

Research on the influence factors of the fall efficiency of the hospitalized geriatric patients with cerebrovascular diseases

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Abstract: To investigate the fall efficiency and its influence factors of the hospitalized geriatric patients with cerebrovascular diseases. The Modified Fall Efficacy Scale (MFES), Morse Fall Risk Assessment Scales (MFS), Berg Balance Scale (BBS) and Tinetti Gait Analysis (TGA) were adopted and the combined ways of questionnaires and observation were utilized to investigate the 113 hospitalized geriatric patients with cerebrovascular diseases. The fall efficiency of the geriatric patients with cerebrovascular diseases were 7.85 ± 2.57 scores. The two projects "walking up and down stairs" and "taking public transport means" have got the lowest scores; The two projects "stretching out the hand to the box or the drawer for taking something" and "sitting up and down to the chair" have got the highest scores. It was found that there were three factors which had significant influences on the fall efficiency, they were myodynamia of the right upper extremity, Berg balance functions and gait. For the sake of helping the geriatric patients with cerebrovascular diseases to establish the self-confidence of preventing the falls, the medical workers need to take further psychological counseling for the patients and befittingly and specifically to improve the fall efficiency of patients so as to effectively prevent the occurring of the fall on the basis of improving the balance ability and gait of patients.

Keywords: Cerebrovascular disorders; geriatric patients; accidental falls; influence factors.

INTRODUCTION

The cerebrovascular diseases are common diseases and frequently-occurring diseases in geriatric patients and may cause some dysfunctions such as movement, sense and balance, which obviously increase the risks of falls in patients with cerebrovascular diseases (Chen *et al.*, 2004). The falls are frequent for geriatric patients with cerebrovascular diseases no matter in the acute stage or the convalescence period (Chen *et al.*, 2004). Falls not only give rise to physical injuries to patients but also cause the decline of the confidence for self-caring and further recession of functions, which will make patients easier to fall again and form a vicious circle (Hao and Liu, 2007). Fall efficiency is one of the most important indexes to reflect the confidence of patients to prevent the falls and

refers to the confidence and ability to avoid falls during the daily activities (Hao and Liu, 2007). Some survey indicates that the ability to prevent fall efficiency of the patients with high risks to fall is obviously lower than that in the patients with middle and low risks to fall (Zhang *et al.*, 2011). The lower of the fall efficiency in patients who lack of confidence to prevent fall during daily activities, the bigger the possibility of falls (Zhou and Li, 2008). One of the reasons of falls in hospitalized geriatric patients with cerebrovascular diseases is that patients lack of awareness of the own abilities, with performance as too high or too low judgements about their own capacities, resulting in blind confidence or excessive loss of confidence, thus the fall occurs (Lai *et al.*, 2009). The

present study or practice on the prevention of fall in hospitalized patients with cerebrovascular disease mainly focus on the aspects of the diseases, body functions and environment. However, for the prevention of confidence in the ability to prevent falls or psychological problems, has not been aroused with enough recognition. This survey aims to investigate the fall efficiency and influence factors of the hospitalized geriatric patients with cerebrovascular diseases so as to early identify the abnormalities of the fall efficiency of the geriatric patients with cerebrovascular diseases and then to take specific mental intervening measures to prevent the occurring of falls.

MATERIALS AND METHODS

The selection for the objects of study

With the methods of convenience sampling, 113 geriatric patients with cerebrovascular diseases who hospitalized in neurological department of XXX top three hospital of Beijing from August 2010 to June 2011 were selected. Inclusion criteria: patients with clear consciousness and age ≥ 60 ; the diagnosis of patients was conformed to the diagnosis standards approved by the *Fourth National Cerebrovascular Disease Conference*; patients with stable disease after 1 to 2 weeks submission to the hospital; patients who were informed consent and willing to cooperate. Exclusion criteria: patients who had to stay in bed and could not ambulate out of the bed completely; patients who were combined other severe disease and resulting in the limitation of motion

The self-designed general materials were adopted to collect the general materials of the hospitalized patients.

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The general materials mainly contained the age, sex, degrees of education, histories of diseases, histories of falls and times of falls. All patients were interviewed face to face by the researchers or the materials of patients were recorded on the basis of the medical histories.

General materials of the objects of study

The objects of study were 113 cases in total. The ages of them were from 60 to 84 years old with average age of 70.88 ± 6.25 years old. Male patients were 80 cases which accounted for 70.8%; Female patients were 33 cases which accounted for 29.2%. With regard to the degrees of education, 61 cases were equal to or above the junior high school (54%), and 23 cases were senior high school (20.3%), and 29 cases were equal to or above the junior college (25.7%). The medical diagnosis for the patients contained intracranial and extracranial arteriostenosis, arterial aneurysm, cerebrovascular disorder and vascular malformation of spinal cord and so on. The intracranial and extracranial arteriostenosis contained carotid artery stenosis, vertebral artery stenosis, subclavian artery stenosis, basilar artery stenosis and middle cerebral artery stenosis etc, which degrees of coronary artery stenosis were from 25% to 90%. The upper limbs strength of patients varied from 0 to 5 grades, and the muscle strength of lower limbs varied from 2 to 5 grades. The arms and legs of patients had normal sense or feeling of numbness. 74 cases had courses of diseases under six months, which accounted for 65.5%; 39 cases had courses of diseases above six months, which accounted for 34.5%. 39 cases had histories of falls, which accounted for 34.5% of the total number. Among the 39 cases, 17 cases had fallen more than one time, which accounted for 43.6%; 35 cases had pre-operative histories of falls, which accounted for 89.7%. The histories of falls and times of falls referred to those that happened during the process of the diagnosis of the cerebrovascular diseases.

Research methods

Methods of collecting data

There were three data collectors in total including researchers, and the measuring methods for questionnaire scales were uniformly trained by the researchers. The fall efficacy of the patients was investigated by means of a questionnaire, which was completed by the patients themselves or by investigators according to the facts. The measurements for the balance ability, gait, myodynamia and sense of limbs were uniformly and objectively evaluated by the researchers. The patient's disease diagnosis, past medical history and treatment methods were obtained by consulting the medical records. 113 data were collected in total and all of them were effective questionnaires.

The research tools

Modified falls efficiency scale (MFES)

The MFES in Chinese version modified by Yanping Hao, *et al* was adopted to determine the level of confidence of

the elderly in the daily activities such as dressing, bathing, walking, and so on (Hao and Liu, 2007). The MFES in Chinese version had a total of 14 items, and each item was set up with 0 to 10 points. 0 point meant that patients did not have confidence at all; 5 points meant that patients were generally confident; 10 points meant patients were completely confident. The average score after the cumulative score is the final score. The lower the score, the less of the confidence. 0 to 4 points represented that the level of fall efficiency was low; 5 to 9 points represented that the level of fall efficiency was middle; 10 points represented that patients had enough confidence. The coefficient Cronbach's α of this scale in Chinese version was 0.977 and the content valid coefficient was from 0.637 to 0.926. The total test time for this scale was only 5 to 10min, which had a reference value for the evaluation of the fall efficacy of the elderly with balanced or low mobility (Hao and Liu, 2007).

The assessment scale for the risks factors of falls

Morse Fall Scale (MFS) was recognized as the standard quoted tool to specially evaluate the risks of falls of the hospitalized patients (Chow *et al*, 2007). MFS (CMFS) in Chinese version was a kind of evaluation scale with multi stage estimations for the test of falling risk. The core contents of MFS consisted of six items: histories of falls, other diagnosis, walking aid, intravenous injection treatment/immobilization for heparin, gait and mental states. Each item was set up 0 to 25 points. The scoring methods of the scale: 6 core items of the scale were given corresponding scores according to the classification level that had been proved by experiments, the total scores referred to the aggregate scores of all the items. The total scores of 0 to 24 meant that patients had no risks of falls; 25 to 44 points meant that patients had low risks of falls; above 45 points meant that the patients had high risks of falls (Tang *et al.*, 2010).

The measurements for the balance functions and gait

The Berg Balance Scale (BBS) and Tinetti Gait Analysis (TGA) were adopted to measure the balance functions and gait of patients. There were a total of 14 items in Berg Balance Scale. Each item was set up with 0 to 4 points and the total points were from 0 to 56 points. Patients with total points of less than 20 meant that the balance functions were poor; The higher the score, the stronger the ability to balance. There were 8 items in TGA scale in total. Each item was set up with 0 to 2 points and the total scores were from 0 to 12 points. The higher the score, the more normal of the gait.

STATISTICAL ANALYSIS

The SPSS 13.0 statistical analysis software was used in the collected information for descriptive statistics, variance analysis, Pearson correlation coefficient analysis, Logistic multiple regression analysis and other statistical processing.

Table 1: Comparison of the fall efficiency between the research objects

Projects		n	X±s	t or F value	P value
Sex	M	80	118.48±31.28	4.240	<0.001
	F	33	89.00±38.71		
Age(years old)	60~69	56	105.93±40.50	0.702	0.498
	70~79	43	114.53±31.06		
	≥80	14	111.29±31.60		
Degrees of education	Equal to or above the junior high school	61	103.79±39.96	2.757	0.068
	Senior high school	23	124.04±17.76		
	Equal to or above the junior college	29	111.41±35.77		
Course of disease (months)	<6	74	121.46±23.21	5.234	<0.001
	≥6	39	87.87±45.13		
Presence of operation	Yes	49	108.35±37.31	-0.391	0.697
	No	64	111.03±35.31		
Presence of fall	Yes	39	86.95±36.51	-5.513	<0.001
	No	74	121.95±29.52		
Fall times	1 time	22	91.91±40.24	0.964	0.341
	≥2 times	17	80.53±31.04		
Fall risks	Zero risk	34	127.18±22.07	7.498	0.001
	Low risk	42	108.10±40.97		
	High risk	37	95.97±34.63		

Table 2: Analysis on the relative factors of the fall efficiency of the research objects

Projects	Pearso's r value	P value
Myodynamia of left upper extremity	0.141	0.136
Myodynamia of right upper extremity	0.326	<0.001
Myodynamia of left lower extremity	0.234	0.013
Myodynamia of right lower extremity	0.129	0.175
Sense of left upper extremities	0.269	0.004
Sense of right upper extremities	0.141	0.137
Sense of left lower extremities	0.210	0.025
Sense of right lower extremities	0.169	0.173
Equilibrium functions of Berg	0.844	<0.001
Gait of TGA	0.809	<0.001

Table 3: Regression analysis of Logistic on the fall efficiency of research objects

Factors	Parameter estimation	Wald value	P value	OR value	95%CI
Constant terms	8.165	2.361	0.001	0.773	5.594~10.824
Myodynamia of right upper extremity	0.585	0.170	0.001	0.228	0.248~0.922
Berg balance scale	0.162	0.021	0.000	0.732	0.121~0.202
TGA	0.345	0.079	0.000	0.392	0.189~0.502

Annotation: R=0.893, R²=0.797

RESULTS

The overall fall efficiency and other indexes of geriatric patients with cerebrovascular diseases

The results of this research showed that the fall efficiency of geriatric patients with cerebrovascular diseases reached 1.79 to 10.00 points and the average values were 7.85±2.57 points, which belonged to the middle level. Among which, 36 cases had got full mark of 10 points, which accounted for 31.6%. The lowest points items were

“walking up and down stairs” and “taking public transport means”, and the points of them were (6.91±3.44) points and (6.99±3.88) points respectively; The highest points items were “stretching out the hand to the box or the drawer for taking something” and “sitting up and down to the chair”, and the points of them were (9.12±1.68) points and (9.10±1.62) points respectively. The results of research showed that the average scores of the risks of falls in patients was 35.18±22.42 points. The overall level of patients was in low risks of falls. Among them, 34

cases (30.1%) had no risks of falls; 42 cases (37.2%) had low risks of falls; 37 cases (32.7%) had high risks of falls. The average points of Berg balance functions in patients were 47.86 ± 11.67 points, and the average scores of TGA in patients were 9.50 ± 2.92 points.

Comparison between fall efficiency of geriatric patients with cerebrovascular diseases

The results of *t* test of the independent samples and the one-way analysis of variance revealed that the scores of fall efficiency in male patients were higher than that in female patients. Compared with the patients which courses of diseases was less than 6 months, these patients whose courses of diseases was more than 6 months got higher scores of fall efficiency; Compared with the patients with histories of falls, patients without histories of falls got higher scores of fall efficiency; Compared with patients with low or high risks of falls, patients without risks of falls got higher scores of fall efficiency; all the differences had statistical significance ($P < 0.05$) (See in table 1).

Relative factors analysis on the fall efficiency of geriatric patients with cerebrovascular diseases

The correlation coefficient test results showed that the myodynamia of right upper limb, myodynamia of left lower limb, sense of left extremities, balance functions and gait were all obviously correlated to the fall efficiency ($P < 0.05$) (See in table 2).

Multi-factor regression analysis on the fall efficiency of geriatric patients with cerebrovascular diseases

The scores of fall efficiency were regarded as the dependent variables, and the sexes, courses of disease, histories of falls, degrees of risks of falls, the myodynamia of right upper limb, myodynamia of left lower limb, sense of left upper extremity, sense of right lower extremity, Berg balance functions and grades of gait and other factors were regarded as the independent variables to proceed the regression analysis of Logistic. The *P* value of the introduced variables was set as 0.05; the *P* value of eliminated variables was set as 0.10; and the three variables, the myodynamia of right upper limb, Berg balance functions and gait concluded by the regression analysis of Logistic were put into the regression equation. The overall explanation ratio was 79.7% (See in table 3).

DISCUSSION

The fall efficiency of the hospitalized geriatric patients with cerebrovascular diseases was in the middle level.

The results of this research revealed that the hospitalized geriatric patients with cerebrovascular diseases who had low and high risks of falls accounted for 69.6%, which was similar to the research results of Junhong Zhang that 65.7% hospitalized geriatric patients were in middle risks

of falls and 16.2% patients were in high risks of falls (Zhang *et al.*, 2011). And the results indicated that most of the hospitalized geriatric patients, especially the patients with cerebrovascular diseases, had risks of falls. The research results also revealed that the fall efficiency of geriatric patients with cerebrovascular diseases was in middle level and only 31.6% patients had got 10 points of fall efficiency, which indicated that the geriatric patients with cerebrovascular diseases who had risks of falls were in lack of confidence in preventing falls.

The research results showed that the fall efficiency of female was lower than that of male, which was similar to the research results of Wenjuan Zhu (Zhu and Hao, 2010). Although the above-mentioned demography characteristic was an unchangeable factor to preventing falls, it could still remind nurses that it was not only necessary to help female patients to establish confidence of preventing falls, but also necessary to prevent the occurring of incidental falls of male patients caused by blind self-confidence during the process of caring for the geriatric patients. At the same time, the impact of falls on the geriatric patients might be sustained for a long time, causing them dismal, impatience, anxiety and declining of self-confidence and other negative emotions (Yu *et al.*, 2006; Yang and YangY., 2008). This research also had such situation that the fall efficiency of patients with fall histories was lower. Those patients were always afraid of doing activities due to the fear of falling once again, resulting in a decline in their physical activities, thus resulting the further declining of physical balance abilities and self-confidence. On the contrary, the risks of falls increased.

Multiple factors jointly influenced on the fall efficiency of geriatric patients with cerebrovascular diseases.

The results of multi-factor regression analysis revealed that the fall efficiency of patients with weak myodynamia of right upper limb, poor balance function and reeling gait was low. There are 3 factors that affect the fall efficacy in patients with cerebrovascular disease: myodynamia of right upper limb, Berg balance functions and gait. The research results of Ashburn indicated that among the prediction results of multiple regression analysis for risk factors of falls in stroke patients within 6 months after discharging from hospital. The two high risk factors, namely, inpatient fall tendency and upper limb dysfunction were the main factors influencing the fall of patients after discharge. In other words, fall tendency and upper limb function might lead to the occurrence of falls in patients after discharge (Ashburn *et al.*, 2008). Similar results occurred in this research that the myodynamia of right upper limb had influence on the fall efficiency of patients. The reason might be that due to 78.2% patients were right-handers, thus their first response usually was to use their right upper limb to prevent the risks when a sudden danger occurred (Kong and Liu, 2009). The right upper limb played a supporting and protective role in

preventing the body from falling down. Therefore, it was easy to understand that the myodynamia of right upper limb had influence on the self-confidence of patients to prevent falls, namely the fall efficiency.

Poor balance abilities and reeling gaits were also the main reasons for the fall of patients. The balance abilities and gaits would directly have an influence on the fall efficiency of patients (Zhou and Li, 2007). 130 risk factors for falls occurred among 38 pieces of research articles about elderly falls in the community, for instance, ages, eyesight, balance abilities, strength of lower limbs, gaits, daily living abilities, cognitive defects and environmental factors and so on (Zhou and Li, 2007). However, the decline of the dynamic balance ability and fall history are the two major factors which caused the old people to fall down many times. Those above-mentioned factors directly foreboded the occurrence of falls of patients (Li *et al.*, 2007). Some researches also indicated that the decline in the balance of activity was the determinant of the fall in the patient (Pang and Eng, 2008). Therefore, the factors that affected the efficacy of fall could predict the occurrence of falls to a great extent. However, among these research results, some conclusions were inconsistent with above-mentioned results. For instance, no falls and only a fall occurred in patients with chronic stroke; The occurrence of multiple falls might have nothing to do with the patient's ability to balance and activity, and might be related to the reaction of the balance in the exercise process or the interaction with the environment (Harris *et al.*, 2005). In addition, some researches also indicated that falls were most likely to occur in those patients who stood up from the chair and could not independently stand, the lowest incidence of falls were those patients who not only could not stand up from chair by themselves but also could not independently stand up (Lord *et al.*, 2003). Therefore, the above-mentioned issues warned the medical workers that except for those patients with poor static balance abilities and gaits, more attentions should be paid to those patients who were easily to lose their balance when doing activities.

Enlightenment for prevention of falls of the elderly patients with cerebrovascular diseases

Enhancing the psychological counseling for the elderly patients with low fall efficiency

In practical work, we should strengthen the psychological counseling of the prevention of falls in elderly patients with cerebrovascular disease, especially for those patients with low fall efficiency. For instance, female patients, patients with long-term courses of disease, patients with histories of falls and patients with high risks of falls. Early identification, early education, and early intervening measures were very useful to help them overcome the fear of falling from the psychological. To spread widely in hospitals and communities, and to give full play to the support functions of families and society systems to

relieve the psychological burdens of patients (Wang, 2006), which mainly embodied in strengthening the consciousness in preventing falls of patients and caregivers. Due to the poor fall prevention knowledge of the accompanied staff of patients with cerebrovascular diseases, medical workers should pay more attention to the educational needs for the prevention of falls to accompanied staffs, and then targeted propaganda and education were necessary (Guo *et al.*, 2011). At the same time, more work should be done to accelerate the formation of positive attitude to prevent falls of patients and caregivers, to correct misconducts and promote the formation of fine conduct to prevent falls (Guo *et al.*, 2011).

Enhancing the skill training of preventing falls for patients with low fall efficiency

These present research results showed that patients with weak myodynamia of right upper limb, poor balance abilities and reeling gaits had a lower fall efficiency. Medical workers should not only strengthen the recognition and warning function, but also pay more attention to the training of balance functions and cultivation of activity ability. For patients with poor right upper extremity function, they should be trained on how to use the flexible function of the body so as to prevent falls in emergency situations. Patients with poor balance ability and unstable gait should strive to enhance their balance function and gait training, and improve the ability and confidence of patients to prevent falls. What needs to be reminded was that in the clinical nursing work, the medical workers should not only pay attention to those patients with low fall efficiency, but also could not relax vigilance to those patients with higher fall efficiency. Most falls happened inadvertently or negligence in patients during their hospitalization. Such falls were usually irrelevant with patients' physical condition, static balance or gaits of patients, but related to emotions, barriers and adjustment for the balance during movement (Harris *et al.*, 2005). Therefore, with regard to the high risk groups of elderly patients with cerebrovascular diseases, it was not worthy to decrease the patients' self-confidence in preventing falls due to inordinate cautions. At the same time, it was not worthy to decrease the vigilance of falls due to the blind self-confidence of patients.

CONCLUSION

In order to help patients with cerebrovascular diseases to establish their self-confidence in the prevention of falls, medical workers need to take further psychological counseling for the patients and improve the self-confidence of them in the prevention of falls on the basis of improving the balance abilities and gaits of patients. However, something should be reminded that people cannot blindly improve the fall efficiency and take it as the ultimate goal. Because blindly improving patients' fall efficiency

may also increase the risks of falls from a certain point of view. Therefore, only appropriate and targeted measures should be taken to improve the fall efficiency of patients, which can indeed effectively prevent the occurrence of falls. Further discussion and researches are necessary with regard to how to take effective measures to improve the fall efficiency of patients and decrease the risks of falls.

REFERENCES

- Ashburn A, Hyndman D, Pickering R, Yardley L and Harris S (2008). Predicting people with stroke at risk of falls. *Age Aging*, **37**(3): 270-276.
- Chen J, Shi FY and Li ZP (2004). The fall factors of brain stroke patients. *Chinese Journal of Clinical Rehabilitation*, **8**(7): 132.
- Chow SK, Lai CK, Wong TK, Suen LK, Kong SK, Chan CK and Wong IY (2007). Evaluation of the Morse FallScale: Applicability in Chinese hospital populations. *Int. J. Nurs. Stud*, **44**(4): 556-565.
- Guo H, Tian J and Wan QQ (2011). Fall-prevention knowledge, attitude and practice among attendants of hospitalized elderly patients with cerebrovascular diseases. *Chinese Journal of Nursing*, **46**(3): 270-272.
- Hao YP and Liu XP (2007). Research of application of the modified fall efficacy scale of Chinese version in the aged in China. *Chinese Journal of Nursing*, **42**(1): 19-21.
- Harris JE, Eng JJ, Marigold DS, Tokuno CD and Louis CL (2005). Relationship of balance and mobility to fall incidence in people with chronic stroke. *Phys. Ther.*, **85**(2): 150-158.
- Kong YN and Liu W (2009). Analysis on the left and right handedness of children of 3 to 5 years old. *China Modern Medicine*, **16**(14): 157.
- Lai Q, Zhang M and Chen D (2009). The fall risk factors and nursing of the elderly inpatients with cerebrovascular diseases. *Prevention and Treatment of Cardio-Cerebral-Vascular Disease*, **9**(1): 77-78.
- Li LT, Wang SY and Jing CX (2007). Investigation on risk factors of multiple falls in elderly people. *Chinese Journal of Disease Control & Prevention*, **11**(3): 281.
- Lord SR, March LM, Cameron ID, Cumming RG and Schwarz J (2003). Differing risk factors for falls in nursing home and intermediate-care residents who can and cannot stand unaided. *JAGS*, **51**(11): 1645-1650.
- Pang MY and Eng JJ (2008). Fall-related self-efficacy, not balance and mobility Performance, is related to accidental falls in chronic stroke survivors with low bone mineral density. *Osteoporos. Int.*, **19**(7): 919-927.
- Tang W, Gan XN, Liu ZH and Huang Y (2010). Feasibility of the chine sized morse fall scale in clinical nursing. *Journal of China Medical University*, **39**(11): 943-946.
- Wang ZQ (2006). Analysis of causes on falls of the elderly patients and nursing strategies. *Journal of Nursing*, **13**(8): 46-47.
- Yang JP and Yang Y (2008). Analysis and investigation on the incidence of falls in university-community dwelling older population in Yichuan. *Modern Preventive Medicine*, **35**(18): 3536-3537.
- Yu PL, Tan ZH, Wu D, Yao YH and Wu ZL (2006). Incidence of falls in a community-dwelling elder population in Beijing. *Chinese Journal of Geriatrics*, **25**(4): 305-308.
- Zhang JH, Su TJ, Wang HJ and Yang XH (2011). Correlation between fall risk and psychological efficiency in elderly inpatients. *Journal of Nursing*, **18**(5A): 30-32.
- Zhou DD and Li YH (2007). Risk factors of falls in community-dwelling elder persons-A systematic review. *Journal of Environmental & Occupational Medicine*, **24**(1): 87-91.
- Zhou JG and Li TJ (2008). Research on assessment methods and measuring scale of fall risks of the elderly patients. *Journal of Nursing*, **15**(12): 11-13.
- Zhu WJ and Hao YP (2010). Analysis on the states of fall efficiency and influence factors of the community elderly. *Modern Preventive Medicine*, **37**(16): 3065-3068.