ORIGINAL REPORT

DISCHARGE HOME AFTER ACUTE STROKE: DIFFERENCES BETWEEN OLDER AND YOUNGER PATIENTS

Roy D. Dutrieux, MD[1,2], Monica van Eijk, MD, PhD[1,2], Marloes L. van Mierlo, PhD[3], Caroline M. van Heugten, PhD[4,5], Johanna M. A. Visser-Meily, MD, PhD[3] and Wilco P. Achterberg, MD, PhD[2]

From the [1]Zonnehuis Group Vlaardingen, Dillenburg Rehabilitation Center, Vlaardingen, [2]Department of Public Health and Primary Care, Leiden University Medical Center, Leiden, [3]Rudolf Magnus Institute of Neuroscience and Center of Excellence for Rehabilitation Medicine, University Medical Center Utrecht and Rehabilitation Center De Hoogstraat, Utrecht, [4]School for Mental Health and Neuroscience and [5]Department of Neuropsychology and Psychopharmacology, Maastricht University, Maastricht, The Netherlands

Objective: **To identify determinants for discharge destination of older (≥70 years) and younger (<70 years) acute stroke patients.**
Design: **Multicentre prospective cohort.**
Patients: **A total of 395 patients, within 7 days of clinically evaluated stroke, were included from 6 hospital stroke units.**
Methods: **The main outcome measure was discharge destination (home vs clinical rehabilitation). Independent variables were: demographic factors, stroke characteristics, functional impairments and disabilities, cognition, comorbidity, and premorbid social participation. Multivariate logistic regression analysis established the independent strength of the contribution of possible determinants to discharge destination.**
Results: **Seventy-six percent of younger patients were discharged home, compared with 63% of older patients. Most of the younger patients discharged to clinical rehabilitation (71%) had a spouse, whereas only 40% of the older age group discharged to clinical rehabilitation had a spouse. Multivariate analysis showed that, besides National Institutes of Health Stroke Scale and Barthel Index scores, having a spouse was an important determinant for discharge home in the older age group (adjusted odds ratio 4.77, 95% confidence interval 2.01–11.31), but not in the younger age group.**
Conclusion: **The presence of a spouse is an additional important factor determining discharge home in older stroke patients. It is important to monitor and support informal caregivers in order to provide appropriate care for older community-dwelling stroke patients.**

Key words: stroke; acute phase; discharge destination.

INTRODUCTION

All Western countries are faced with an impending explosion of healthcare costs, calling for more voluntary, informal and community-based care (1). Some consider that individuals should not primarily rely on government provision, but take care of themselves with the help of others. Therefore, the role of informal caregivers and volunteers is expanding (2). This role is even greater when considering the substantial reduction in hospital admission stays during the last decade. This is partly due to the development of integrated stroke services, aiming to improve healthcare outcomes and processes of care by connecting the hospital with the rehabilitative and chronic phases of stroke care (3). In the Netherlands, participating organizations in a typical stroke service are hospitals, rehabilitation centres, skilled nursing facilities, and the primary care providers. Although both the rehabilitation centre and skilled nursing facility provide rehabilitation services, there are no clear criteria for the most appropriate discharge destination after the acute phase.

From the literature it becomes clear that discharge destination is related to post-admission functional ability, age, cognitive abilities, and availability of social support (4–6). A systematic review showed that older patients with more comorbidities are more likely to be discharged to inpatient rehabilitation or long-term care after an acute stroke, rather than being discharged home (7). Another systematic review on prognostic indicators of acute hospital discharge disposition after stroke included 48 cohort studies with, in general, poor methodological quality (8). Hemiparesis, severity of impairment, functional status after stroke, cognition, age, and urinary incontinence, were consistently found to be important determinants of rehabilitation admission. Younger patients were more likely to be discharged home, while older stroke patients were more likely to be discharged to a supported living environment (8). Unfortunately, even with the available data, it remains difficult to identify clear clinical criteria for discharge after the acute phase, especially when discriminating between older and younger stroke patients. Although the Stroke-Unit Discharge Guideline is a helpful instrument for decision-making, using clinical and social subdomains and indicating age and cognitive disabilities as important determinants of outcome (9), it does not consider different pathways after acute stroke for older and younger ages. In general, the focus is usually directed at

discharge home. Home rehabilitation provides the opportunity to provide task-specific therapies, which will probably result in the patient regaining autonomy more rapidly (10).

Older age is a negative predictor of functional outcome in stroke patients (11–13), lowering the chance of being discharged directly home. Older age is frequently accompanied by more comorbidities, which might partly explain this association. There seems to be an indirect relationship between having multiple comorbidities and impaired functional outcome after geriatric stroke rehabilitation (14). However, some studies found no relationship between having multiple comorbidities and outcome (15, 16). Another factor is that older patients are less likely to have a spouse who is capable of providing care, compared with younger patients, which also makes it difficult for them to be discharged home (17, 18).

Therefore, this study aimed to identify determinants for discharge destination after the acute phase of stroke, focusing on differences between older and younger stroke patients.

METHODS

Design and participants

Data for this multicentre prospective longitudinal cohort study were derived from the Restore4Stroke study, the design of which has been published elsewhere (19). The study included 6 hospital stroke units, which were embedded in stroke services throughout the Netherlands. Patients with clinically confirmed stroke within 7 days were eligible to participate after providing written informed consent. Exclusion criteria were: having serious (health) conditions that would interfere with the study outcome, premorbid dependency in activities of daily living (ADL) (Barthel Index < 18), insufficient comprehension of the Dutch language, and premorbid cognitive decline (Heteroanamnestic List for Cognition > 1 (20)).

Patients were assessed in the first week post-stroke and at first follow-up, 2 months post-stroke (19). In this study, data from the first week and 2 months post-stroke are presented.

Procedure and measurements

Within 7 days post-stroke, a trained research assistant collected data on demographics (age, sex, presence of a partner), premorbid social participation, stroke characteristics (number of strokes, and stroke subtype), and related impairments (stroke severity, functional abilities). The primary outcome was hospital discharge destination, i.e. home vs clinical rehabilitation. Cognition and comorbidities were measured at the first follow-up.

Stroke-related impairments were measured by the National Institutes of Health Stroke Scale (NIHSS) (21). The NIHSS is an observational 15-item impairment scale, indicating stroke severity, with a higher score indicating more severe neurological impairment. The score can be stratified into < 5 mild, 5–14 mild to severe, and ≥ 25 severe neurological impairment.

Dependency in ADL was assessed with the Barthel Index (0–20) (22), which measures functional (dis)ability, giving an indication of independent functioning and the need for assistance in care, with higher scores indicating more independency.

As a measure of cognitive status, the Montreal Cognitive Assessment (MOCA) was applied 2 months after stroke (23). This screening instrument has a high sensitivity and specificity for the detection of mild cognitive impairment (23). The highest score is 30 and a score ≤ 26 is indicative of mild cognitive impairment.

Comorbidity was assessed 2 months after stroke using the Cumulative Illness Rating Scale (CIRS) (24). The CIRS measures the comorbidity health status of the patient (score range 0–56), not only

by summarizing the presence of (organ) diseases, but also by grading the severity of illness.

Premorbid social participation was assessed with the Utrecht Scale for the Evaluation of Rehabilitation-Participation (USER-Participation) scale (25). This is a generic measure of participation that focuses on participation in vocational, leisure and social activities. USER-Participation consists of 31 items divided into 3 scales: Frequency (12 items), Restrictions (10 items) and Satisfaction (9 items). For this study, only the frequency scale was used. The sum of scores for the scale is converted to a 0–100 scale, with higher scores indicating better participation (i.e. fewer restrictions). USER-Participation has adequate reliability and validity in patients with physical disabilities (25).

Ethics approval

The medical ethics committee of the Antonius Hospital and all local committees approved the study (number NL34676.100.10). Written informed consent was obtained from all participants.

Statistical analysis

Data were processed using SPSS version 21 (SPSS Inc., Chicago, IL, USA). Differences between age groups and discharge destination (home vs clinical rehabilitation) were tested using Student's t-test for continuous variables or χ^2 tests for categorical variables. First, univariate analyses were performed between discharge destination groups. Then, the associated factors ($p < 0.10$) were entered in a multivariate logistic regression analysis to determine their independent contribution to, and overall explained variance in, discharge destination. Before entering the related variables into a multivariate regression model they were tested for multicollinearity (Pearson's $r < 0.70$) and effect modification. A backward stepwise method was performed. Alpha was set at 0.05.

RESULTS

A total of 395 participants provided written informed consent and entered the study. Table I presents the demographic and clinical characteristics of the patients: mean age was 66.7 (standard deviation (SD) 12.6) years, 64.8% were male, and 68.5% had a partner. Approximately 88% had a first-ever stroke and 7% a haemorrhagic stroke. With a cut-off at 70 years, the mean age of the younger group was 57.4 (SD 8.7) years and of the older group 77.9 (SD 5.3) years. There was no significant difference in sex, first-ever stroke, haemorrhagic stroke, or stroke severity between the 2 groups. Patients in the older age group less often had a spouse, were more dependent in ADLs, and had more severe comorbidities ($p < 0.001$); moreover, they had more impaired cognitive functioning and lower premorbid social participation ($p < 0.01$).

Association with discharge destination

Table II shows the relationship between the clinical and demographic variables and discharge destination for the total patient group, and for the 2 age groups separately. In the total study population 70% were discharged home, and 63% of the older patients were discharged home. The patients discharged home were significantly younger, more often had a spouse, and less often had a first-ever stroke than patients discharged to a clinical rehabilitation setting. Moreover, patients discharged home were significantly functionally less dependent and had fewer cognitive disabilities. Older patients discharged home had a significantly higher Barthel Index (BI) and lower NIHSS and, in more cases, a spouse present. In younger patients there was no significant

Table I. *Patient characteristics related to age in the total cohort of stroke patients*

Variable	Total $n=395$	Age <70 years $n=217$	Age ≥70 years $n=178$	p-value
Demographics				
Age, years, mean (SD)	66.7 (12.6)	57.4 (8.7)	77.9 (5.3)	**<0.001**
Sex male[a], n (%)	256 (64.8)	146 (67.3)	110 (61.8)	0.256
Spouse[a], n (%)	270 (68.4)	167 (77.0)	103 (58.2)	**<0.001**
Personal characteristics				
USER-P, mean (SD)	33.4 (11.1)	35.8 (10.9)	30.0 (10.7)	**<0.001**
CIRS, mean (SD)	6.0 (2.8)	5.3 (2.6)	6.9 (2.8)	**<0.001**
Stroke characteristics				
First-ever[a], n (%)	348 (88.1)	199 (91.7)	149 (83.7)	0.056
Haemorrhagic[a], n (%)	26 (6.6)	14 (6.5)	12 (6.7)	0.538
Measurements				
BI[b], median (IQR)	19.0 (5.0)	20.0 (3.0)	18.0 (7.0)	**0.000**
NIHSS[b], median (IQR)	2.0 (3.0)	2.0 (4.0)	2.0 (3.0)	0.341
MOCA[b], median (IQR)	24.0 (6.0)	25.0 (4.0)	23.0 (5.0)	**0.000**

[a]χ^2; [b]Mann-Whitney *U*, all others Student's *t*-test. Significant *p*-values are shown in bold.
USER-P: Utrecht Scale for Evaluation of Rehabilitation – Participation; CIRS: Cumulative Illness Rating Scale; BI: Barthel Index; NIHSS: National Institutes of Health Stroke Scale; MOCA: Montreal Cognitive Assessment.

difference in the presence of a spouse between patients discharged home (78.8%) and those discharged to clinical rehabilitation (71.2%) ($p=0.254$). There were no significant differences in CIRS scores between the 2 age groups, or between patients discharged home and to clinical rehabilitation. In both age groups, the MOCA scores of the patients discharged home were the same as those of patients discharged to clinical rehabilitation.

Independent association with discharge destination

Bivariately significant determinants (age, sex, presence of a spouse, BI, NIHSS, first-ever stroke and MOCA) were selected to study the independent influence of the predictor variables on discharge destination. There was no multicollinearity between selected determinants. The highest correlation between the independent variables was 0.6, i.e. between BI and NIHSS. Therefore, all significant independent variables were entered in the model. Separate analyses were performed for patients with and without a spouse because, in the total group, there was a significant interaction between the presence of a spouse and age (Table III). In addition to a high NIHSS score and low BI score after stroke (both indicating severity of stroke), higher age was independently related to discharge home only in the group that did not have a spouse (odds ratio (OR) 0.96, 95% confidence interval (CI) 0.92–1.00)).

In the 2 age groups separately, there was no significant interaction between age and the presence of a spouse. Therefore, all variables that showed a significant relation to discharge destination were entered in the multivariate regression analyses. Having a spouse made an important contribution only in the analysis of the older age group (OR 4.77, 95% CI 2.01–11.31).

DISCUSSION

This multicentre cohort study aimed to identify determinants for discharge destination of stroke patients after the acute phase, with a special focus on older (≥70 years) and younger (<70 years) patients. In total, 70% of all patients admitted to acute care of the hospital stroke unit were discharged home. Younger patients were more frequently discharged home than older patients. Factors determining discharge after the acute phase were related to stroke severity and the presence of a spouse. High scores on the BI and low scores on the NIHSS

Table II. *Patient characteristics related to age and discharge destination*

Variable	Total $n=395$			Age ≥70 years $n=178$			Age <70 years $n=217$		
	Home $n=278$	Rehab $n=117$	p	Home $n=113$	Rehab $n=65$	p	Home $n=165$	Rehab $n=52$	p
Demographics									
Age, years, mean (SD)	65.4 (12.2)	69.5 (13.0)	**0.004**	77.2 (5.1)	79.1 (5.6)	**0.033**	57.4 (8.5)	57.7 (9.4)	0.852
Sex, male[a] n (%)	187 (67.3)	69 (59.0)	0.115	62.8	60.0	0.708	70.3	57.7	**0.091**
Spouse[a] n (%)	74.5	53.8	**<0.001**	68.8	40.0	**<0.001**	78.8	71.2	0.254
Personal characteristics									
USER-P, mean (SD)	33.9 (11.2)	32.1 (11.0)	0.138	30.7 (10.9)	29.8 (10.4)	0.611	36.1 (10.8)	34.8 (11.2)	0.460
CIRS, mean (SD)	6.2 (2.7)	5.7 (3.0)	0.171	7.1 (2.9)	6.5 (2.6)	0.176	5.5 (2.3)	4.7 (3.1)	0.119
Stroke type									
First-ever[a], n (%)	240 (86.3)	108 (92.3)	0.094	91 (51.1)	58 (32.6)	0.167	149 (90.3)	50 (96.2)	0.381
Haemorrhagic[a], n (%)	16 (5.8)	10 (8.5)	0.485	6 (3.4)	6 (3.4)	0.459	10 (6.1)	4 (7.7)	0.676
Measurements									
BI[b], median (IQR)	20.0 (1)	13.0 (10.0)	**0.000**	20.0 (2.0)	13.0 (8)	**0.000**	20.0 (1.0)	12.5 (12.0)	**0.000**
NIHSS[b], median (IQR)	1.0 (3.0)	4.0 (5.0)	**0.000**	1.0 (3.0)	4.0 (5.0)	**0.000**	1.0 (3.0)	5.0 (5.0)	**0.000**
MOCA, median (IQR)	24.0 (5.0)	23.0 (6.0)	0.058	22.0 (5.0)	23.0 (5.0)	0.653	25.0 (4.0)	25.0 (7.0)	0.409

[a]χ^2; [b]Mann-Whitney *U*; all others Student's *t*-test; significant *p*-values are shown in bold.
USER-P: Utrecht Scale for Evaluation of Rehabilitation-participation; CIRS: Cumulative Illness Rating Scale; BI: Barthel Index; NIHSS: National Institutes of Health Stroke Scale; MOCA: Montreal Cognitive Assessment; Rehab: clinical rehabilitation.

Table III. *Multivariate regression models for discharge home (vs clinical rehabilitation)*

	Variable	Adjusted OR (95% CI)	WALD	*p*	NR2
Total					
Spouse +	BI	1.52 (1.35–1.72)	44.85	<0.001	0.627
	NIHSS	0.75 (0.64–0.88)	13.24	<0.001	
	First stroke	0.16 (0.03–0.81)	4.90	0.027	
Spouse –	NIHSS	0.69 (0.55–0.88)	9.34	0.002	0.424
	BI	1.19 (1.06–1.34)	8.38	0.004	
	Age	0.96 (0.92–1.00)	5.04	0.025	
Age					
<70 years	BI	1.49 (1.30–1.72)	30.80	<0.001	0.553
	NIHSS	0.84 (0.72–0.98)	4.89	0.027	
≥70 years	BI	1.30 (1.16–1.45)	21.04	<0.001	0.540
	NIHSS	0.67 (0.55–0.82)	15.08	<0.001	
	Spouse	4.77 (2.01–11.31)	12.56	<0.001	

Significant variables univariate analysis *p* < 0.10: age, partner, first-ever stroke, BI, NIHSS, MOCA.
NR2: Nagelkerke R2; BI: Barthel Index; NIHSS: National Institutes of Health Stroke Scale; MOCA: Montreal Cognitive Assessment; OR: odds ratio; CI: confidence intervals.

gave the highest chance of being discharged home after the acute phase of stroke. In addition, in the older age group, the presence of a spouse was an important factor (OR 4.8) of being discharged home, indicating that (for equal severity of stroke) the presence of a spouse determines whether an older person can be discharged home. Sex, severity of cognitive deficits, and the presence and severity of comorbidities did not influence discharge destination.

The finding that stroke severity and functional abilities in the acute phase determine hospital discharge is not new. One review found that stroke severity and functional abilities were consistently associated with hospital disposition after acute stroke (8). This is also in line with clinical practice. Patients with moderate to severe impairments benefit from clinical rehabilitation, while patients with mild impairments after stroke are able to function independently at home (26) or receive therapy through outpatient rehabilitation. Surprisingly, in the present study the presence of a spouse was an important determinant of discharge home, but only in older stroke patients. Having a partner is important for discharge home after rehabilitation (18, 27), but the present results suggest that this is more important for older patients with similar clinical/functional conditions. However, it is debatable whether this is a desirable situation and will lead to the provision of appropriate care for the older stroke patient. For example, older patients discharged home might place too much strain on their, usually equally aged, spouse, with a higher risk of possibly causing burnout and a negative health outcome. This aspect requires more investigation, by monitoring and supporting spouses and informal caregivers, and helping professional care institutions to provide adequate care in the home situation. Another finding that might also affect the patient's partner is the fact that cognitive disabilities are equally present in patients discharged home and in those discharged to clinical rehabilitation. During rehabilitation, patients are clinically evaluated for cognitive disabilities, whereas the level of cognitive functioning of patients discharged home might be overestimated (28), which can place increasing strain on the spouse. Therefore, it is important to adequately monitor and screen for cognitive disabilities.

An important strength of this multicentre study is that it included a large cohort of stroke patients within 7 days post-stroke and evaluated a wide variety of demographic and clinical variables in all patients. An important limitation is that premorbid cognitively impaired patients, or patients with a poor prognosis in the first week after stroke, were excluded from participation. Because this latter group had an over-representation of older patients, this might negatively influence the generalizability of the results.

In conclusion, most patients are discharged home after the acute phase of stroke. The severity of stroke, a low NIHSS score and a high BI score, are the most important factors determining discharge destination. In older patients, the presence of a spouse is an additional important factor determining discharge home. It is important to monitor informal caregivers (burden, mood, health problems associated by caregiving) and support them in order to provide appropriate care for older community-dwelling stroke patients. It is also important to monitor and re-assess patients' cognitive functioning. Discharge home does not implicate that there are no/less cognitive problems, compared with patients admitted for rehabilitation.

REFERENCES

1. Barnes MP, Radermacher H. Neurological rehabilitation in the community. J Rehabil Med 2001; 33: 244–248.
2. van Heugten C, Visser-Meily A, Post M, Lindeman E. Care for carers of stroke patients: evidence-based clinical practice guidelines. J Rehabil Med 2006; 38: 153–158.
3. Van Exel J, Koopmanschap MA, Van Wijngaarden JD, Scholte Op Reimer WJ. Costs of stroke and stroke services: determinants of patient costs and a comparison of costs of regular care and care organised in stroke services. Cost Eff Resour Alloc 2003; 1: 2.
4. Bohannon RW, Lee N, Maljanian R. Postadmission function best predicts acute hospital outcomes after stroke. Am J Phys Med Rehabil 2002; 81: 726–730.
5. van der Zwaluw CS, Valentijn SA, Nieuwenhuis-Mark R, Rasquin SM, van Heugten CM. Cognitive functioning in the acute phase poststroke: a predictor of discharge destination? J Stroke Cerebrovasc Dis 2011; 20: 549–555.
6. Unsworth CA. Selection for rehabilitation: acute care discharge patterns for stroke and orthopaedic patients. Int J Rehabil Res 2001; 24: 103–114.
7. Van der Cruyssen K, Vereeck L, Saeys W, Remmen R. Prognostic factors for discharge destination after acute stroke: a comprehen-

sive literature review. Disabil Rehabil 2014: 1–15.

8. 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.

9. Meijer R, van Limbeek J, Peusens G, Rulkens M, Dankoor K, Vermeulen M, et al. The Stroke Unit Discharge Guideline, a prognostic framework for the discharge outcome from the hospital stroke unit. A prospective cohort study. Clin Rehabil 2005; 19: 770–778.

10. Olofsson A, Andersson SO, Carlberg B. 'If only I manage to get home I'll get better' – interviews with stroke patients after emergency stay in hospital on their experiences and needs. Clin Rehabil 2005; 19: 433–440.

11. Spruit-van Eijk M, Zuidema SU, Buijck BI, Koopmans RT, Geurts AC. Determinants of rehabilitation outcome in geriatric patients admitted to skilled nursing facilities after stroke: a Dutch multi-centre cohort study. Age Ageing 2012; 41: 746–752.

12. McKenna K, Tooth L, Strong J, Ottenbacher K, Connell J, Cleary M. Predicting discharge outcomes for stroke patients in Australia. Am J Phys Med Rehabil 2002; 81: 47–56.

13. 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: 1774–1782.

14. Spruit-van Eijk M, Zuidema SU, Buijck BI, Koopmans RT, Geurts AC. To what extent can multimorbidity be viewed as a determinant of postural control in stroke patients? Arch Phys Med Rehabil 2012; 93: 1021–1026.

15. Karatepe AG, Gunaydin R, Kaya T, Turkmen G. Comorbidity in patients after stroke: impact on functional outcome. J Rehabil Med 2008; 40: 831–835.

16. Soares I, Abecasis P, Ferro JM. Outcome of first-ever acute ischemic stroke in the elderly. Arch Gerontol Geriatr 2011; 53: e81–e87.

17. Meijer R, van Limbeek J, Kriek B, Ihnenfeldt D, Vermeulen M, de Haan R. Prognostic social factors in the subacute phase after a stroke for the discharge destination from the hospital stroke-unit. A systematic review of the literature. Disabil Rehabil 2004; 26: 191–197.

18. Nguyen TA, Page A, Aggarwal A, Henke P. Social determinants of discharge destination for patients after stroke with low admission FIM instrument scores. Arch Phys Med Rehabil 2007; 88: 740–744.

19. van Mierlo ML, van Heugten CM, Post MW, Lindeman E, de Kort PL, Visser-Meily JM. A longitudinal cohort study on quality of life in stroke patients and their partners: Restore4Stroke Cohort. Int J Stroke 2014; 9: 148–154.

20. Meijer R, van Limbeek J, de Haan R. Development of the Stroke-unit Discharge Guideline: choice of assessment instruments for prediction in the subacute phase post-stroke. Int J Rehabil Res 2006; 29: 1–8.

21. Brott T, Adams HP, Jr., Olinger CP, Marler JR, Barsan WG, Biller J, et al. Measurements of acute cerebral infarction: a clinical examination scale. Stroke 1989; 20: 864–870.

22. Collin C, Wade DT, Davies S, Horne V. The Barthel ADL Index: a reliability study. Int Disabil Stud 1988; 10: 61–63.

23. 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 Geriatr Soc 2005; 53: 695–699.

24. Linn BS, Linn MW, Gurel L. Cumulative illness rating scale. J Am Geriatr Soc 1968; 16: 622–626.

25. Post MW, van der Zee CH, Hennink J, Schafrat CG, Visser-Meily JM, van Berlekom SB. Validity of the utrecht scale for evaluation of rehabilitation-participation. Disabil Rehabil 2012; 34: 478–485.

26. Schlegel D, Kolb SJ, Luciano JM, Tovar JM, Cucchiara BL, Liebeskind DS, et al. Utility of the NIH Stroke Scale as a predictor of hospital disposition. Stroke 2003; 34: 134–137.

27. Tanwir S, Montgomery K, Chari V, Nesathurai S. Stroke rehabilitation: availability of a family member as caregiver and discharge destination. Eur J Phys Rehabil Med 2014; 50: 355–362.

28. Boosman H, van Heugten CM, Winkens I, Heijnen VA, Visser-Meily JM. Awareness of memory functioning in patients with stroke who have a good functional outcome. Brain Inj 2014; 28: 959–964.