

Examining the Quality of Life Related to Fall Experience in Chronic Stroke Patients

Ju-Hwan Lee, MS, PT • Shin-Jun Park, MS, PT[†]

Department of Physical Therapy, General Graduate School, Yongin University

Received: June 29, 2016 / Revised: July 4, 2016 / Accepted: August 5, 2016

© 2016 J Korean Soc Phys Med

| Abstract |

PURPOSE: The purpose of this study was to investigate the quality of life related to fall experiences in chronic stroke patients.

METHODS: This cross-sectional study included 117 patients with stroke from 3 hospitals in D metropolitan city. General characteristics, including fall experiences and quality of life, were assessed through a face-to-face interviews conducted in a quiet place using a questionnaire. Measurement of quality of life in stroke patients was conducted using the Korean Stroke Specific Quality of Life Scale (SS-QOL). To identify the SS-QOL items related to fall experiences, the items of the SS-QOL were considered as independent variables, and the variables that were significantly different according to fall experiences were identified using a univariate analysis. A binary logistic regression was then performed using fall experiences as the independent variable.

RESULTS: According to the univariate analysis, self help activities, social role, and upper extremity function were significantly lower in the fall group than that in the non-fall

group ($p < .05$). The findings of the binary logistic regression confirmed that social roles and upper extremity function were the SS-QOL items that were related to fall experience in chronic stroke patients.

CONCLUSION: These findings suggest that social roles and upper extremity function may be risk factors for fall experience in patients with chronic stroke.

Key Words: Fall, Quality of life, Chronic stroke

I. Introduction

Falls occur frequently in stroke patients due to several dysfunctions such as muscle weakness, decreased balance, impairment of gait, poor cognitive function, and reduction in spatial sense (Rapport et al., 1993).

Falling was defined as falling onto the ground (Ory et al., 1993). It is the most frequent accident among the elderly and in patients with neurological disorders (Wada et al., 2007). Stroke patients seem to be vulnerable to falls due to the lack of strength to hold their postural sway. Thus, long response latency for postural sway is needed for stroke patients (Ikai et al., 2003). The incidence of falls in patients with neurological disorders was two times higher than that in a control group with no neurological disorders (Stolze et al., 2004). Falls in stroke patients could

[†]Corresponding Author : 3178310@naver.com

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

lead to a delay in the recovery of balance and motor function, musculoskeletal diseases, and even death (Rammemark et al., 2000; Poole et al., 2002).

Stroke patients who experienced falls at least once have poor balance and low ability to perform activities of daily living (Teasell et al., 2002). Several studies have reported that balance ability and training are risk factors for falls in stroke patients (Lamb et al., 2003; Mackintosh et al., 2006; Simpson et al., 2011). Balance-related interventions on various surfaces have been implemented in trying to prevent falls in stroke patients (Cheng et al., 2001; Vearrier et al., 2005).

However, there are limitations of balance training for prevention of falls since possible falls may occur during balance exercise (English et al., 2007), which are closely related to psychological and environmental factors (Jørgensen et al., 2002; Simpson et al., 2011). Worsening depressive symptoms raised the possibility of falls in patients with stroke (Jørgensen et al., 2002). Stroke patients who returned home after discharge from the hospital had a higher risk of falls than did the control group without neurological diseases (Simpson et al., 2011).

The Stroke Specific Quality of Life Scale (SS-QOL) evaluates the physical, psychological, and social aspects of stroke patients (Williams et al., 1999). The Barthel Index and the MOS 36-item Short Form Health Survey (SF-36) have been used to assess the result of interventions for stroke patients (Duncan et al., 2000; Kwok et al., 2006). Stroke patients with aphasia could have good results on these tools since they do not include items for language assessment. The Health-Related Quality of Life (HRQOL) assesses the overall health status in the physical, psychological, and social aspects, but it does not evaluate the representative characteristics of upper extremity function and communication dysfunction in stroke patients. Therefore, the SS-QOL (Williams, 1998; Williams et al., 1999) was utilized in the present study.

In studies on fall-related factors in stroke patients, attention-deficit, poor balance, and poor ability in performing activities of daily living have been found to be related to falls (Teasell et al., 2002; Hyndman and Ashburn, 2003), whereas the outcomes were not obtained by assessing the overall characteristics of patients with chronic stroke. To date, there has been minimal research regarding fall-related factors across the nation and worldwide. Experiences of falls in stroke patients cannot be explained by balance and gait speed (Harris et al., 2005). Thus, this study was performed to identify the characteristics and the effects of SS-QOL items on fall experiences in chronic stroke patients, and to supply baseline data for the prevention and reduction of falls using the SS-QOL.

II. Methods

1. Participants

The subjects of the present study were 117 patients who had been hospitalized in Hospital A, B, and C, located in Gyeonggi-do province, South Korea. Written informed consent was obtained. The subjects were divided into two groups: fall group and non-fall group based on the fall experiences reported in the questionnaires. The inclusion criteria were: patients who had had a stroke at least six months prior to the data collection, had no neurological and musculoskeletal diseases, had no unilateral neglect, and were communicative. The subjects were selected from among those whose score on the mini-mental state examination Korean version was 24 or higher (Folstein et al., 1975). The subjects who could walk without assistance, or had the ability to walk 8 m with an assistive device were included (Harris et al., 2005).

Six patients were excluded because physical therapists who were responsible for evaluations at each hospital

confirmed additional musculoskeletal disease (n=4) and more than one occurrence of stroke (n=2).

2. Experimental design

This was a cross-sectional study conducted at General Hospital A in Seoul, and Hospital B and C in Gyeonggi-do province, from February to April in 2016. The subjects filled out the survey in a quiet consultation room through face-to-face interviews. The survey was conducted by those who had worked for more than 5 years as physiotherapists. The therapists were fully aware of the purpose, content, and method of the study, and were educated about the survey.

3. Measurements tools and methods

The SS-QOL and a questionnaire on general characteristics were used in order to analyze the factors that influence falls in chronic stroke patients.

1) Descriptive questionnaire on general characteristics

A questionnaire on general characteristics was used for assessing falls in patients with chronic stroke, including age, gender, etiology, region of lesion, education level, fall location, spouse, and fall experience.

2) The Stroke Specific Quality of Life (SS-QOL) scale

The SS-QOL (Williams et al., 1999), translated and standardized by Moon (2003), was used to assesses the quality of life of chronic stroke patients. The Korean SS-QOL is composed of 49 items across 12 categories: energy (3 items), family role (3 items), language (5 items), movement (6 items), mood (5 items), personal characteristics (3 items), self-help activities (5 items), social responsibility (5 items), thinking (3 items), upper extremity function (5 items), vision (3 items), and job-producing activities (3 items). Scores ranged from 49 to 245, and a higher score indicated a higher degree of quality of life. In terms of the reliability of the Korean SS-QOL, a

Cronbach α value of .80 was observed, showing a high internal consistency (Moon, 2003).

4. Statistical analysis

The data were analyzed using SPSS software (Version 20.0). Comparison of descriptive statistics and SS-QOL categories between the fall and non-fall groups was conducted by an independent t-test and chi-squared test. For analysis of the SS-QOL items that effect fall experiences, a binary logistic regression was used. Items of the SS-QOL that were significantly different in terms of fall experiences, as per the univariate analysis, were entered as independent variables in the binary logistic regression. Whether patients had a fall experience was selected as the dependent variable for the binary logistic regression. Statistical significance was set at $p < .05$.

III. Results

1. General characteristics depending on fall experience

The general characteristics depending on fall experience have been presented in Table 1. In total, 61 stroke patients had experienced falls, while 56 stroke patients had not. The mean age of the group with fall experience was 64.1 ± 8.70 years, and right hemisphere lesions were reported in 35 participants in the fall group. In terms of education level, highest proportion of participants in the fall group had completed high school education. There were no significant differences between the fall and non-fall groups in terms of age, gender, etiology, region of lesion, education level, spouse, and admission ($p > .05$), but falls occurred most often in the hospital corridors in the fall group ($p < .05$).

Table 1. General characteristics depending on fall experience

Classification	F(n=61)	NF(n=56)	$\chi^2(p)$ or t(p)
Age (mean±SD)	64.1±8.70	65.04±5.43	-7.05(.48)
Gender {n(%)}			1.72(.19)
Male	43(36.8)	33(28.2)	
Female	18(15.4)	23(19.7)	
Etiology {n(%)}			.83(.36)
Cerebral infarction	17(14.5)	20(17.1)	
Cerebral hemorrhage	44(37.6)	36(30.8)	
Lesion region {n(%)}			.32(.57)
Right Cerebral	35(29.9)	35(29.9)	
Left Cerebral	26(22.2)	21(17.9)	
Education Level {n(%)}			2.93(.40)
Elementary School graduation	1(.9)	2(1.7)	
Middle School graduation	11(9.4)	6(5.1)	
High School graduation	44(37.6)	46(39.3)	
University graduation	5(4.3)	2(1.7)	
Fall location {n(%)}**			117(.00)
Hospital room	17(27.9)	0	
Hospital corridor	44(72.1)	0	
Spouse {n(%)}			1.60(.21)
Have spouse	48(41)	49(41.9)	
Spouseless	13(11.1)	7(6)	
Admission {n(%)}			1.49(.22)
Inpatients	54(46.1)	45(38.5)	
Outpatients	7(6)	11(9.4)	

F; Fallers, NF; Non Fallers

*p<.05, **p<.01

Table 2. Comparison item of SS-QOL depending on fall experience

Subdomain(n=117)	F(n=61) (mean±SD)	NF(n=56) (mean±SD)	t	p
Energy	8.26±1.81	8.46±2.79	.47	.65
Family role	5.66±2.11	6.39±2.29	-1.81	.07
Use of language	17.28±6.62	18.55±5.72	-1.12	.27
Movement	11.11±4.18	12.00±6.14	-.90	.37
Feeling	7.39±3.29	7.83±3.25	-.74	.46
Personality	8.77±2.36	9.38±2.78	-1.27	.21
Self-help activities**	8.31±3.48	11.2±5.82	-3.22	.00**
Social role**	5.92±1.64	7.25±2.06	-3.86	.00**
Ability to think	7.61±2.22	8.38±2.33	-1.82	.07
Upper extremity function**	7.33±3.46	11.88±4.84	-5.80	.00**
Eyesight	8.46±3.40	9.70±3.74	-1.88	.06
Occupation-Production activities	5.67±2.18	6.02±2.32	-.83	.41

F; Fallers, NF; Non Fallers

*p<.05, **p<.01

2. Comparison of SS-QOL items depending on fall experience

A comparison of SS-QOL items depending on fall experiences has been presented in Table 2. There were significant differences between groups in terms of self help activities, social role, and upper extremity function ($p < .05$). The scores on self help activities, social role, and upper extremity function were significantly lower in the fall group than that in the non-fall group ($p < .05$).

3. Effects of the SS-QOL items on fall experiences in stroke patients

According to the binary logistic regression analysis, the model fit was acceptable because the significance level was more than .05 on the Hosmer and Lemeshow test ($p = .17$). Chronic stroke patients who had a higher score on social roles were more likely to have no experience with falls (odds ratio [OR], .71; 95% CI, .51-.91, $p < .01$). Chronic stroke patients who had a higher score on upper extremity function were more likely to have no experience with falls (odds ratio [OR], .81; 95% CI, .72-.91, $p < .01$).

Table 3. Binary logistic regression for fall experience

Variables	B	Exp(B)	p
Self-help activities	-.10	.91	.06
Social role	-.34	.71	.01*
Upper extremity function	-.22	.81	.01*

* $p < .05$, ** $p < .01$

IV. Discussion

Stroke patients have higher risk of falls than do non-stroke patients (Jørgensen et al., 2002). Musculoskeletal injuries such as hip fracture and the decline in functional independence may occur in stroke patients (Ramnemark et al., 1998; Ramnemark et al., 2000). Previous research on improvement of physical capacity and functional ability

in stroke patients who experienced falls has been reported (Na et al., 2007; Song et al., 2010, Ahn and Ahn, 2011). However, there is insufficient national and international research on the correlation between quality of life and fall experiences. Therefore, this study aimed to identify the items of quality of life that affect fall experiences in stroke patients, and to provide baseline data for the prevention of falls.

In this study, 44 (72.1%) stroke patients had experienced a fall in the hospital corridors. Majority of the subjects were hospitalized patients. Fall prevention education for patients was important (GUO et al., 2011), whereas environmental factors such as dim lighting, slippery floors, and a narrow space could be possible risk factors for falls. Environmental improvement to prevent falls and education of parents or guardians are necessary (World Health Organization, 2008).

On comparing the scores on the quality of life items between the fall and non-fall groups, self help activity and upper extremity function in the non-fall group was significantly higher than that in the fall group. This result was similar to the findings of the study by Hyndman et al. (2002). The fall group showed significantly lower scores on activities of daily living and upper extremity function than the non-fall group did. Scores on social roles were significantly higher in the non-fall group (7.25) than that in the fall group (5.92). This result was similar to that reported by Forster and Young (1995). In their study, a significant decrease was observed in the social roles in the fall group as compared to the non-fall group. Thus, since social roles and upper extremity function were lower in the fall group as compared to the non-fall group, prevention efforts for falls need to be added to the concept of treatment.

In terms of SS-QOL items influencing fall experiences, the logistic regression revealed that chronic stroke patients in the non-fall group were more likely to have higher scores on social roles and upper extremity function (odds ratio

[OR], .71; 95% CI, .51-.91, odds ratio [OR], .81; 95% CI, .72-.91). The score on social role was computed in the present study by combining the scores on the items related to outings, sexual activity, leisure activity, and the influence of physical conditions on social life. This finding indicates the importance of supporting various social roles in stroke patients. In the study conducted by Faulkner et al. (2003), there was a negative correlation between incidence rate of falls and family relationships ($p < .05$). Maintaining strong family bonds could reduce the risk of falls, and its strong bond would not only improve functional aspects but also depression and social role in stroke patients (Tsouna-Hadjis et al., 2000). Thus, parents or guardians, who are considered to be aware of the importance of family roles, play an important role in preventing falls and improving social roles in stroke patients.

Meanwhile, there was a positive correlation between the upper extremity function and balance, and decreased balance control was a risk factor for falls in stroke patients (Arya et al., 2014; Mackintosh et al., 2006). Thus, falls were considered to be affected by worsened balance ability due to reduced upper extremity function. Movement of upper extremity prevented falls as the center of gravity shifts in the opposite direction (Milosevic et al., 2011). It was thought that interventions to improve upper extremity function would be needed for the prevention of falls.

To date, numerous studies have been conducted on the prevention of falls in stroke patients and in the elderly. Marigold et al. (2005) reported that group therapy including agility, weight shifting, and stretching was effective in reducing falls. Harris et al. (2005) suggested that prescription of 4-wheel walkers for stroke patients with a low berg balance scale score (below 45 points) could reduce the risk of falls. Nyberg and Gustafson (1997) reported that a scale that categorizes patients who are at risk for falls as low risk, medium risk, and high risk groups would be useful for the application of appropriate therapeutic interventions based on the characteristics of

stroke patients. To date, there has been minimal national and international research regarding interventions for improvement of upper extremity function and social roles in stroke patients. Thus, more studies need to be conducted on prevention and reduction of falls by improving upper extremity function and social roles in patients with chronic stroke.

This study was conducted at three hospitals, and the subjects of this study were chronic stroke patients who had sufficient cognitive ability (MMSE score of 24 points or more). Thus, it is difficult to generalize these results to all stroke patients. Therefore, further research needs to be conducted on a larger sample that is categorized into acute and sub-acute stages.

V. Conclusion

The present study was performed to identify the items of quality of life related to falls in stroke patients. It was found out that social roles and upper extremity function influenced fall experience, indicating that these two factors are important for intervention for fall prevention in stroke patients. Therefore, rehabilitation to improve physical capacity and social role should include activities such as outings, sexual activity, and leisure activity, which would help prevent falls in patients with chronic stroke.

References

- Ahn MH, Ahn CS. Comparison of effects of Feedbacks vs Repeative task training on lower extremity function in patients with chronic hemiplegia. *J Korean Soc Phys Med.* 2011;6(1):9-17.
- Arya KN, Pandian S, Abhilasha CR, et al. Does the motor level of the parietic extremities affect balance in

- poststroke subjects?. Rehabilitation research and practice, 2014.
- Bohannon RW, Smith MB. Interrater reliability of a modified Ashworth scale of muscle spasticity. *Phys Ther.* 1987;67(2):206-7.
- Cheng PT, Wu SH, Liaw MY, et al. Symmetrical body-weight distribution training in stroke patients and its effect on fall prevention. *Arch Phys Med Rehabil.* 2001;82(12):1650-4.
- Duncan PW, Lai SM, Keighley J. Defining post-stroke recovery: implications for design and interpretation of drug trials. *Neuropharmacology.* 2000;39(5):835-41.
- English CK, Hillier SL, Stiller KR, et al. Circuit class therapy versus individual physiotherapy sessions during inpatient stroke rehabilitation: a controlled trial. *Arch Phys Med Rehabil.* 2007;88(8):955-63.
- Faulkner KA, Cauley JA, Zmuda JM, et al. Is social integration associated with the risk of falling in older community-dwelling women?. *J Gerontol A Biol Sci Med Sci.* 2003;58(10):M954-M9.
- Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975;12(3):189-98.
- Forster A, Young J. Incidence and consequences of falls due to stroke: a systematic inquiry. *Bmj.* 1995;311(6997):83-6.
- GUO H, TIAN J, WAN QQ. Fall-prevention knowledge, attitude and practice among attendants of hospitalized elderly patients with cerebrovascular disease [J]. *Chinese Journal of Nursing.* 2011;3:021.
- Harris JE, Eng JJ, Marigold DS, et al. Relationship of balance and mobility to fall incidence in people with chronic stroke. *Phys Ther.* 2005;85(2):150-8.
- Hyndman D, Ashburn A. People with stroke living in the community: Attention deficits, balance, ADL ability and falls. *DISABIL REHABIL.* 2003;25(15):817-22.
- Hyndman D, Ashburn A, Stack E. Fall events among people with stroke living in the community: circumstances of falls and characteristics of fallers. *Archives of physical medicine and rehabilitation.* 2002;83(2):165-70.
- Ikai T, Kamikubo T, Takehara I, et al. Dynamic postural control in patients with hemiparesis. *AJPM&R.* 2003;82(6):463-9.
- Jørgensen L, Engstad T, Jacobsen BK. Higher incidence of falls in long-term stroke survivors than in population controls depressive symptoms predict falls after stroke. *Stroke.* 2002;33(2):542-7.
- Kwok, T, Lo RS, Wong E, et al. Quality of life of stroke survivors: a 1-year follow-up study. *Archives of physical medicine and rehabilitation.* 2006;87(9):1177-82.
- Lamb SE, Ferrucci L, Volapto S, et al. Risk factors for falling in home-dwelling older women with stroke the women's health and aging study. *Stroke.* 2003;34(2):494-501.
- Mackintosh SF, Hill KD, Dodd KJ, et al. Balance score and a history of falls in hospital predict recurrent falls in the 6 months following stroke rehabilitation. *Arch Phys Med Rehabil.* 2006;87(12):1583-9.
- Marigold DS, Eng JJ, Dawson AS, et al. Exercise leads to faster postural reflexes, improved balance and mobility, and fewer falls in older persons with chronic stroke. *JAGS.* 2005;53(3):416-23.
- Milosevic M, McConville KMV, Masani, K. Arm movement improves performance in clinical balance and mobility tests. *Gait & posture.* 2011;33(3):507-9.
- Moon JI. A Study on the Factors Affecting Stroke Quality of Life; Using the Stroke-Specific Quality of Life (SS-QOL). Master's Degree, Daegu University. 2003.
- Nyberg L, Gustafson Y. Fall prediction index for patients in stroke rehabilitation. *Stroke.* 1997;28(4):716-21.
- Ory MG, Schechtman KB, Miller JP, et al. Frailty and injuries in later life: the FICSIT trials. *JAGS.* 1993;41(3):283-96.

- Poole KE, Reeve J, Warburton EA. Falls, Fractures, and Osteoporosis After Stroke Time to Think About Protection?. *Stroke*. 2002;33(5):1432-6.
- Rha YH, Goo BO, Rho MH, et al. The Effect of External-feedback Weight-bearing Training Protecting a Fall in Hemiplegic Patients. *J Korean Soc Phys Med*. 2007;2(2):143-50.
- Ramnamark A, Nilsson M, Borssén B, et al. Stroke, a major and increasing risk factor for femoral neck fracture. *Stroke*. 2000;31(7):1572-7.
- Ramnamark A, Nyberg L, Borssen B, et al. Fractures after stroke. *Osteoporos Int*. 1998;8(1):92-5.
- Rapport LJ, Webster JS, Flemming KL, et al. Predictors of falls among right-hemisphere stroke patients in the rehabilitation setting. *Arch Phys Med Rehabil*. 1993;74:621-6.
- Simpson LA, Miller WC, Eng JJ. Effect of stroke on fall rate, location and predictors: a prospective comparison of older adults with and without stroke. *PLoS One*. 2011;6(4):e19431.
- Song CH, Lee GC, Yoo JH, et al. The Relation between Postural Sway and Asymmetric Weight-bearing for Fall Prevention in Patients with Stroke. *J Korean Soc Phys Med*. 2010;5(1):81-8.
- Stolze H, Klebe S, Zechlin C, et al. Falls in frequent neurological diseases. *J Neurol*. 2004;251(1):79-84.
- Teasell R, McRae M, Foley N, et al. The incidence and consequences of falls in stroke patients during inpatient rehabilitation: factors associated with high risk. *Arch Phys Med Rehabil*. 2002;83(3):329-33.
- Tsouna-Hadjis E, Vemmos KN, Zakopoulos N, et al. First-stroke recovery process: the role of family social support. *Arch Phys Med Rehabil*. 2000;81(7):881-7.
- Vearrier LA, Langan J, Shumway-Cook A, et al. An intensive massed practice approach to retraining balance post-stroke. *Gait & posture*. 2005;22(2):154-63.
- Wada N, Sohmiya M, Shimizu T, et al. Clinical analysis of risk factors for falls in home-living stroke patients using functional evaluation tools. *Arch Phys Med Rehabil*. 2007;88(12):1601-5.
- Williams LS, Weinberger M, Harris, LE, et al. Development of a stroke-specific quality of life scale. *Stroke*. 1999;30(7):1362-9.
- Williams LS. Health-related quality of life outcomes in stroke. *Neuroepidemiology*. 1998;17(3):116-20.
- World Health Organization. Ageing, & Life Course Unit. WHO global report on falls prevention in older age. World Health Organization. 2008.