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ORIGINAL RESEARCH

Patient and Family Member Factors Influencing Outcomes of Poststroke Inpatient Rehabilitation

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Abstract

Objective: To investigate how family members' attitudes toward functional regain, and patients' knowledge and intention of independence influence poststroke rehabilitation.

Design: Cross-sectional study.

Setting: Three rehabilitation inpatient settings.

Participants: Younger (n=79) and older (n=84) poststroke patients, along with their family members (spouses, n=104; children, n=59).

Interventions: Not applicable.

Main Outcome Measures: Custom-designed questionnaires were used to tap into the patients' knowledge about rehabilitation (Patient's Rehabilitation Questionnaire—Knowledge About Rehabilitation) and intention of independence (Patient's Rehabilitation Questionnaire—Intention of Independence), and family members' attitudes toward patients in performing basic activities of daily living (BADL) (Family Member Attitudes Questionnaire—BADL) and instrumental activities of daily living (Family Member Attitudes Questionnaire—instrumental activities of daily living). The rehabilitation outcomes included gains in motor, cognitive, and emotional functions, and self-care independence, measured with common clinical instruments.

Results: The Family Member Attitudes Questionnaire—BADL predicted cognitive outcome and the Patient's Rehabilitation Questionnaire—Intention of Independence predicted motor outcome for both groups. Differential age-related effects were revealed for the Patient's Rehabilitation Questionnaire—Intention of Independence in predicting emotional outcome only for the younger group, and self-care independence only for the older group.

Conclusions: Patients' intention of independence positively affected motor recovery, while family members' positive attitudes promoted cognitive regain. The findings suggested plausible age-related differences in how patients' intentions affect emotion versus self-care independence outcomes. Future studies should explore strategies for promoting positive attitudes toward independence among patients and family members during poststroke rehabilitation.

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Poststroke rehabilitation is a long process that puts tremendous pressure on a patient's family.[1] In addition to caring for the patient, family members play an active role in augmenting the patient's functional recovery by assisting in functional training and therapeutic exercises.[2] Filial piety is common in Eastern societies and affects patients' functional independence.[3,4] Children of older Chinese patients provide care and assistance to fulfill filial duties. The support that the patient receives from family members can negatively affect the patient's attitude toward and motivation for independence; this kind of support is counterproductive for poststroke rehabilitation.[5] The theory of planned behavior proposes that behavior is determined by an individual's intention to perform such a behavior, which is affected by the individual's attitude, perceived behavioral control, and subjective norms.[6] Attitudes and behavioral control are based on the perspective of the self. Subjective norms are also based on social pressure, which is due to the perspectives of others. In this context, knowledge about the treatment process would affect a patient's intention of independence and hence participation in rehabilitation. Family members' attitudes can be a source of social pressure perceived by the patient, which similarly would affect the patient's intention of independence and participation in rehabilitation.

Previous studies[7,8] have indicated that family members' beliefs regarding, and attitudes toward, physical activity mediate stroke survivors' outdoor travel, diet, and physical activity. Negative attitudes toward outings and paid work deter poststroke patients' participation in these activities.[9] Some of these studies[7-9] were limited by relatively small sample sizes, their qualitative nature, and the use of subjective outcomes. In addition to attitudes, family members' and caregivers' knowledge about poststroke recovery was reported to significantly affect patients' rehabilitation outcomes.[10] These studies proposed that a better understanding of the process of recovery and rehabilitation can help to form realistic expectations among family members or caregivers, which can facilitate patients to move through a rehabilitation program by improving their adherence to therapeutic intervention.[11]

Stroke recovery is a complex process involving a poststroke survivor's coping with changes in cognition, functional independence, and mental health. Poststroke rehabilitation outcome could be influenced by a variety of factors. The 2 factors of interest were family members' attitudes toward patients' independence, and patients' intention of independence and their knowledge about poststroke rehabilitation. This study aimed to investigate how the family member and patient factors would influence poststroke rehabilitation. These 2 factors were measured with 2 custom-built instruments. The rehabilitation outcomes included motor, cognition, and emotion functions as well as self-care independence. We anticipated that the patient and family member factors may or may not influence the rehabilitation outcomes of younger and older patients in the same way. Because younger and older patients had different life roles, support systems, and expectations, and those would interact with the patient and family factors and reflect on the patients' rehabilitation outcomes. The results would shed light on the need to develop interventions for enhancing the outcomes of inpatient poststroke rehabilitation.

List of abbreviations:

BADL	**basic activities of daily living**
BDI-II-C	**Chinese version of the Beck Depression Inventory-II**
FMA	**Fugl-Meyer Assessment**
IADL	**instrumental activities of daily living**
MBI-C	**Chinese version of the Modified Barthel Index**
MoCA	**Montreal Cognitive Assessment**

Methods

Participants

The participants were poststroke inpatients recruited from 3 major hospitals in China between August 2013 and November 2014. The inclusion criteria were as follows: (1) diagnosis of first stroke; (2) age between 40 and 80 years; (3) 3 to 12 weeks after onset; and (4) moderate to severe neurologic function according to the National Institutes of Health Stroke Scale (score $\geq$6). The age of 60 years was used as the cutoff for the younger and older groups, which matches the statutory retirement age in China. The same cutoff criterion was used in other clinical studies on older Chinese patients.[12-14] Patients were excluded if they had comorbidities with other medical illnesses that would hinder the rehabilitation process, such as heart, kidney, liver, or nervous system disease. The patients' family members also participated in this study. Ethical approval was obtained from the ethic committees of each of the 3 hospitals, and written informed consent was obtained from all participants.

Procedure

The staff physicians in rehabilitation medicine or the rehabilitation therapists at the participating hospitals carried out the data collection. The researchers trained the physicians and therapists on administering the instruments. The clinician conducted the interviews by completing the Patient's Rehabilitation Questionnaire with the patient and the Family Member Attitudes Questionnaire with the patient's family member. The 4 clinical instruments were then administrated to the patient in the following order: Fugl-Meyer Assessment (FMA), the Chinese version of the Beck Depression Inventory-II (BDI-II-C), the Chinese version of the Modified Barthel Index (MBI-C), and the Chinese Fuzhou version of the Montreal Cognitive Assessment (MoCA). The second administration of the 4 clinical instruments on the patient was conducted 6 weeks after the baseline assessment, following the same procedure.

Instruments

Patient's Rehabilitation Questionnaire

The Patient's Rehabilitation Questionnaire has 7 short statements (supplemental appendix S1, available online only at http://www.archives-pmr.org/). It was designed to assess the patient's knowledge about the poststroke rehabilitation process (Patient's Rehabilitation Questionnaire—Knowledge About Rehabilitation, 3 items) and the patient's intention of independence (Patient's Rehabilitation Questionnaire—Intention of Independence, 4 items). Explorative factor analysis (principal component and varimax rotation) revealed a 2-factor structure accounting for 49.5% variance (Kaiser-Meyer-Olkin = .57; $\chi^2_{135.53} = 135.53$, $P < .001$). Evidence of structural validity indicated that the 2 subscales possessed different test dimensions.

Family Member Attitudes Questionnaire

The Family Member Attitudes Questionnaire consisted of 16 task items (see supplemental appendix S1). It was designed to assess the

patient's expected roles by family members in performing basic activities of daily living (BADL) after the stroke (Family Member Attitudes Questionnaire—BADL, 10 items) and the patient's expected roles in performing instrumental activities of daily living (IADL) after the stroke (Family Member Attitudes Questionnaire—IADL, 6 items). The task items were extracted from the Modified Barthel Index (except the "wheelchair" item) and Frenchay Activities Index.

Other instruments

Information on the Chinese Fuzhou version of the MoCA, FMA, BDI-II-C, and Chinese version of the Modified Barthel Index (MBI-C) is presented in supplemental appendix S1.

Statistical analysis

A 2×2 analysis of variance (Group: younger vs older patient; Occasion: baseline vs 6th week) was conducted to test the patients' scores measured at the 2 different timelines on the 4 outcome measures. Pearson and Spearman correlations were used to explore the relationships between patients' scores on the outcome measures at the sixth week and patients' demographic characteristics and their outcome measure scores at baseline. Variables with significant relationships were included as block 1 variables in the next level of analysis. Hierarchical regression analyses (stepwise) were conducted to predict patients' gain scores (6th week minus baseline) on each of the 4 outcome measures. There were 2 blocks of predictors. Block 1 variables were entered first. Block 2 variables were scores on the Family Member Attitudes Questionnaire—BADL, Family Member Attitudes Questionnaire—IADL, Patient's Rehabilitation Questionnaire—Knowledge About Rehabilitation, and Patient's Rehabilitation Questionnaire—Intention of Independence. The multicollinearity assumption of the regression analyses was evaluated using the condition index (<30) and the variance inflation factor (<10), and residual analyses were performed. These procedures were conducted separately for the younger (40—60y) and older (61—79y) patient groups. All statistical analyses were performed using SPSS 18.0 software.[a]

Results

A total of 189 patients met the inclusion criteria. Among them, 21 patients did not complete all assessments, and 5 patients had a recurrent stroke during the study. The final sample size was 163, with 79 in the younger group (mean age ± SD, 51.4±5.8y) and 84 in the older group (mean age ± SD, 68.4±5.1y) (table 1). The participants in the 2 groups did not significantly differ in sex ($P=.233$), marital status ($P=.580$), duration of disease ($P=.264$), and neurologic function (assessed by National Institutes of Health Stroke Scale) ($P=.074$). Compared with the older group, the younger group had a significantly higher level of education ($P=.020$), a lower rate of comorbidities ($P=.014$), and a shorter length of stay before assessment ($P=.008$). The family member participants included 45 spouses and 39 children of the patients in the older group, and 59 spouses and 20 children of the patients in the younger group.

Between-group differences

The older group had a significantly higher mean score on the Family Member Attitudes Questionnaire—IADL than the younger group ($P=.001$), with no other significant between-group difference found in the scores on the Patient's Rehabilitation Questionnaire—Knowledge About Rehabilitation, Patient's Rehabilitation Questionnaire—Intention of Independence, and Family Member Attitudes Questionnaire—BADL. For the 4 outcome measures, no significant Group × Occasion interaction was revealed (Chinese Fuzhou version of the MoCA, $P=.843$; FMA, $P=.758$; MBI-C, $P=.801$; BDI-II-C, $P=.607$). Both the younger and older groups showed significantly higher scores at the sixth week than at baseline on the Chinese Fuzhou version of the MoCA

Table 1 Demographic characteristics of patients in younger and older groups

Variables	Total (N=163)	Younger Group (n=79)	Older Group (n=84)	P*
Age (y)	60.2±10.1	51.4±5.8	68.4±5.1	<.001
Women	57 (35.0)	55 (69.6)	51 (60.7)	.233
Education (y)	9.0±4.8	9.9±4.5	8.1±4.9	.020
Married	153 (93.9)	75 (94.9)	78 (92.9)	.580
Comorbidities				
None	22 (13.5)	16 (20.3)	6 (7.1)	.014
≥1	141 (86.5)	63 (79.7)	78 (92.9)	
Stroke type				
Ischemic	101 (62.0)	38 (48.1)	63 (75.0)	<.001
Hemorrhagic	62 (38.0)	41 (51.9)	21 (25.0)	
Duration of disease (d)	41.1±19.1	39.3±18.2	42.7±19.9	.264
LOS preassessment (d)	20.6±20.3	16.3±17.9	24.7±21.7	.008
Family caregiver				
Spouse	104 (63.8)	59 (74.7)	45 (53.6)	.005
Children	59 (36.2)	20 (25.3)	39 (46.4)	
NIHSS	10.3 (2.8)	9.9 (2.4)	10.7 (3.1)	.074

NOTE. Values are mean ± SD, n (%), or as otherwise indicated.
Abbreviations: LOS, length of stay; NIHSS, National Institutes of Health Stroke Scale.
* Categorical variable, χ^2 test; continuous variable, independent-sample t test.

Table 2 Scores on Pt.Q, Fam.Q, and other rehabilitation outcome measures of patients in the younger and older groups

Measures	Younger Group			Older Group		
	Baseline	6th wk	*P**	Baseline	6th wk	*P**
Pt.Q						
Pt.Q-K	11.8±1.9	ND	NA	11.8±1.8	ND	NA
Pt.Q-I	17.7±3.2	ND	NA	18.6±3.0	ND	NA
Fam.Q						
Fam.Q-BADL	2.8±2.7	ND	NA	2.5±2.8	ND	NA
Fam.Q-IADL	1.9±1.9	ND	NA	2.9±1.9	ND	NA
Outcome measures						
MoCA-ChiFZ	15.5±7.4	19.1±6.8	<.001	13.7±6.4	17.6±7.3	<.001
FMA	18.7±13.9	33.0±17.4	<.001	20.2±16.2	33.3±20.9	<.001
MBI-C	49.2±19.3	65.9±19.0	<.001	42.0±19.4	57.7±21.0	<.001
BDI-II-C	16.6±10.5	10.8±7.0	<.001	19.3±12.6	12.4±8.5	<.001

NOTE. Values are mean ± SD or as otherwise indicated.
Abbreviations: Fam.Q, Family Member Attitudes Questionnaire; MoCA-ChiFZ, Chinese Fuzhou version of the MoCA; NA, not applicable; ND, not done; Pt.Q Patient's Rehabilitation Questionnaire; Pt.Q-I Patient's Rehabilitation Questionnaire—Intention of Independence; Pt.Q-K Patient's Rehabilitation Questionnaire—Knowledge About Rehabilitation.
* Paired *t* test.

(*P*<.001), FMA (*P*<.001), and MBI-C (*P*<.001). In contrast, both groups showed significantly lower scores at the sixth week than at baseline on the BDI-II-C (*P*<.001) (table 2).

Relationships among the measures

The length of stay preassessment was significantly correlated with the gain score on the Chinese Fuzhou version of the MoCA, FMA, and BDI-II-C taken among the younger (r=.227−.380, *P*<.05) and older groups (r=.376, *P*<.01) (table 3). The duration of disease and National Institutes of Health Stroke Scale were significantly correlated with the FMA and BDI-II-C of the younger group (r=−.244 and −.224, respectively, *P*<.05). The baseline scores on the Chinese Fuzhou version of the MoCA, MBI-C, and BDI-II-C were significantly correlated with all outcomes for both the younger (r=−.751 to .395, *P*<.01) and older groups (r=−.744 to .473, *P*<.01).

Hierarchical regression analyses

Duration of disease, length of stay, and National Institutes of Health Stroke Scale, MBI-C, and BDI-II-C were the predictors of block 1. Only the Family Member Attitudes Questionnaire—BADL significantly predicted cognitive function outcome for both the younger and older groups (table 4).

The regression equations for cognition function outcome are as follows:

$$\begin{aligned}\text{Cognition Gain (Younger)} &= 6.30 - 0.07(\text{MBI-C}) \\ &\quad + 0.10(\text{BDI-II-C}) \\ &\quad - 0.32(\text{FAM.Q} - \text{BADL})\end{aligned}$$

$$\begin{aligned}\text{Cognition Gain (Older)} &= 4.03 + 0.07(\text{BDI-II-C}) \\ &\quad - 0.54(\text{FAM.Q} - \text{BADL})\end{aligned}$$

Equations 1 and 2 explain 32.7% and 25.2% of the variance, respectively.

The Patient's Rehabilitation Questionnaire—Intention of Independence was the significant predictor of the other outcomes. It significantly predicted motor function outcome for both groups, but predicted emotion function outcome only for the younger group and self-care independence outcome only for the older group.

The regression equations for the motor function outcome are as follows:

Table 3 Relationships between rehabilitation outcomes and other variables for patients in the younger and older groups

Variables	Younger Group				Older Group			
	MoCA-ChiFZ Gain	FMA Gain	MBI-C Gain	BDI-II-C Gain	MoCA-ChiFZ Gain	FMA Gain	MBI-C Gain	BDI-II-C Gain
Duration of disease	−.197	−.244*	−.149	.146	.074	−.061	.047	−.071
LOS preassessment	.227*	.380*	−.060	.315†	.162	.376†	.209	.144
NIHSS	.199	.207	.011	−.224*	−.007	.138	−.037	−.111
MoCA-ChiFZ baseline	−.378*	.186	−.059	−.005	−.018	.014	.121	.141
FMA baseline	.024	−.001	.05	−.105	.146	−.071	.05	.084
MBI-C baseline	−.398†	−.041	−.384†	−.031	−.148	−.199	−.221*	.157
BDI-II-C baseline	.379†	.395†	.014	−.751†	.304†	.473†	.174	−.744†

Abbreviations: LOS, length of stay; MoCA-ChiFZ, Chinese Fuzhou version of the MoCA; NIHSS, National Institutes of Health Stroke Scale.
* Correlation significant at the .05 level (2-tailed).
† Correlation significant at the .01 level (2-tailed).

Table 4 Hierarchical regression analysis predicting rehabilitation outcomes

Steps/Predictors	Adjusted R^2	R^2_{change}	F_{change}	β
For Younger Patient Group				
MoCA-ChiFZ gain				
1. MBI-C baseline	.147	.158	14.489*	−0.069*
BDI-II-C baseline	.264	.125	13.229*	0.099*
2. FAM.Q-BADL	.327	.070	8.129*	−0.320*
FMA gain				
1. BDI-II-C baseline	.145	.156	14.234*	0.274†
LOS preassessment	.182	.047	4.462†	0.123
2. PT.Q-I	.246	.072	7.431*	0.886*
MBI-C gain				
1. MBI-C baseline	.136	.148	13.329*	−0.277*
BDI-II-C gain				
1. BDI-II-C baseline	.558	.564	99.593*	−0.587*
2. PT.Q-I	.593	.039	7.474*	−0.520*
For Older Patient Group				
MoCA-ChiFZ gain				
1. BDI-II-C baseline	.081	.092	8.332*	0.066†
2. FAM.Q-BADL	.252	.178	19.739*	−0.539*
FMA gain				
1. BDI-II-C baseline	.214	.224	23.605*	0.452*
LOS preassessment	.259	.053	5.980†	0.118
2. PT.Q-I	.310	.058	6.995†	1.217†
MBI-C gain				
1. MBI-C baseline	.037	.049	4.216†	−0.127
2. PT.Q-I	.092	.065	5.974†	1.178†
BDI-II-C gain				
1. BDI-II-C baseline	.549	.554	101.957*	−0.598*

Abbreviation: Fam.Q, Family Member Attitudes Questionnaire; LOS, length of stay; MoCA-ChiFZ, Chinese Fuzhou version of the MoCA.
* $P<.01$.
† $P<.05$.

$$\text{Motor Gain (Younger)} = -7.89 + 0.27(\text{BDI-II-C}) + 0.89(\text{Pt.Q} - \text{I}) \quad (3)$$

$$\text{Motor Gain (Older)} = -21.15 + 0.45(\text{BDI-II-C}) + 1.22(\text{Pt.Q} - \text{I}) \quad (4)$$

Equations 3 and 4 explain 24.6% and 31.0% of the variance, respectively.

The regression equations for the emotion function and self-care independence outcomes are as follows:

$$\text{Emotion Gain (Younger)} = 13.12 - 0.59(\text{BDI-II-C}) - 0.52(\text{Pt.Q} - \text{I}) \quad (5)$$

$$\text{Emotion Gain (Older)} = 4.61 - 0.60(\text{BDI-II-C}) \quad (6)$$

$$\text{Self} - \text{Care Gain (Younger)} = 30.34 - 0.28(\text{MBI-C}) \quad (7)$$

$$\text{Self} - \text{care Gain (Older)} = -0.939 + 1.18(\text{Pt.Q} - \text{I}) \quad (8)$$

Equations 5 and 6 explain 59.3% and 54.9% of the variance, respectively, and equations 7 and 8 explain 13.6% and 9.2% of the variance, respectively.

(Note: Gain = Gain score on the Chinese Fuzhou version of the MoCA [for cognition], FMA [for motor], BDI-II-C [for emotion], and MBI-C [for self-care]; MBI-C = Score on MBI-C at baseline; BDI-II-C = Score on BDI-II-C at baseline.)

Discussion

This study explored the effects of family members' attitudes and patients' knowledge about rehabilitation and intention of independence on rehabilitation outcomes among Chinese poststroke inpatients. The patient and family factors were revealed to act in a mixed manner across rehabilitation outcomes and patients' age groups. Family members' factor was found to influence the cognitive function outcome equally among the younger and older patients. More positive attitudes among family members were associated with more gains in cognitive function among the patients. By the same token, the patient factor influenced the motor function outcome in both groups. Differential age-related effects were observed in the patient's intention of independence on the other 2 outcomes. Among the younger group, their intention of independence was only significantly associated with the gains in the emotion function outcome. In contrast, among the older group, their intention of independence was only significantly associated with the gains in the self-care independence outcome.

In this study, family members' attitude toward the patient's independence was defined as the extent to which the family members expected the patient to perform BADL and IADL tasks

after the inpatient rehabilitation. Family members' attitude toward the patient's performance of BADL was found to significantly predict the patient's gain in cognitive function. Irrespective of age, the family members tended to expect the patient after receiving rehabilitation to perform fewer BADL tasks after the stroke. The 3 most frequent BADL tasks that the patients were not expected to perform were stair climbing, bathing, and ambulation (in descending order) in both the younger and older groups. Our findings are similar to those reported in previous studies[7,9] that poststroke patients' behaviors in rehabilitation were influenced by the positive or negative evaluation of their family members. This was attributed to overprotection and reduction in the self-reliance of the patients. Consistent with these studies, our results indicated that lower expectations of the family members were associated with lesser gains by the patients over the 6-week rehabilitation period. Negative attitudes among the family members seem to exert a hindering effect on the patients' gain of cognitive function in inpatient rehabilitation. Because cognitive dysfunctions are common among poststroke patients,[15] any hindrance of gains in cognitive function during inpatient rehabilitation would be undesirable. Computer-based cognitive training[16] and activities of daily living practices[17] are strategies adopted in inpatient rehabilitation. These strategies can directly or indirectly enhance a patient's cognitive function. It is likely that family members' negative attitudes might have exerted their effect via the patients less actively participating in the rehabilitation program and hence not maximizing gains in cognitive function.

The patient's intention of independence was the second factor found among both younger and older patients influencing the motor function outcome. A stronger intention of independence by patients was associated with better motor function gains. This is a reasonable finding, since an individual's intention leads to the occurrence of one's behavior.[6] Our findings are consistent with the notion that an individual's intention is the best predictor of the actual performance of the behavior.[18] Patients with a stronger intention of independence would participate more actively in the inpatient rehabilitation program, which was substantiated by others promoting motor and self-care functional outcomes.[19] The inpatient rehabilitation programs included sensorimotor training and physical modality interventions. These components would contribute to gains in motor function. Of note, the results did not reveal interactions between the patient and the family member factors. Previous studies[20-22] reported that people with disabilities, including poststroke patients, in China and Taiwan had diminished expectations of their independence. Wang et al[22] explained that family members tend to provide too much assistance in self-care activities performed by the patients. After the onset of stroke, as primary caregivers, family members tended to overprotect poststroke patients by assisting them in their BADL tasks. Future studies should look into the possible patient and family member interactions and its mechanism on influencing cognitive and motor function outcomes by using more stringent research designs.

Unique to this study were the differences observed in the effects of the patient factor on the emotion and self-care outcomes. The intention of independence was found to be associated with the emotional function outcome in the younger patients, but not the older patients. This perhaps can be explained by the relatively active role engagement of the younger patients compared with that of their older counterparts, such as being a parent and worker even after the stroke. A previous study[23] revealed that returning to work was an important factor in life satisfaction among young poststroke patients. Younger poststroke patients were found to be motivated to regain functional independence because of an obligation to fulfill social and family responsibilities.[24] In fact, the intention of independence of the younger patients was moderately and negatively correlated with the family members' attitude toward the patient's independence. The satisfaction and motivation probably accounted for the emotional function among the younger patients. Among the older patients, the patient factor was found to be associated with self-care performances. When compared with their younger counterparts, the older patients in this study did not work, as most of them were retired (mean age, 68.4y). Older poststroke patients lost their social roles because of difficulties with leaving the home to pursue related activities.[25] The intention of independence would drive their attention to managing self-care tasks during the inpatient rehabilitation program,[26] hence promoting self-care performance at discharge.[27] This might explain why the patient factor was associated with the self-care independence outcome among the older patients.

Previous research[28] reported that baseline depression status and independent functional levels in subacute stroke patients were significant predictors of rehabilitation recovery within 3 months. The results of other significant block 1 variables in the regression equation are consistent with this study. It seems that the patients' knowledge did not contribute to the rehabilitation outcomes. A possible explanation might be that most of the patients had a low level of this knowledge, which was reported in poststroke patients in a previous study.[29]

Study limitations

This study has a few limitations. First, the regression models yielded modest power. The percentages of variance explained by the family and patient variables are relatively smaller than those of the baseline variables. Readers are reminded to interpret the results with caution. Future research should replicate the study with more stringent control of the potential confounding variables, such as the characteristics of family members and caregiver roles. Second, the relatively few items in the Patient's Rehabilitation Questionnaire would underrepresent the content domain of the patient's knowledge about stroke rehabilitation and intention of independence. It would also yield relatively low Cronbach alpha values, hence affecting the internal consistency of the measure. The results reported should be interpreted with caution. There was a lack of information on the actual behaviors displayed by the family members and patients throughout the rehabilitation process, such as the quantity of training. A behavioral checklist could be useful for triangulating the results of the patient and the family member factors. Future studies could improve information on the family member participants and the content validity of the Patient's Rehabilitation Questionnaire for addressing the between-group differences. Third, 6 weeks might have been adequate in capturing inpatient rehabilitation outcomes. A longer period such as 6 to 12 months, however, would be more useful for reflecting the gains of the entire poststroke rehabilitation process. Last but not least, the use of regression analysis might have excluded predictors that were important but did not reach statistical significance. Future research may consider using other multivariate statistical methods, such as canonical correlations or path analysis, for exploring factors influencing patients' rehabilitation outcomes.

Conclusions

Family members' attitudes and patients' intention of independence are important factors influencing poststroke patients' rehabilitation across different outcomes. Patients' intention of independence would promote motor recovery, while family members' positive attitudes toward such independence could enhance cognitive regains. Patients' intention of independence would influence the emotion outcome among the younger patients in contrast to the self-care independence outcome among the older patients. The findings prompt the need for future research on developing strategies of enhancing positive attitudes toward functional independence among both patients and their family members for promoting better outcomes in poststroke rehabilitation.

Supplier

a. SPSS 18.0 software; SPSS Inc.

Keywords

Attitude; Family; Intention; Rehabilitation; Stroke

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Supplemental Appendix S1 Questionnaire Items and Additional Details

Supplemental Box 1 Items of the Patient's Rehabilitation Questionnaire

1. The goals of stroke rehabilitation were regaining a stable vital sign and getting out of danger.
2. You should begin rehabilitation as early as possible.
3. Spending more time on rehabilitation would lead to better outcomes.
4. You should try your best to be as independent as possible.
5. You should participate as actively as possible in the rehabilitation.
6. You should strive for independence in ambulation but not in self-care activities.
7. You should not engage too much in social activities.

Methods

Outcomes

Patient's Rehabilitation Questionnaire

The Patient's Rehabilitation Questionnaire has 2 parts. The first part (items 1−3) assesses the patient's knowledge of the rehabilitation process (Patient's Rehabilitation Questionnaire−Knowledge About Rehabilitation), and the second part (items 4−7) assesses the patient's intention of independence (Patient's Rehabilitation Questionnaire−Intention of Independence). The test construct of the Patient's Rehabilitation Questionnaire makes reference to recent publications[1-3] on the principle of poststroke rehabilitation. The patient responds with a rating on the 6-point Likert scale. To avoid potential acquiescence, the polarity of the rating scale for 3 items (items 1, 6, 7) was reversed. Higher scores on each of the 2 parts suggest more knowledge or a stronger intention of independence by the patient. The content of the questionnaire was reviewed by an expert panel in terms of content relevance and importance. Exploratory factor analysis identified a 2-factor structure that explained 49.5% of the variance, corresponding to Patient's Rehabilitation Questionnaire−Knowledge About Rehabilitation (Cronbach α=.73) and Patient's Rehabilitation Questionnaire−Intention of Independence (Cronbach α=.67), respectively (Kaiser-Meyer-Olkin=.684; χ^2_{21}=277.331, P<.001).

Supplemental Box 2 Items of the Family Member Attitudes Questionnaire (Fam.Q)

Fam.Q-BADL	Fam.Q-IADL
1. Feeding	11. Light housework
2. Transfer	12. Heavy housework
3. Personal hygiene	13. Local shopping
4. Toileting	14. Social outings
5. Bathing	15. Walking outdoors ≥15min
6. Ambulation	16. Pursuing active interest in a hobby
7. Stair climbing	
8. Dressing	
9. Bowel control	
10. Bladder control	

Family Member Attitudes Questionnaire

The Family Member Attitudes Questionnaire has 2 parts. The first part (items 1−10) assesses the patient's expected roles in performing activities of daily living after the stroke (Family Member Attitudes Questionnaire−BADL), which was extracted from the Modified Barthel Index[4] (except the "wheelchair" item). The second part (items 11−16) assesses the patient's expected roles in performing instrumental activities of daily living after the stroke (Family Member Attitudes Questionnaire−IADL), which was extracted from the Frenchay Activities Index.[5] The family members were asked to identify the task items that they perceived that the patient would not be required to perform independently after discharge from the hospital. The score on the Family Member Attitudes Questionnaire is the total number of items identified from the Family Member Attitudes Questionnaire−BADL and Family Member Attitudes Questionnaire−IADL. Higher total scores indicate that the patient would not be expected to perform basic and instrumental activities of daily living. Explorative factor analysis identified a 2-factor structure that explained 50.8% of the variance, corresponding to the Family Member Attitudes Questionnaire−BADL (Cronbach α=.87) and Family Member Attitudes Questionnaire−IADL (Cronbach α=.80) (Kaiser-Meyer-Olkin=.831; χ^2_{120}=1274.146, P<.001).

Chinese Fuzhou version of the Montreal Cognitive Assessment

The MoCA is a standardized cognitive assessment for screening patients with cognitive deficits, such as mild cognitive impairment.[6] It consists of 28 items covering 8 domains of cognitive function. Our research team further modified the Chinese Beijing, Changsha, Taiwanese, Hong Kong, and Los Angeles versions into the Chinese Fuzhou version of the MoCA in preparation for this study.[7-11]

The Chinese version of instructions for test administration was adopted without modification. An expert panel review was conducted to evaluate the relevance and representativeness, as well as linguistic fluency, of the 5 Chinese versions by comparing them with the test content of the original English version.[12-14] The panel comprised 5 experts who were senior researchers in clinical rehabilitation. The findings of the expert panel suggested that changes should be made to 5 subtests. The consensual discussion among the panel members concluded that the changes were necessary because of the potential differences in the task-taking processes or difficulty level of the items in the translation taken by the previous studies. The changes were as follows:

1. *Visuospatial/executive functions (alternating trail making):* "A/B/C/D/E" were replaced with "甲/乙/丙/丁/戊," of which the Chinese characters were common terms in Chinese representing an identical sequential order.
2. *Language (naming) test:* The picture of the "rhinoceros" was replaced with the "bear" (熊, xiong), which shared a similar difficulty with the word "rhinoceros" and familiarity of the animals among the Westerners.
3. *Attention (target detection using tapping):* The letters of the English alphabets were replaced with Arabic numerals.
4. *Language (verbal fluency):* Instead of saying the names of as many different animals as possible as in 4 of the 5 Chinese

MoCA versions, it was changed to saying as many short phrases (2−4 Chinese characters) as possible beginning with the Chinese phonetics "yi." A few of the examples are as follows: yī shēng (doctor, 医生) and yī fu (clothes, 衣服) or yí wèn (query, 疑问) and yì zhì (will, 意志). According to the expert panel, the process of searching for phrases beginning with "yi" would be similar to the process of saying English words starting with the letter "F" as in the original MoCA version.

5. *Memory (delay recall) test:* The words "church" and "daisy" were changed to "temple" (寺庙, si miao) and "chrysanthemum" (菊花, ju hua), respectively, which were deemed more culturally relevant and shared a similar level of difficulty and familiarity with their counterparts as in the original English version.

Validation of the Chinese Fuzhou version of the MoCA was conducted by administering it to 381 poststroke patients (34.9% women; 67.7% ischemic stroke). The mean age ± SD of these patients was 61.2±10.3 years, with a mean ± SD education level of 8.4±4.7 years. The time from onset of stroke of patients ranged from 12 to 99 days. The test-retest reliability with 1-week delay was conducted on a random sample of 99 patients selected among those who participated in the validation study. The test-retest reliability with 1-week delay of Chinese Fuzhou version of the MoCA was .90 (intraclass correlation coefficient [ICC]; 95% confidence interval, .86−.93), which was comparable with the original English (ICC=.92), Taiwanese (ICC=.88), and Hong Kong versions (ICC=.96).[6,9,10] At the item level, the test-retest reliability (kappa statistics) ranged from .42 to .77. Cronbach α for the total test was .92, suggesting a slightly higher internal consistency than the original English version (Cronbach α=.83), the Chinese Beijing (Cronbach α=.88), Chinese Changsha (Cronbach α=.884), Taiwan (Cronbach α=.86), Hong Kong (Cronbach α=.72), and Chinese Los Angeles versions (Cronbach α=.78).[6-11]

Fugl-Meyer Assessment

The brief version of the FMA[15] was used to assess motor function for the upper extremity (33 items) and lower extremity (17 items). Each item was rated on a 3-point ordinal scale from "unable to perform" (score 0) to "fully able to perform" (score 2). A total score of 100 indicated full normal motor function.

Chinese version of the Modified Barthel Index

The MBI-C measures the level of independence in basic activities of daily living.[4] It consists of 10 items, and the total score is 100. A higher score indicates a higher level of independence on the task items. It was validated with good internal consistency (Cronbach α=.93) and interrater reliability (κ=.81-.99).

Chinese version of the Beck Depression Inventory-II

The BDI-II-C is a measure of depressive mood status in patients.[16] It is composed of 21 items, and each item is rated between 0 and 3. A higher total score indicates a more severe depressive mood. It was validated, and the internal consistency (Cronbach α) for the total scale was .94.[16]

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