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Stair walking is associated with returning home after inpatient stroke rehabilitation in Belgium and Switzerland: a multicentric retrospective study

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ABSTRACT

Introduction: Identifying factors associated with discharge destination after inpatient stroke rehabilitation is important for patients and healthcare professionals. It supports discharge planning and prevents delayed discharge.
Objective: To identify key variables from socio-demographic and clinical data associated with returning home after inpatient stroke rehabilitation, focusing on patients from three rehabilitation centers in Belgium and Switzerland.
Methods: This multicenter retrospective study, conducted in three centers, included 1475 adult patients with stroke admitted to an inpatient rehabilitation unit between December 2012 and June 2021. A logistic regression with backward selection was used to define the model for discharge destination. The dependent variable was the discharge destination (home vs other). The independent variables were selected from the socio-demographic, medical, neurological, care pathway, and functional data and included age, gender, living arrangement, type of stroke, previous stroke, cognitive impairments, independence in grooming, eating, and stair walking.
Results: The final model included three variables (independence in stair walking, living arrangement, and cognitive impairment). Stair walking had the strongest association with returning home. Patients who were partially (OR 5.83, 95% CI 3.67-9.26) or fully independent (OR 14.31, 95% CI 9.34-21.93) were more likely to return home than patients who were unable to walk the stairs. The results were similar for subgroups and for discharge and admission data.
Conclusion: The study showed that independence in walking stairs is strongly associated with discharge destination. Aligned with another study, these results should be confirmed in further research.

Keywords: Patient discharge, Stair climbing, Stroke, Stroke rehabilitation

What is already known about this topic?

- *Living together, having support at home, being married, and achieving higher independence scores on the motor and total score of the Functional Independence Measure are associated with a higher probability of returning home after inpatient stroke rehabilitation.*

What does the study add?

- *Independence in stair walking was the strongest factor associated with returning home after inpatient stroke rehabilitation.*
- *It is important to support the development of stair walking during rehabilitation.*

Introduction

Stroke is a major health problem with a high burden on patients and their families, as well as on healthcare and economic systems (1). Every year, approximately 12.2 million people suffer a stroke in the world (2), including approximately 25,000 people in Belgium (3) and 19,000 in Switzerland (4). The absolute number of stroke cases worldwide is expected to increase in the coming decades (5), mainly due to ageing and population growth (6). Advances in acute treatment have led to improved survival and recovery. However, more than half of all patients require subacute inpatient rehabilitation (7), and many patients still experience long-term disability. Therefore, it is essential to identify the factors associated with discharge destinations to support the rehabilitation process and to enhance patient flow (8,9).

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Stroke rehabilitation aims to improve patients' health and independence in activities of daily living. It also seeks to enable the patient to return home and to regain their premorbid level of activity. After rehabilitation, patients may be discharged either to home or to a long-term care facility. This transition is managed through discharge planning, a process initiated at admission that involves healthcare professionals, patients, and their families (10,11). This process aims to identify the most appropriate discharge destination to improve patient flow.

Several associative variables for discharge destination have been investigated. In systematic reviews and meta-analyses of socio-environmental (12) and physical functioning factors (13) for discharge after inpatient rehabilitation, the most associative variables for returning home were living together, having support at home, being married, and achieving higher independence scores on the motor and total scores of the Functional Independence Measure. In addition, some individual motor activities have been associated with returning home, such as the ability to roll (14,15), to maintain minimal balance (16) or to sit (17), and to transfer independently (18). However, there is no consensus about the individual motor activity that is associated with returning home in this population. The aim of this study was to identify key socio-demographic and clinical variables associated with returning home after inpatient stroke rehabilitation, focusing on patients from three rehabilitation centers in Belgium and Switzerland.

Methods

Design and setting

This was a multicenter retrospective study including patients from three inpatient rehabilitation centers: Revarte, a specialized rehabilitation hospital in the vicinity of Antwerp, Flanders, Belgium; the neurorehabilitation unit of the University Hospital in Lausanne, Vaud, Switzerland; and the University Neurorehabilitation of the University Hospital Inselspital in Bern, Switzerland. Ethical approval was obtained from the Ethics Committee GasthuisZusters Antwerpen for the Belgian center (BVDE/AVG/2014/12.95), and from the Cantonal Commission for Ethics in Human Research (CER-VD) for the Swiss centers (2021-01159).

Participants

Patients discharged from the rehabilitation centers between December 2012 and June 2021 were eligible for the study. As this study aimed to identify factors consistently associated with discharge destination across all populations undergoing stroke rehabilitation, no specific inclusion criteria were defined, except that patients had a primary medical diagnosis of stroke (ischemic and hemorrhagic) confirmed on admission to rehabilitation, be admitted to inpatient stroke rehabilitation in the subacute phase (19), be an adult (18 years old and older), and have signed the general informed consent upon hospital admission. Patients were excluded if they were admitted to rehabilitation units for reasons other than stroke (e.g., traumatic brain injury, brain tumor).

In the three rehabilitation centers, therapy is tailored to the individual's needs. Patients usually receive one hour of occupational therapy and one hour of physiotherapy a day during the working days (Monday to Friday). They also receive up to two hours of speech therapy and neuropsychology, depending on the severity of their impairments. In addition to their individual treatment, patients may participate in group therapy. The three rehabilitation centers admit patients from a stroke unit within a university hospital. Rehabilitation costs are covered by mandatory health insurance. Patients are typically discharged once they achieve their rehabilitation goal. Variability across rehabilitation centers was observed in the assessment tools used to evaluate functional status. For example, two centers used the Functional Independence Measure (20), while the other employed the Extended Barthel Index (21,22) to assess independence in activities of daily living. Similarly, cognitive function was assessed with the Mini-Mental State Examination (23) in two centers and with the Montreal Cognitive Assessment (24) in the other.

Data collection

Data were extracted from medical records in Belgium first and then in a similar way from the electronic medical records in Switzerland. Data of interest included personal and health-related data. Only data collected routinely in daily practice were included. Socio-demographic data, neurological and medical status were collected based on admission assessment, and functional data were collected based on discharge assessment in the three centers and based on admission assessment in the Swiss centers. Data was extracted according to the following five categories (definitions and codes are available in Supplementary material 1):

- Socio-demographic data: age, gender, children, living arrangement, type of housing before stroke, presence of stairs at home, working partner, social support, formal care, non-medical help, and hospital insurance.
- Neurological status: side of lesion, type of stroke, location of the lesion, the Mini-Mental State Examination score (23), and based on clinical reports, we categorized cognitive function, the presence of dysarthria, anosognosia, neglect, spasticity, phasic disorders, dysphagia, and aphasia, as well as the severity of aphasia.
- Medical status: list of comorbidities (including the number of cardiac comorbidities, neurological comorbidities, orthopedic comorbidities, respiratory comorbidities, and the presence of depression), smoking habits, and previous stroke.
- Care pathway: length of stay (time in days from admission in inpatient rehabilitation to discharge), onset-to-admission interval (time in days from admission to acute care to admission to inpatient rehabilitation), and discharge destination.
- Functional status: stroke severity with the National Institutes of Health Stroke Scale (25), assessments of activities of daily living with the Extended Barthel Index score (21,22), or the Functional Independence Measure score (20), as well as expert assessment of independence

in hygiene, dressing, feeding, transferring, walking and stair walking with categories based on the Functional Independence Measure, and assessments of upper and lower limb function, mobility, strength, pain, sensation, cognition, and communication based on appropriate assessment from clinical expert.

Data analysis

For all statistical analyses, significance was set at $p < 0.05$. Statistical analyses were conducted using SPSS (26). The analysis was conducted using a complete case approach under the assumption that the data were missing completely at random. Functional status was analyzed with categories based on the Functional Independence Measure and expert opinion for homogeneity across the three centers. Equivalence between the Extended Barthel Index and Functional Independence Measure scores was determined using the transformation table from the Swiss National Association for Quality Development in Clinics and Hospitals – ANQ (27). Missing data analysis was performed to evaluate the amount of missing data and to assess the pattern of missingness. Variables with missing data above 50% were not considered in the analyses (working partner, formal care, non-medical help, hospitalization insurance, Mini-Mental State Examination, anosognosia, spasticity, smoking habits, severity of aphasia and specific assessments for stroke rehabilitation (such as the Motor Assessment Scale or the Chedoke-McMaster Stroke Assessment).

For descriptive statistics, continuous data was reported as the median with the first and third quartiles (Q1; Q3), due to a non-normal distribution. Categorical data were reported as frequencies and percentages. The Mann–Whitney U test was used to analyze continuous or ordinal data, and the Chi^2 test was used for categorical data to compare groups based on discharge destinations (home versus other).

For the logistic regression, variables associated with discharge destination (12,13) and independence in activities of daily living (28,29) were selected for the initial model. A backward elimination (30) was performed to identify significant variables associated with discharge destination in the final model. The initial model included nine variables: age, gender, living arrangement, previous stroke, type of stroke, cognitive impairment, independence in eating, grooming, and stair walking. Variables with high risk of multicollinearity were not included in the initial model (independence in dressing, transferring and walking). As a rule of thumb, a minimum sample size of 10 participants per event was required for logistic regression (31). We reported the adjusted odds ratio from the multivariable model and the corresponding 95% confidence intervals (CI). Analyses were performed for the entire cohort and separately for the Belgian and Swiss cohorts. For the Swiss cohort, functional data were also collected at admission. The model was rerun using these admission data to examine the association between admission variables and discharge destination in this subgroup. Bootstrapping was used to assess the internal validity of the model (32).

Results

The study included 1475 patients (931 in the Belgian and 544 in the Swiss cohorts) with a median age of 65.0 years (54.0; 76.0) and 45% of women. They had ischemic and hemorrhagic strokes in 72% and 28% of cases. Most patients (87%) had their first stroke. The median onset-to-admission interval was 16.0 days (10.0; 26.0), and the median length of stay in rehabilitation was 61.5 days (36.0; 93.0). Approximately two-thirds of patients were discharged home (62%), and 38% patients were discharged to other destinations, including nursing homes (13%), further rehabilitation (14%), and other hospitals (9%). Table 1 displays additional patient characteristics and corresponding missing data by discharge destination. Regarding the pattern of missingness, Little's test was non-significant (p=.141), suggesting that the missingness can be considered as missing completely at random.

The logistic regression with backward selection included 648 patients (43.9% complete cases) and identified independence in stair walking, living arrangement, and cognitive impairments in the final model, showing their association with discharge destination. The results from the final model are presented in Table 2 for the full cohort, the Belgian and the Swiss cohorts on discharge and in Table 3 for the Swiss cohort on admission. Independence in stair walking was the most significant variable. When adjusted for living arrangement and cognitive functions, partially independent and independent patients in stair walking were more likely to return home (respectively OR 5.83, 95% CI 3.67-9.26 and OR 14.31, 95% CI 9.34-21.93) than patients who were not able to walk stairs. These results were similar on discharge in the subgroups (Belgian and Swiss cohorts, Table 2) and on admission in the Swiss cohort (Table 3).

Discussion

This study identified that stair walking had the strongest association with returning home after inpatient stroke rehabilitation, when adjusted for living arrangement and cognitive impairments, across the three sites in Belgium and Switzerland. Patients who were partially or fully independent in stair walking at discharge were 3.9 and 9.9 times more likely to return home, respectively, than those who were unable to climb stairs, regardless of the presence of stairs at home. These results identify stair walking as an important ability not reported in a previous systematic review on physical functioning factors associated with returning home after stroke (12).

Independence in stair walking is important but challenging for community living (33) as it requires both sensorimotor and cognitive functions (34). For sensorimotor abilities, balance (35-37), muscle strength (34,35,37), proprioception (37) and cardiovascular fitness (35) are strongly associated with stair walking. Cognitive functions also contribute to stair walking independence, especially unilateral spatial neglect (34) and fear of falling (37), impairing this skill in people after stroke, while vision deficits and pain affect stair walking in older adults (37). Moreover, stair-walking cadence, measured in stairs per second, is associated with the frequency and duration (38) of physical activity in the community after stroke.

TABLE 1 - Socio-demographic and clinical data of participants by country and discharge destination

Variable	Full cohort (n = 1475)			Belgian cohort (n = 931)			Swiss cohort (n = 544)		
	Home (n = 908)	**Other (n = 567)**	***P***	**Home (n = 632)**	**Other (n = 299)**	***P***	**Home (n = 276)**	**Other (n = 268)**	***P***
Age, median (Q1; Q3)	65.5 (54.0; 76.0)	65.0 (55.0; 77.0)	0.450	70.0 (58.0; 78.0)	76.0 (66.0; 83.0)	<.001	57.0 (48.0; 66.5)	58.0 (49.5; 64.0)	0.392
Gender (women), n (%)	400 (44)	267 (47)	0.254	282 (45)	153 (51)	0.061	118 (43)	114 (43)	0.959
Have children, n (%)	567 (84)	326 (77)	0.001	411 (86)	187 (78)	0.005	156 (80)	139 (75)	0.258
Missing	*235 (26)*	*141 (25)*		*155 (25)*	*59 (20)*		*80 (29)*	*82 (31)*	
Living arrangement (together), n (%)	471 (69)	262 (60)	0.004	332 (69)	111 (46)	<0.001	139 (69)	151 (78)	0.051
Missing	*222 (24)*	*132 (23)*		*147 (23)*	*58 (19)*		*75 (27)*	*74 (28)*	
Social support, n (%)			0.002			<0.001			0.015
Missing	*263 (29)*	*155 (27)*		*154 (24)*	*61 (20)*		*109 (39)*	*94 (35)*	
Live alone and has no children	53 (8)	48 (12)		34 (7)	34 (14)		19 (11)	14 (8)	
Live alone and has children	155 (24)	115 (28)		120 (25)	95 (40)		35 (21)	20 (12)	
Live together and has no children	49 (8)	48 (12)		34 (7)	18 (8)		15 (9)	30 (17)	
Live together and has children	388 (60)	201 (49)		290 (61)	91 (38)		98 (59)	110 (63)	
Type of home, n (%)			0.169			0.012			0.082
Missing	*267 (29)*	*163 (29)*		*163 (26)*	*61 (20)*		*104 (38)*	*102 (38)*	
Apartment with stairs	95 (15)	66 (16)		45 (10)	27 (11)		50 (29)	39 (24)	
Apartment without stairs	163 (25)	111 (28)		104 (22)	70 (29)		59 (34)	41 (25)	
House with stairs	312 (49)	183 (45)		254 (54)	105 (44)		58 (34)	78 (47)	
House without stairs	56 (9)	27 (7)		53 (11)	21 (9)		3 (2)	6 (4)	
Nursing home or service flat	10 (2)	15 (4)		10 (2)	14 (6)		0 (0)	1 (1)	
House with a stairlift	5 (1)	2 (1)		3 (1)	1 (0)		2 (1)	1 (1)	
Presence of stairs, n (%)	432 (68)	261 (66)	0.437	303 (66)	135 (58)	0.061	129 (75)	126 (76)	0.771
Missing	*275 (30)*	*171 (30)*		*171 (28)*	*68 (23)*		*104 (38)*	*103 (38)*	
Type of stroke, n (%)			0.003			0.250			0.004
Missing	*173 (19)*	*63 (11)*		*166 (26)*	*50 (17)*		*7 (3)*	*13 (5)*	
Ischemic	553 (75)	341 (68)		348 (75)	176 (71)		205 (76)	165 (65)	
Haemorrhagic	182 (25)	163 (33)		118 (25)	73 (29)		64 (24)	90 (35)	
Side of lesion, n (%)			0.530			0.855			0.763
Missing	*197 (22)*	*92 (16)*		*176 (28)*	*58 (19)*		*21 (8)*	*34 (13)*	
Left	346 (49)	223 (47)		221 (49)	116 (48)		125 (49)	107 (46)	
Right	305 (43)	203 (43)		206 (45)	107 (44)		99 (39)	96 (41)	
Bilateral	60 (8)	49 (10)		29 (6)	18 (8)		31 (12)	31 (13)	
Previous stroke, n (%)	92 (14)	52 (11)	0.310	68 (14)	31 (12)	0.405	24 (12)	21 (11)	0.701
Missing	*225 (25)*	*112 (20)*		*148 (23)*	*38 (13)*		*77 (28)*	*74 (28)*	
Presence of aphasia, n (%)	221 (45)	212 (64)	<0.001	142 (42)	106 (65)	<.001	79 (53)	106 (63)	0.069
Missing	*417 (46)*	*235 (41)*		*290 (46)*	*135 (45)*		*127 (46)*	*100 (37)*	
Presence of dysphagia, n (%)	177 (31)	198 (51)	<0.001	122 (28)	142 (59)	<.001	55 (42)	56 (37)	0.426
Missing	*339 (19)*	*177 (31)*		*194 (19)*	*59 (20)*		*145 (53)*	*118 (44)*	

Variable	Full cohort (n = 1475)			Belgian cohort (n = 931)			Swiss cohort (n = 544)		
	Home (n = 908)	**Other (n = 567)**	***P***	**Home (n = 632)**	**Other (n = 299)**	***P***	**Home (n = 276)**	**Other (n = 268)**	***P***
Presence of neglect, n (%)	171/423 (40)	205 (60)	<0.001	100 (35)	81 (49)	0.004	71 (51)	124 (71)	0.004
Missing	*485 (53)*	*226 (40)*		*349 (55)*	*134 (45)*		*136 (49)*	*92 (34)*	
Cognitive impairment, n (%)			<0.001			<.001			<.001
Missing	*232 (26)*	*129 (23)*		*230 (36)*	*112 (37)*		*2 (1)*	*17 (6)*	
Age-associated to mild	504 (75)	208 (48)		276 (69)	82 (44)		228 (83)	126 (50)	
Moderate to severe	172 (25)	230 (53)		126 (31)	105 (56)		46 (17)	125 (50)	
Cardiac comorbidities, n (%)			0.155			0.116			0.521
Missing	*365 (40)*	*188 (33)*		*295 (47)*	*119 (40)*		*70 (25)*	*69 (26)*	
None	110 (20)	67 (18)		59 (18)	27 (15)		51 (25)	40 (20)	
Single	221 (41)	140 (37)		147 (44)	66 (37)		74 (36)	74 (37)	
Multiple	212 (40)	172 (45)		131 (39)	87 (48)		81 (39)	85 (43)	
Neurological comorbidities, n (%)			<0.001			0.016			0.010
Missing	*450 (50)*	*221 (39)*		*377 (60)*	*152 (51)*		*73 (26)*	*69 (26)*	
None	292 (64)	171 (49)		166 (65)	76 (52)		126 (62)	95 (48)	
Single	123 (27)	118 (34)		65 (25)	46 (31)		58 (29)	72 (36)	
Multiple	43 (9)	57 (17)		24 (9)	25 (17)		19 (9)	32 (16)	
Orthopaedic comorbidities, n (%)			0.582			0.397			0.781
Missing	*368 (41)*	*193 (34)*		*297 (47)*	*119 (40)*		*71 (26)*	*74 (28)*	
None	247 (46)	183 (49)		114 (34)	51 (28)		133 (65)	132 (68)	
Single	176 (33)	111 (30)		134 (40)	76 (42)		42 (21)	35 (18)	
Multiple	117 (22)	80 (21)		87 (26)	53 (29)		30 (15)	27 (14)	
Respiratory comorbidities, n (%)			0.009			0.010			0.309
Missing	*421 (46)*	*192 (34)*		*347 (55)*	*126 (42)*		*74 (27)*	*66 (25)*	
None	304 (62)	199 (53)		188 (66)	98 (57)		116 (57)	101 (50)	
Single	139 (29)	123 (33)		77 (27)	48 (28)		62 (31)	75 (37)	
Multiple	44 (9)	53 (14)		20 (7)	27 (16)		24 (12)	26 (13)	
Presence of depression, n (%)	107 (24)	91 (26)	0.462	183 (27)	64 (40)	0.008	38 (19)	27 (14)	0.197
Missing	*456 (50)*	*216 (38)*		*380 (60)*	*139 (46)*		*76 (28)*	*77 (29)*	
Onset to admission interval, median (Q1; Q3)	15.0 (10.0; 22.0)	18.0 (11.0; 32.0)	<0.001	14.0 (10.0; 23.0)	18.0 (12.0; 31.5)	<.001	15.0 (9.0; 20.0)	17.0 (10.0; 35.0)	<.001
Length of stay in rehabilitation, median (Q1; Q3)	60.0 (36.0; 97.0)	64.0 (36.0; 89.0)	0.753	72.0 (48.0; 105.0)	76.0 (42.0; 106.0)	0.955	35.0 (20.0; 58.5)	53.0 (33.0; 78.5)	<.001
Independence in grooming, n (%)			<0.001			<.001			<.001
Missing	*152 (17)*	*70 (12)*		*151 (24)*	*53 (18)*		*1 (0)*	*17 (6)*	
Independent	520 (69)	145 (29)		290 (60)	50 (20)		230 (84)	95 (38)	
Under supervision	101 (13)	105 (21)		82 (17)	50 (20)		19 (7)	55 (22)	
Partially independent	105 (14)	168 (34)		81 (17)	78 (32)		24 (9)	90 (36)	
Dependent	30 (4)	79 (16)		28 (6)	68 (28)		2 (1)	11 (4)	

Variable	Full cohort (n = 1475)			Belgian cohort (n = 931)			Swiss cohort (n = 544)		
	Home (n = 908)	**Other (n = 567)**	***P***	**Home (n = 632)**	**Other (n = 299)**	***P***	**Home (n = 276)**	**Other (n = 268)**	***P***
Independence in dressing, n (%)			<0.001			<.001			<.001
Missing	*154 (17)*	*73 (13)*		*153 (24)*	*56 (19)*		*1 (0)*	*17 (6)*	
Independent	542 (72)	149 (30)		314 (66)	56 (23)		228 (83)	93 (37)	
Partially independent	158 (21)	230 (47)		114 (24)	76 (31)		44 (16)	154 (61)	
Dependent	54 (7)	115 (23)		51 (11)	111 (46)		3 (1)	4 (2)	
Independence in eating, n (%)			<0.001			<.001			<.001
Missing	*184 (20)*	*91 (16)*		*183 (29)*	*74 (25)*		*1 (0)*	*17 (6)*	
Independent	583 (81)	226 (48)		344 (77)	85 (38)		239 (87)	141 (56)	
Dependent on preparations	130 (18)	203 (43)		96 (21)	101 (45)		34 (12)	102 (41)	
Dependent	11 (2)	47 (10)		9 (2)	39 (17)		2 (1)	8 (3)	
Independence in transfer, n (%)			<0.001			<.001			<.001
Missing	*186 (20)*	*82 (14)*		*185 (29)*	*65 (22)*		*1 (0)*	*17 (6)*	
Independent	597 (83)	220 (45)		339 (76)	82 (35)		258 (94)	138 (55)	
Under supervision	45 (6)	71 (15)		36 (8)	27 (12)		9 (3)	44 (18)	
Dependent	80 (11)	194 (30)		72 (16)	125 (53)		8 (3)	69 (28)	
Independence in walking, n (%)			<0.001			<.001			<.001
Missing	*158 (17)*	*79 (14)*		*155 (25)*	*57 (19)*		*3 (1)*	*22 (8)*	
Independent	361 (48)	137 (28)		195 (41)	49 (20)		166 (61)	88 (36)	
With a walking device	240 (32)	77 (16)		168 (35)	57 (24)		72 (26)	20 (8)	
With a wheelchair for long distances	106 (14)	79 (16)		86 (18)	46 (19)		20 (7)	33 (13)	
Wheelchair independent	19 (3)	81 (17)		8 (2)	18 (7)		11 (4)	63 (26)	
Dependent (wheelchair)	24 (3)	114 (23)		20 (4)	72 (30)		4 (2)	42 (17)	
Independence in stair walking, n (%)			<0.001			<.001			<.001
Missing	*293 (32)*	*152 (27)*		*292 (46)*	*135 (45)*		*1 (0)*	*17 (6)*	
Independent	425 (69)	101 (24)		237 (70)	46 (28)		188 (68)	55 (22)	
Partially independent	127 (21)	74 (18)		74 (22)	29 (18)		53 (19)	45 (18)	
Dependent	63 (10)	240 (58)		29 (9)	89 (54)		34 (12)	151 (60)	

Note: For categorical data, we reported the number of missing data for the variable, and percentage values (%) are valid percentages for the collected data (total N-missing); Probability values were obtained using the Chi[2] test for categorical data and the Mann–Whitney U test for continuous/ordinal data. The extend of missing data per variables was as follow age (0%), gender (0%), have children (25.5%), living arrangement (24%), social support (28.3%), type of home (29.2%), presence of stairs (30.2%), type of stroke (16%), side of lesion (19.6%), previous stroke (22.8%), presence of aphasia (44.2%), presence of dysphagia (35%), presence of neglect (48.2%), cognitive impairment (24.5%), cardiac comorbidities (37.5), neurological comorbidities (45.5%), orthopaedic comorbidities (38%), respiratory comorbidities (41.6%), presence of depression (45.6%), onset to admission interval (15.9%), length of stay in rehabilitation (0.2%), independence in hygiene (15.1%), independence in dressing (15.4%), independence in eating (18.5%), independence in transfer (18.2%), independence in gait (16.1%), independence in stair walking (30.2%).

TABLE 2 - Final model including living arrangement, independence in stair walking and cognitive impairments for discharge destination (home vs other) in the full cohort and in the Belgian and Swiss cohorts on discharge

Cohort	Variables	Sig	aOR	95% CI	R^2 Nagelkerke	Overall percentage	Home percentage	Other percentage
Full cohort (n=785)					0.371	77.2	88.1	60.1
	Living arrangement							
	Alone		Reference					
	Together	0.016	1.568	1.086-2.265				
	Independence in stair walking							
	Dependent		Reference					
	Partially independent	<0.001	5.832	3.673-9.260				
	Independent	<0.001	14.313	9.342-21.930				
	Cognitive impairments							
	Moderate to severe		Reference					
	None to mild	<0.001	2.453	1.720-3.500				
	Constant	<0.001	0.125					
Belgian cohort (n=399)					0.369	79.9	90.0	56.3
	Living arrangement							
	Alone		Reference					
	Together	<0.001	3.895	2.253-6.736				
	Independence in stair walking							
	Dependent		Reference					
	Partially independent	<0.001	6.481	3.138-13.385				
	Independent	<0.001	15.804	8.018-31.154				
	Cognitive impairments							
	Moderate to severe		Reference					
	None to mild	0.003	2.184	1.297-3.678				
	Constant	<0.001	0.107					
Swiss cohort (n=386)					0.402	75.9	81.9	69.5
	Living arrangement							
	Alone		Reference					
	Together	0.223	0.709	0.408-1.232				
	Independence in stair walking							
	Dependent		Reference					
	Partially independent	<0.001	5.139	2.714-9.727				
	Independent	<0.001	12.356	6.897-22.134				
	Cognitive impairments							
	Moderate to severe		Reference					
	None to mild	<0.001	3.395	1.995-5.776				
	Constant	<0.001	0.140					

TABLE 3 - Final model including living arrangement, independence in stair walking, and cognitive impairments for discharge destination (home vs other) in the Swiss cohort on admission

Variables	Sig	aOR	95% CI	R^2 Nagelkerke	Overall percentage	Home percentage	Other percentage
Living arrangement				0.399	72.1	61.9	83.0
Alone		Reference					
Together	0.157	0.665	0.378-1.170				
Independence in stair walking							
Dependent		Reference					
Partially independent	<0.001	8.648	4.082-18.321				
Independent	<0.001	23.887	7.135-79.975				
Cognitive impairments							
Moderate to severe		Reference					
None to mild	<0.001	3.784	2.222-6.444				
Constant	<0.001	0.310					

Note: Number of patients = 376

The present study contributes to the growing literature on factors associated with returning home and highlights the central role of stair walking in stroke rehabilitation. Although stair walking has been studied with patients after stroke, it is not systematically reported in national guidelines. It is mentioned as part of mobility rehabilitation (41-44), circuit training (41), or aerobic endurance exercises (41), but many guidelines omit it or report the need for further research (41). The present results from two European cohorts suggest that stair walking should be an integral part of stroke rehabilitation and a goal for community living.

Although stair walking showed the strongest association in this study, other variables, such as living together, independence in dressing and walking and absence of cognitive impairment, were also significantly associated with returning home. Previous studies have identified additional variables significantly associated with returning home after inpatient stroke rehabilitation, such as transferring (18), walking (14,17), rolling (14), cognitive impairments assessed with the Mini Mental State Examination (45), and the presence of caregiver or family members (13) or social support assessed with Gijon scale (46). Transferring, walking and stair walking may be considered as part of a broader functional mobility that enables patients to be independent and safe at home. In contrast, activities such as dressing, bathing and eating can often be supported by formal or informal caregivers, which may explain why they were not significant in the model. These results suggest that returning home requires a combination of functional abilities, some of which may be supported by an informal caregiver. Stair walking is a complex activity that involves both physical and cognitive components. Given its strong association with returning home, it should be specifically addressed and practiced during inpatient stroke rehabilitation.

This study has several limitations. The retrospective multicenter design resulted in missing data and variable data quality, as standardized assessments were not systematically used across centers. We therefore focused on motor activities of daily living and reported different levels of independence, while other variables (cognitive impairment, comorbidities, social support, neurological symptoms) were reported more generally. Both admission and discharge data were included, although admission data were less complete. The extent of missing data led us to perform complete-case logistic regression without cluster adjustment (although principal component analysis showed similarities across centers), reducing sample size and potentially introducing selection bias while limiting generalizability due to residual inter-center heterogeneity. Finally, data collection during 2020 and 2021 coincided with the COVID-19 pandemic, which affected stroke presentation rates (47) and rehabilitation access (48), even though the impact on the quality of care in acute (49) and inpatient rehabilitation units appeared limited.

Conclusion

This study shows that stair walking is highly correlated with discharge destination and should be a key focus of physical rehabilitation after stroke. Although stair walking is already routinely practiced in clinical settings, it remains an essential and complex activity of daily living. During rehabilitation and after discharge, clinicians should incorporate stair walking into training and discharge planning discussions, and encourage patients to practice it safely and regularly, especially as they may be exposed to challenges such as functional decline (50) and the “bouncing-back” effect (i.e., increasing care needs, including hospital readmission) (51). Further studies should explore the relationship between stair walking and the risk of functional decline and bouncing back. In addition, the association between stair walking and discharge destination after inpatient stroke rehabilitation should be confirmed in future research using a detailed assessment of other relevant variables, such as cognitive impairments, social support, and neurological and medical status.

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