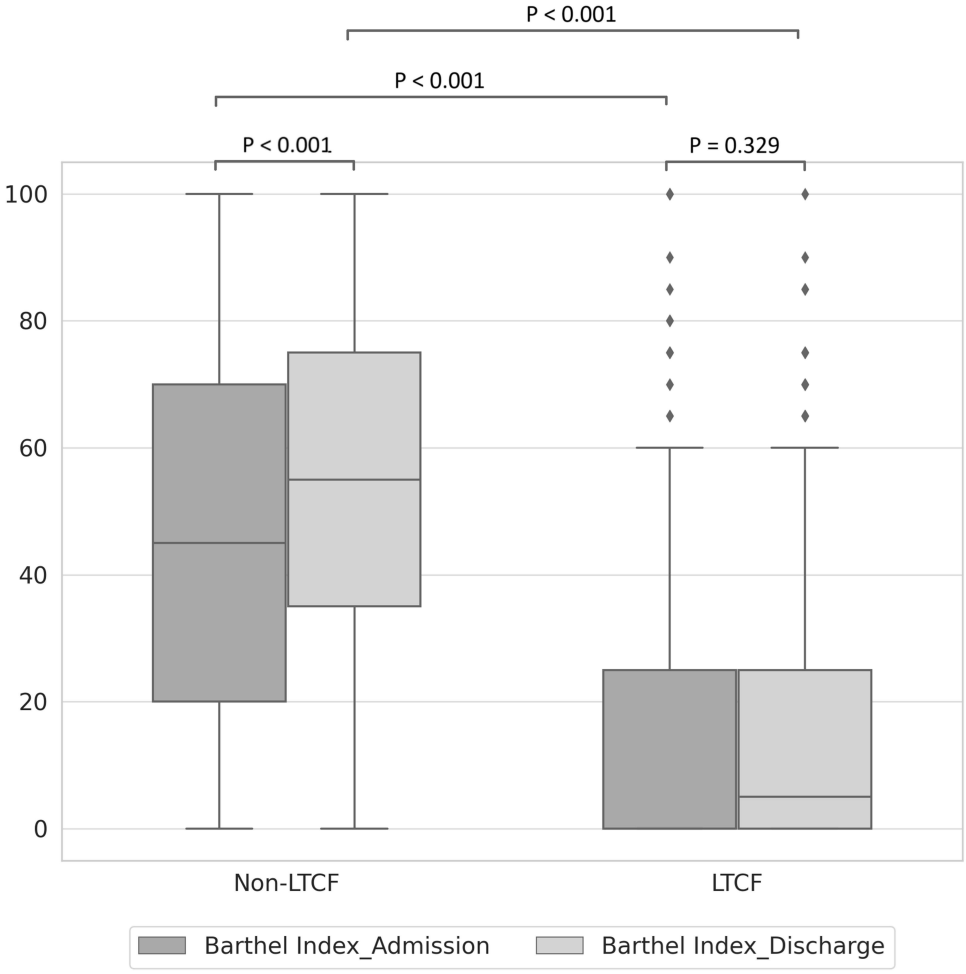

Figure 2 Barthel Index Scores at Admission and Discharge for Patients Based on LTCF Admission.
Abbreviation: LTCF, long-term care facility.

Table 3 Associations Between LTCF Admission and Selected Variables.

	Univariable Logistic Regression		Multivariable Logistic Regression	
	Odds Ratio (95% CI)	***p* value**	**Odds Ratio (95% CI)**	***p* value**
Characteristics				
Age (years)				
< 80	Ref		Ref	
≥ 80	1.49 (1.12–1.97)	0.006	1.27 (0.88–1.82)	0.202
Sex				
Female	Ref			
Male	1.08 (0.85–1.38)	0.532		
Smoking				
Never	Ref			
Ever/current	0.88 (0.68–1.13)	0.310		
Alcohol				
Never	Ref			
Ever/current	0.93 (0.68–1.26)	0.633		
Length of hospital stay (days)				
< 14	Ref		Ref	
≥ 14	5.62 (4.16–7.60)	< 0.001	1.49 (1.01–2.19)	0.045
ICU admission	1.49 (1.11–1.99)	0.007	0.72 (0.50–1.03)	0.073
Stroke subtype				
Ischemic stroke	Ref		Ref	
Hemorrhagic stroke	1.72 (1.34–2.19)	< 0.001	1.14 (0.81–1.61)	0.451
Comorbidities				
Previous CVA	0.96 (0.72–1.29)	0.803		
Hypertension	0.84 (0.64–1.09)	0.178		
Dyslipidemia	0.73 (0.56–0.96)	0.022	0.97 (0.69–1.36)	0.848
Diabetes	0.89 (0.70–1.13)	0.320		
Cancer	0.87 (0.53–1.44)	0.596		
CKD	1.65 (0.65–4.18)	0.293		
Atrial fibrillation	1.40 (1.02–1.90)	0.035	0.72 (0.48–1.09)	0.120
Treatments				
NG tube at discharge	10.54 (8.12–13.69)	< 0.001	1.87 (1.29–2.71)	0.001
Foley catheter at discharge	3.18 (2.46–4.12)	< 0.001	0.94 (0.69–1.30)	0.724
Severity Scales				
Discharge mRS				
3	Ref		Ref	
4	4.74 (3.22–6.97)	< 0.001	1.27 (0.79–2.06)	0.325
5	36.16 (24.00–54.50)	< 0.001	3.22 (1.72–6.05)	< 0.001
Discharge Barthel index	0.95 (0.94–0.95)	< 0.001	0.97 (0.96–0.98)	< 0.001
Discharge NIHSS				
0–7	Ref		Ref	
8–15	4.73 (3.42–6.54)	< 0.001	1.19 (0.78–1.81)	0.421
16–42	19.35 (13.92–26.89)	< 0.001	1.17 (0.67–2.05)	0.588
GCS				
3–8	5.57 (3.89–7.98)	< 0.001	1.04 (0.66–1.65)	0.855
9–12	2.94 (2.21–3.92)	< 0.001	0.96 (0.67–1.38)	0.821
13–15	Ref		Ref	

Abbreviations: CI, confidence interval; Ref, reference; ICU, intensive care unit; CVA, cerebrovascular accident; CKD, chronic kidney disease; NG tube, nasogastric tube; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; GCS, Glasgow Coma Scale.

On multivariable analysis, discharge mRS score 5 (OR 3.22 [1.72–6.05]), discharge Barthel Index (OR 0.97 [0.96-–0.98]), NG tube at discharge (OR 1.87 [1.29–2.71]) length of hospital stay (OR 1.49 [1.01–2.19]) and were significantly associated with LTCF admission.

Discussion

This retrospective study focuses on the clinical attributes associated with the discharge destination of acute stroke patients. We found that a discharge mRS score of 5, the discharge Barthel Index score, nasogastric tube placement, and a hospital stay of more than 14 days were significantly associated with admission into LTCFs. These factors serve as valuable clinical indicators, aiding physicians in identifying patient subgroups that may require proactive intervention and early discharge planning.

The previous study indicated that the association between pre-stroke mRS scores and stroke outcomes may be confounded by multiple factors.[12] Therefore, we specifically targeted stroke patients with pre-stroke mRS scores of 2 or lower and post-stroke mRS scores of 3 or higher. By selecting individuals who experienced a significant decline in functional status, we aimed to identify patients at increased risk for LTCF admission. This approach allows us to focus on identifying key risk factors and prioritizing patients who may benefit most from early interventions, ensuring that our findings have direct clinical relevance.

Our findings indicate that both post-stroke mRS scores and Barthel Index scores are crucial factors for admission into LTCFs for stroke survivors. These results are consistent with previous studies, which have shown that these indicators are reliable and well-established tools for assessing functional disability[13,14] and predicting the need for institutionalization.[8,15] The difference between the admission and discharge scores of the Barthel Index is minimal in our cohort, and this observation underscores the importance of early assessment for facilitating smoother discharge transitions based on patients' needs.

The use of NG tubes is common among stroke patients with severe dysphagia, reflecting the severity of the disease.[16] Swallowing difficulties may lead to increased risk of aspiration pneumonia and mortality,[16,17] and notably, it is associated with an increase in institutionalization rates.[8,18] The use of NG tube feeding not only has implications for patient care but also exerts a negative effect on caregivers' well-being, creating an additional barrier to a smooth transition from hospital to community settings.[19,20] Active swallowing training may increase the likelihood of NG tube removal and reduce the risk of aspiration pneumonia.[21] Therefore, the use of NG tubes in stroke patients serves as an important consideration in rehabilitation and discharge planning, often requiring a multidisciplinary approach to manage both the clinical and social implications effectively.[22]

Previous literature demonstrated that a longer length of hospital stay is independently associated with an increased likelihood of institutionalization, which is consistent with our finding.[8,23] The determinants of prolonged length of stays are multifactorial and complex, with some non-modifiable factors such as the severity of stroke and preexisting comorbidities.[24] Of note, the time-consuming process of finding suitable care facilities, as well as their limited availability, are also key factors that extend the length of stay. This emphasizes the importance of prompt evaluations for LTCF placement. Effective inter-communication among stroke care teams and the early establishment of family expectations will be a key step.[25–27]

Finally, age showed a significant association with discharge dispositions in our preliminary analysis, consistent with previous studies linking higher age to increased chances of LTCF admission.[2,8] However, when we adjusted for confounding variables such as mRS scores and the Barthel Index scores, age was no longer statistically significant. Given the potential complexities and challenges in caring for the elderly after a stroke,[28] this observation may suggest that functional disability, rather than age, is the more crucial factor in decision-making for LTCF transition.[29,30]

Our study has several limitations. Firstly, this research was a retrospective analysis conducted in a single medical center and targeted specific stroke patients, potentially limiting the generalizability of the results. Secondly, data extracted from the electronic medical records in Chimei Medical Center's stroke registry may be subject to missing data, including laboratory data and clinical care metrics, or potential misdiagnosis. A total of 8.8% of the patients were excluded due to missing data, which may have introduced selection bias. Additionally, pre-stroke mRS and Barthel index scores were obtained through patient or caregiver interviews, which may introduce self-report bias. Thirdly, our study may be subject

to selection bias due to the specific inclusion criteria, which might not fully represent the broader stroke patient population. Additionally, while our focus was on discharge arrangements and institutionalization, key factors such as socioeconomic status and family support systems, which could significantly impact prognosis, were unavailable. Finally, although we assessed overall functional outcomes, we did not explore specific aspects of functional impairment, such as limb mobility, language skills, swallowing function, and cognitive abilities. As a result, our study may not fully capture the complexity of factors influencing LTCF admission.

Conclusion

In conclusion, this study identifies critical clinical factors—including discharge mRS and Barthel Index scores, as well as nasogastric tube placement and length of hospital stay—that are significantly associated with LTCF admission in stroke patients. These findings highlight the need for early assessments and comprehensive discharge planning to improve patient outcomes. Further research is essential to validate these results and explore other potential determinants, particularly socioeconomic variables, to create a more robust predictive model for LTCF admission. Additionally, studies may explore early and prompt interventions to improve this vital patient-centered outcome.

Acknowledgments

We would like to extend our gratitude to Chi Mei Stroke Center for their invaluable guidance and insights during the manuscript preparation. The authors also acknowledge the Chi Mei Medical Center for providing the necessary facilities for conducting this research.

Funding

There is no funding to report.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Nguyen VQ, PrvuBettger J, Guerrier T, et al. Factors associated with discharge to home versus discharge to institutional care after inpatient stroke rehabilitation. *Arch Phys Med Rehabil*. 2015;96(7):1297–1303. doi:10.1016/j.apmr.2015.03.007
2. Burton JK, Ferguson EEC, Barugh AJ, et al. Predicting discharge to institutional long-term care after stroke: a systematic review and metaanalysis. *J Am Geriatr Soc*. 2018;66(1):161–169. doi:10.1111/jgs.15101
3. van Almenkerk S, Smalbrugge M, Depla MF, Eefsting JA, Hertogh CM. What predicts a poor outcome in older stroke survivors? A systematic review of the literature. *Disabil Rehabil*. 2013;35(21):1774–1782. doi:10.3109/09638288.2012.756941
4. Tseng HP, Lin FJ, Chen PT, et al. Derivation and validation of a discharge disposition predicting model after acute stroke. *J Stroke Cerebrovasc Dis*. 2015;24(6):1179–1186. doi:10.1016/j.jstrokecerebrovasdis.2015.01.010
5. Tan WS, Chong WF, Chua KS, Heng BH, Chan KF. Factors associated with delayed discharges after inpatient stroke rehabilitation in Singapore. *Ann Acad Med Singap*. 2010;39(6):435–441. doi:10.47102/annals-acadmedsg.V39N6p435
6. Mittmann N, Seung SJ, Hill MD, et al. Impact of disability status on ischemic stroke costs in Canada in the first year. *Can J Neurol Sci*. 2012;39(6):793–800. doi:10.1017/S0317167100015638
7. Werner RM, Coe NB, Qi M, Konetzka RT. Patient outcomes after hospital discharge to home with home health care vs to a skilled nursing facility. *JAMA Intern Med*. 2019;179(5):617–623. doi:10.1001/jamainternmed.2018.7998
8. Clery A, Bhalla A, Bisquera A, et al. Long-term trends in stroke survivors discharged to care homes: the South London stroke register. *Stroke*. 2020;51(1):179–185. doi:10.1161/STROKEAHA.119.026618
9. Sarzynska-Dlugosz I. An optimal model of long-term post-stroke care. *Front Neurol*. 2023;14:1129516. doi:10.3389/fneur.2023.1129516
10. Stroke Unit Trialists C. Organised inpatient (stroke unit) care for stroke. *Cochrane Database Syst Rev*. 2013;2013(9):CD000197. doi:10.1002/14651858.CD000197.pub3
11. Hsieh FI, Lien LM, Chen ST, et al. Get with the guidelines-stroke performance indicators: surveillance of stroke care in the Taiwan stroke registry: get with the guidelines-stroke in Taiwan. *Circulation*. 2010;122(11):1116–1123. doi:10.1161/CIRCULATIONAHA.110.936526
12. Quinn TJ, Taylor-Rowan M, Coyte A, et al. Pre-stroke modified rankin scale: evaluation of validity, prognostic accuracy, and association with treatment. *Front Neurol*. 2017;8:275. doi:10.3389/fneur.2017.00275
13. Banks JL, Marotta CA. Outcomes validity and reliability of the modified Rankin scale: implications for stroke clinical trials: a literature review and synthesis. *Stroke*. 2007;38(3):1091–1096. doi:10.1161/01.STR.0000258355.23810.c6
14. Shin S, Lee Y, Chang WH, et al. Multifaceted assessment of functional outcomes in survivors of first-time stroke. *JAMA Network Open*. 2022;5(9):e2233094. doi:10.1001/jamanetworkopen.2022.33094
15. Pinedo S, Erazo P, Tejada P, et al. Rehabilitation efficiency and destination on discharge after stroke. *Eur J Phys Rehabil Med*. 2014;50(3):323–333.

16. Martino R, Foley N, Bhogal S, Diamant N, Speechley M, Teasell R. Dysphagia after stroke: incidence, diagnosis, and pulmonary complications. *Stroke*. 2005;36(12):2756–2763. doi:10.1161/01.STR.0000190056.76543.eb
17. Banda KJ, Chu H, Kang XL, et al. Prevalence of dysphagia and risk of pneumonia and mortality in acute stroke patients: a meta-analysis. *BMC Geriatr*. 2022;22(1):420. doi:10.1186/s12877-022-02960-5
18. Arnold M, Liesirova K, Broeg-Morvay A, et al. Dysphagia in acute stroke: incidence, burden and impact on clinical outcome. *PLoS One*. 2016;11(2):e0148424. doi:10.1371/journal.pone.0148424
19. Xue M, Zhai X, Liu S, Xu N, Han J, Zhou M. The experience of family caregivers of patients receiving home nasogastric tube feeding in China: a descriptive qualitative study. *J Hum Nutr Diet*. 2022;35(1):14–22. doi:10.1111/jhn.12908
20. Abrahamson V, Jensen J, Springett K, Sakel M. Experiences of patients with traumatic brain injury and their carers during transition from in-patient rehabilitation to the community: a qualitative study. *Disabil Rehabil*. 2017;39(17):1683–1694. doi:10.1080/09638288.2016.1211755
21. Jongprasitkul H, Kitisomprayoonkul W. Effectiveness of conventional swallowing therapy in acute stroke patients with dysphagia. *Rehabil Res Pract*. 2020;2020:2907293. doi:10.1155/2020/2907293
22. Rabaut J, Thirugnanachandran T, Singhal S, et al. Clinical outcomes and patient safety of nasogastric tube in acute stroke patients. *Dysphagia*. 2022;37(6):1732–1739. doi:10.1007/s00455-022-10437-1
23. Bejot Y, Troisgros O, Gremeaux V, et al. Poststroke disposition and associated factors in a population-based study: the Dijon Stroke Registry. *Stroke*. 2012;43(8):2071–2077. doi:10.1161/STROKEAHA.112.658724
24. Yang CC, Bamodu OA, Chan L, et al. Risk factor identification and prediction models for prolonged length of stay in hospital after acute ischemic stroke using artificial neural networks. *Front Neurol*. 2023;14:1085178. doi:10.3389/fneur.2023.1085178
25. Bull MJ, Roberts J. Components of a proper hospital discharge for elders. *Nurs Older People*. 2001;13(7):8. doi:10.7748/nop.13.7.8.s9
26. Ou L, Young L, Chen J, Santiano N, Baramy LS, Hillman K. Discharge delay in acute care: reasons and determinants of delay in general ward patients. *Aust Health Rev*. 2009;33(3):513–521. doi:10.1071/AH090513
27. Toh HJ, Lim ZY, Yap P, Tang T. Factors associated with prolonged length of stay in older patients. *Singapore Med J*. 2017;58(3):134–138. doi:10.11622/smedj.2016158
28. Dutrieux RD, van Eijk M, van Mierlo ML, van Heugten CM, Visser-Meily JM, Achterberg WP. Discharge home after acute stroke: differences between older and younger patients. *J Rehabil Med*. 2016;48(1):14–18. doi:10.2340/16501977-2045
29. Bell CL, LaCroix AZ, Desai M, et al. Factors associated with nursing home admission after stroke in older women. *J Stroke Cerebrovasc Dis*. 2015;24(10):2329–2337. doi:10.1016/j.jstrokecerebrovasdis.2015.06.013
30. Vluggen T, van Haastregt JCM, Tan FES, Kempen G, Schols J, Verbunt JA. Factors associated with successful home discharge after inpatient rehabilitation in frail older stroke patients. *BMC Geriatr*. 2020;20(1):25. doi:10.1186/s12877-020-1422-6