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Stratify, Hendrich II fall risk model and Morse fall scale used in predicting the risk of falling for elderly in-patients.

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Abstract

Objective: To explore the sensibility and specificity of StratifyHendrich II Fall Risk Model and Morse Fall Scale in predicting the risk of falling for the elderly in-patients, as well as the correlation among these three rating scales.

Methods: Two testers trained applied three rating scales, including Stratify, Hendrich II Fall Risk Model and Morse Fall Scale, to assess the risk of fall for 200 elderly in-patients in our hospital at same time. According to the history of fall in recent one year, these patients were divided into fall group and non-fall group, 100 patients a group. The independent sample t test was used to analyze discriminant validity of Stratify, Hendrich II Fall Risk Model and Morse Fall Scale, and the Spearman rank correlation coefficient was adopted to analyze their correlativity.

Results: There was statistical significance in the score differences of the three rating scales for both groups (P<0.05). And the correlativity among the rating scales was 0.680~0.888.

Conclusion: Stratify, Hendrich II Fall Risk Model and Morse Fall Scale have higher sensibility and specificity in predicting the fall risk of patients, and high correlativity, but various emphasis points. Therefore, clinically nurses should adopt them based on the features and requirements of the elderly patients.

Keywords: Stratify, Hendrich II fall risk model, Morse fall scale, Fall.

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Background

With the coming of population-aging, the aging population increases. The elderly has high risk in fall, and almost half of the elder people who are over 60 years old have falling experience. Nearly 5% of them after fall have fracture, about 5%~11% of fall result in severe injury, and fall is a main cause of death in the elderly [1].

Medical fees for the injury due to fall in the elderly over 60 are approximately 6% of their whole medical expenditure, so the fall issue is becoming important increasingly in the health of the elderly [2]. Preventing fall is the key to decrease osteoporotic fracture and other relevant impairments in the elderly, and to identify and evaluate the fall risk of them is an antecedent to prevent and interfere it effectively.

At present, there are few rating scales which is used to predict the fall risk specially, reported in China, so this study applies Stratify, Hendrich II Fall Risk Model, and Morse Fall Scale, which are commonly used in clinical, to estimate the fall risk of the elderly patients, explores their discriminant validity and correlativity, and provides objective basis for clinical nurses in preventing the elderly patients fall.

Objects and Methods

Objects

From October to December, 2014, a total of 200 elderly in-patients in the affiliated hospital of Qingdao university were selected. Among them, 100 patients who were 67~91 years old (average 82.7 ± 9.7), with the history of falling in last one year, were enrolled into the fall group, 57 male, 43 female; there were 57 patients with cardiovascular diseases, 22 neurological diseases, 17 diabetes, 2 respiratory diseases, 1 digestive system diseases, and 1 osteoarthrosis. The other 100 patients who were 65~90 years old (average 79.5 ± 6.7), without history of falling in the last one year, were divided into the non-fall group, 55 male, 45 female; Among them, there were 54 patients with cardiovascular diseases, 22 neurological diseases, 14 diabetes, 6 respiratory diseases, 2 digestive system diseases, and 2 osteoarthrosis. Patients were eligible for the study if they were over 60 years old and had no consciousness disorders, and if they could walk by themselves or assistive devices, and if they had no severe physiological defect or organic diseases and understanding or communication disorders. In addition, all of they gave written informed consent. However, those patients were not eligible for the study if they were aged ≤ 60 years; if they had consciousness disorders and couldn't walk by assistive devices, and if they had severe physiological defect or organic diseases and understanding or communication disorders. Besides, those didn't give written informed consent. The patients in both groups had no statistic difference in sex, age and underlying diseases (P>0.05), so they could be compared (Table 1).

Table 1. *Comparison the common clinical symptoms of both groups.*

	Fall group (n=100)	**Non-fall group (n=100)**
Age (years)	82.7 ± 9.7	74.5 ± 6.5
Male/female	57/43	55/45
Underlying diseases		
Cardiovascular diseases [n (%)]	57	54
Neurological diseases [n (%)]	22	22
Diabetes [n (%)]	17	14
Respiratory diseases [n (%)]	2	6
Digestive system diseases [n (%)]	1	2
Osteoarthrosis [n (%)]	1	2

Rating scales

Stratify: It was built by Oliver and his team in 1997, which includes five items, such as unconsciousness/restlessness; gait instability; having history of falling; frequent urination and defection; poor vision affected the life. And the patient who has two risk factors of fall mentioned above belongs to the high risk group of falling.

Hendrich II fall risk model: It was enacted in 2003 by Ann Hendrich and his team, which includes three items, such as confusion/disorientation/behavior impulsivity; depressive state; dizziness and vertigo; male; taking antiepileptic drugs; taking benzodiazepines. If the total score of the scale is ≥ 5, the patients can be identified into the high risk group of falling.

MFS: It was developed by Morse, the professor of university of Pennsylvania, America, in 1989, which has six items in total. The items and grading standards are following: history of falling (no=0 score, yes=25 score); more than one underling diseases (no=0 score, yes=15 score); ambulatory aid (Bed rest or nurse assist=0 score, cane, crutches, or walker =15 score, furniture=30 score); IV or IV heparin (no=0 score, yes=20 score); gait (normal, bed rest, immobile=0 score, weak=10 score, disability or impaired=20 score); mental status(knows own limits=0 score, overestimates or forgets limits=15 score). The total score is 125, the higher score, the higher risk of falling.

Methods

Training for testers

In this study, both testers were registered rehabilitation therapists in rehabilitation medical department of our hospital. In order to assuring their consistency of the understanding and implementing about the items of scales and the test methods, and avoiding errors between various testers occurred in test, these two testers received unified training, 30 min before testing patients, which was to introduce the application aim and meaning of the rating scales, test methods and requirement of filling, and to discuss and analyze the divergence of rating scales application, finally, reach an agreement. After that, the test started officially.

Data collection

Firstly, all patients must write informed consent. Then, test method evaluated by other people was adopted, meanwhile, the patients were estimated with the Stratify, Hendrich II Fall Risk Model, and Morse Fall Scale successively. Some test content of Stratify and MFS, such as history of falling and over one underling diseases, need be recalled by patients. In order to avoid mistakes caused by poor memory or cognition of the elderly people, their family members were allowed to answer questions. When testing, the patients were permitted to use ambulatory aids, such as cane and walking aids, but no help from other people.

Statistical analysis

The data was processed using statistical analysis software SPSS23.0 IBM. The discrimination validity of Stratify, Hendrich II Fall Risk Model and Morse Fall Scale were analyzed with the independent sample t test. And the correlativity of the risk of falling in the patients which were evaluated by the three rating scales were tested by the

Spearman rank correlation coefficients. The statistical significance was defined as P<0.05.

Results

The score of Stratify in fall group was higher than non-fall group, there was statistic difference (P<0.05), and the score of Hendrich II Fall Risk Model in fall group also was over the other group, there was significant difference (P<0.01). What's more, the score of MFS in fall group was higher than non-fall group with a statistical significance (P<0.01) (Table 2).

Table 2. *Comparison of the score of Stratify, Hendrich II Fall Risk Model and Morse Fall Scale of two groups (score, x ± S).*

Groups	Cases	Stratify	Hendrich II Fall Risk Model	Morse Fall Scale
Fall group	100	5.05 ± 1.00*	7.50 ± 1.40*	67.5 ± 14.40**
Non-fall group	100	2.07 ± 1.02	4.07 ± 1.02	42.87 ± 15.02

Note: compared with non-fall group,*P<0.05, **P<0.01

Furthermore, 200 patients were evaluated with these three rating scales at the same moment, the correlation analysis about the score indicated that Stratify had highly positive correlation with Hendrich II Fall Risk Model, but also MFS. And Hendrich II Fall Risk Model and MFS also showed highly positive correlation, P<0.01 (Table 3).

Table 3. *Comparison of the score of Stratify, Hendrich II Fall Risk Model and Morse Fall Scale (score, x ± S).*

Rating scales	MFS	Hendrich II Fall Risk Model
Stratify	0.686	0.888
MFS	-	0.680

Discussion

A fall refers to a falling down on the ground or on a lower level without intention, but does not include those caused by violence, loss of consciousness, hemiplegia, or seizure. With the aging trend of the social population, fall has become an important issue, which seriously affects the health of the elderly, and its incidence in the world has a higher proportion. Fall can affect the health and live quality of the elderly severely, in which nearly half may result in serious injury, including brain trauma, fracture and other physical injury and anxiety, fear and other psychological damage. The evaluation for fall risk factors is essential to prevent falls. A number of studies at home and abroad [3,4] show that, assessing the risk factors related to falls as well as formulating and implementing the preventive measures can play a positive role in preventing falls in the elderly. At present, many scholars of domestic and overseas devote themselves to the exploitation of fall assessment tools, and have developed various tools to assess the risk factors of the elderly fall. Overseas researchers achieve their objective evaluation of the risk of falling through the development of scale generally, according to the characteristics of different populations, they made a variety of assessment rating scales which fit different test objects and focus, such as emergency patients, outpatients, inpatients, patients in nursing institute, community population, and elderly population. There are dozens of fall related assessment tools, but lack of reliability and validity of studies, so they cannot be generalized. Now there are over ten scales used for the evaluation of fall risk in the elderly, among them, about Stratify, Hendrich II Fall Risk Model and Morse Fall Scale, there are more and more mature researches [5]. Even though many scholars tried to develop various fall risk assessment tools for different people, none of them with a recognized reliability and validity and better predictive ability is suitable for all types of people [6]. Due to the test content of Stratify, including unconsciousness/ restlessness; gait instability; having history of falling; frequent urination and defection; poor vision affected the life, so it can be used to observe the balance ability of the subjects, but also their consciousness and vision. Therefore, foreign experts suggest that Stratify can be regarded as a simple testing method for basic movement ability of elderly population [7,8]. And its sensibility and specificity reach 87% in the identification of falls population. Stratify is applied for the elderly patients in this study, with a better discrimination validity between the fall patients and non-fall patients, it can assess the fall risk of patients effectively. However, due to its fall risk factors of assessment, such as consciousness, gait, history of falling and vision, it is recommended to be selected for the assessment of the elderly population who are older and frail, and have unstable gait and poor vision. In addition, this scale is simple which consumes less time, so nurse can use it to screen the patients on admission, implementing the preventive measures for falling timely.

MFS has been translated into a variety of languages, and is widely used in medical institutions in the United States, Canada, Sweden, Australia and other countries [9]. In foreign literature, the predictive sensitivity of MFS in different countries is 72%~83% [10]. But there are few reports about the studies of MFS in Chinese elderly population. This study shows that there is good discriminant validity of the use of MFS in Chinese elderly patients, and there is a significant difference in the scores of MFS between the fall group and non-fall group (P<0.01). So it can help to distinguish the high risk group in the elderly patients. The fall risk factors of MFS assessment include history of falling, several diseases, gait, and frequency of micturition, urgency of urination, cognitive

impairment or over confidence when receiving intravenous infusion, so this scale is used to evaluate the elderly in-patients properly.

Hendrich Fall Risk Model was first used to assess the balance function of the elderly patients with stroke [11,12]. Falls can be caused by external factors, such as environment, clothing and nurses, and internal factors, which include the body degeneration of the elderly resulted from the age, especially the decline of balance function due to dysfunction of vision, vestibular function and proprioception, the patients may fall down with body imbalance [13]. According to reports, the 60 year old is the watershed of balance ability, after 60 years, the balance ability reduces 16% every 10 years [14,15]. Therefore, Hendrich II Fall Risk Model has been the most effective tool for the assessment of the elderly fall. In this study, Hendrich II Fall Risk Model is used to test the balance function of the fall group and non-fall group, and there is statistic difference ($P<0.01$), which indicates that Hendrich II Fall Risk Model has higher sensibility and discrimination validity in the assessment of fall risk of the patients.

The results shows that StratifyHendrich II Fall Risk Model and Morse Fall Scale have close correlation in the assessment of fall risk of the elderly patients, which indicates that the three scales have better consistency in the possibility of evaluating the occurrence of falling. What's more, they have higher sensibility and specialty in evaluating the fall risk of patients, but their emphasis points are difference, so in clinic, the nurses should adopt them based on the characteristics and necessity of the elderly patients own.

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