

Research Article

Inpatient Falls in a Hospital Rehabilitation Department

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OPEN ACCESS**Abstract**

Background: A Rehabilitation program encourages mobility, which may create a risky environment. Identifying high-risk inpatients prone to fall is a major component of prevention programs.

Objectives: To study the various circumstances which lead to patient falls in rehabilitation department.

Material and methods: Eighty fall cases, 38 men and 17 women, registered between 2008 and 2012. Group 1 (participants) included 41 patients who fell once and group 2 (control) included 14 patients who fell twice or more. All patients needed rehabilitation and hospital stay after the acute phase. The nursing staff was required to report all falls occurring in the hospital. The data examined were: the illness or injury for which the patients were hospitalized for rehabilitation; hour of day the fall occurred; existence of illness or previous injury which may have influenced the occurrence of the fall; the action which caused the fall; location in the hospital where the fall occurred; the injury caused by the fall, if any.

Results: All the patients who fell more than once had cerebral lesion (Fisher's exact test, $p=0.004$ 2-sided). In patients of group 1, the event usually occurred when transferring from one place to another (Chi Square Test, $p=0.038$ 1-sided), and at group 2, the event mainly occurred due to slipping while walking or standing (Chi Square Test, $p=0.005$ 2-sided).

Conclusions: Falls were most frequent in stroke patients. Fall during transfer was more frequent among patients who fell once. Slipping while walking or standing happened more among the patients who fell twice or more.

Keywords

- Fall events
- Rehabilitation department
- Risk factors

INTRODUCTION

Falls in the Rehabilitation Department are common and pose a significant problem for both the person who falls and the health care system. Falls can lead to pain, soft tissue injury, bone fracture, and even brain damage [1]. Participation in rehabilitation programs regularly encourages mobility, which may create a risky environment. It therefore seems urgent to find ways to prevent falling, especially among individuals prone to repeated falls. Identifying high-risk inpatients is a major component of prevention programs, and fall risk factors in different populations of patients have already been studied to some extent [2-4]. The cumulative effect of multiple risk factors would contribute more to the tendency of falls than would the potential effect of each factor alone. Falls may cause further restriction in mobility, which may negatively influence participation in a physiotherapy program.

Patients with cerebral lesion after stroke or other brain injury who undergo rehabilitation often suffer from a variety of cognitive and physical deficits, placing them at high risk of falling. Confusion, unsafe gait, and wheelchair confinement were significant risk factors for falls in stroke patients hospitalized

for rehabilitation [4]. Fallers also presented with symptoms of visuo-spatial hemi neglect and dyspraxia that may contribute to their instability. Saverino et al. [5], recorded 40 falls in 32 patients hospitalized in a rehabilitation center. 'Intrinsic falls' due to sensory-motor and cognitive impairment occurred in 35% of cases, and extrinsic falls caused by environmental factors, in 12.5% of them. 'Extrinsic reasons' may include falls that occurred during transfers, or from sitting in a wheelchair or on some other kind of furniture [6].

Falls are common events among hospital inpatients [7] and constitute a major health problem in the rehabilitation setting. The rehabilitation department represents a particular situation where the aim of admission is to restore function and independence. An evaluation of fall risk may be a very useful aid to planning the level of restoring functional autonomy. Wong et al. [8], found that falls experienced during inpatient stroke rehabilitation may have contributed to a longer length of stay in the hospital.

The objectives of the present retrospective study were to identify and analyze characteristics of patients who fall during their rehabilitation period: the illness or injury for which they

were hospitalized in the Rehabilitation Department, the time, the place and the circumstances of their falls, and the factors contributing to patient falls, and then, to evaluate the extent of injuries resulting from inpatient falls.

MATERIAL AND METHODS

Study design

The research was performed at a 24-bed Rehabilitation Department in a tertiary medical center. The patients described in this retrospective study were consecutively admitted to the Rehabilitation Department, and subsequently experienced a fall accident. The survey was done over a period of 5 years, between 2008 and 2012. All patients needed further rehabilitation and hospital stay after the acute phase. The patients were admitted after selection from acute care departments, usually several days to two weeks following onset of the medical condition or after surgery. They were documented from the time of admission to the Rehabilitation Department until discharge and the medical records offered detailed information on patients' medical history.

Sample

All the patients included in the research were recovered in our 24-bed Rehabilitation Department after brain lesion, spinal disorders with neurological deficit, lower limb amputation, and lower limb fractures. In the nursing forms 80 falls were registered in 55 patients (38 men and 17 women) during the period studied. The mean age of the patients involved was 62.9+9.7 years. Group 1 (called "participants") included 41 patients who fell once (mean age 63.2+10.4) and group 2 (called "control") included 14 patients who fell twice or more (maximum 6 falls) (mean age 62.3+7.9). Among the 55 patients who suffered falls, 33 were hospitalized due to cerebral, brainstem or cerebellar lesion (infarction or hemorrhage), 31 from vascular origin and 2 after removal of cerebral tumor. Nine patients were after orthopedic operation, 8 after lower limb amputation, and the remaining 5 with paraparesis due to spinal disorders. In 58 of the 80 fall incidents (72.5%) patients with cerebral lesion were involved. No one of the fall events was excluded from the research.

Measuring instruments

A fall was defined as an event, documented in an incidence report, whereby there was displacement of the body to a level of knee height or lower through an uncontrolled, involuntary action [9]. The nursing staff is required by hospital policy to report all falls occurring in the hospital. All incident reports completed by the nursing staff were reviewed and the following data were extracted. We compared the safety risk assessment made by the nurses of the fall occurrence. Each fall that occurred in the department was recorded systematically by the staff on a structured form including questions about when, how and why the patient fell. Questions about the time, place and circumstances when the fall occurred, and any injuries or other consequences of the fall provided useful information [9,10]

The various data examined were: the illness or injury for which the patients were hospitalized in the Rehabilitation Department; hour of day the fall occurred; existence of illness or previous injury which may have influenced the occurrence of

the fall; the action which caused the fall; location in the hospital where the fall occurred; the injury caused by the fall, if any. As a policy in the department, safety precautions were taken for the entire group of patients in order to prevent falls. All beds and wheelchairs were equipped with brakes on their wheels. At admission, all the patients or their family members (of patients with communication disorders) were instructed on how to use their personal alarm button and the bed-side light, and how to get off the low set bed. In high-risk patients prone to fall, the bed's side-rails were kept raised.

Statistical analysis

Qualitative data were presented by frequencies and percentages. Quantitative data were described by means \pm standard deviation.

Comparison of qualitative data between the groups was examined by Chi-square test or Fisher's exact test. P value \leq 0.05 will be considered as a significant value.

RESULTS

Fifty-two fall events (65%) occurred during the morning and the afternoon, 27 (33.8%) during the evening and the night. In one patient, the hour of fall was not registered.

Fifty-two fall events (65%) occurred in the patient's room, 15 in the bathroom/restroom, 5 in the Rehabilitation Department corridors, another 5 in the physiotherapy institute and 3 in the dining room or outside the department walls.

Peak frequencies of 44 falls (55%) were recorded during transfers, 16 falls occurred due to sliding, 5 falls happened after the patients climbed over the bedside, and 3 patients were found on the floor so that the exact reason for fall was unknown. Another 12 falls occurred from different reasons as tackling an object, bending, sliding from wheelchair, capsizing with wheelchair, going down stairs, etc.

There is a correlation between the number of fallers and the reason for hospitalization in the rehabilitation department. The patients of group 1 were hospitalized after cerebral, brainstem or cerebellar lesion, amputation of a lower limb, fractured lower limb or spinal disorder as opposed to patients of group 2 who all suffered from cerebral, brainstem or cerebellar lesion (Fischer's Exact Test, $p=0.004$ 2-sided) (Table 1). In patients of group 1, the event usually occurred when transferring from one place to another (Chi Square Test, $p=0.038$ 1-sided) (Table 2). In patients of group 2, the event mainly occurred due to slipping while walking or standing (Chi Square Test, $p=0.005$ 2-sided) (Table 3).

The existence of previous neurological, oncological or psychiatric disorders, old fractures in the lower limbs, vision impairment or other severe systemic disease, had no significant influence on the number of falls.

Among participants reporting injury after fall in group 1 ($n=16$) and in group 2 ($n=7$), only one (in group 2) had brain contusion. All the other injuries were very mild: the lower limb was involved 10 times, once together with the back, the head 6 times, the upper limb 4 times, the buttocks once and a lower limb stump once.

Table 1: There is a correlation between the number of fallers and the reason for recovery in the rehabilitation department (Fisher's exact test, $p=0.004$ 2-sided).

		Reason of rehabilitation				Total
		Brain	Orthopedic	Amputation	Spinal	
One fall	No. of fallers	19	9	8	5	41
	% of fallers	46.3%	22.0%	19.5%	12.2%	100.0%
Two falls or more	No. of fallers	14	0	0	0	14
	% of fallers	100%	0%	0%	0%	100.0%
Total	No. of fallers	33	9	8	5	55
	% of fallers	60.0%	16.4%	14.5%	9.1%	100.0%

Table 2: Patients who fell only once, did it mostly during transfer, in confront to patients who fell twice or more (Chi Square Test, $p=0.038$ 1-sided).

		Transfer		Total
		No	Yes	
One fall	No. of fallers	14	27	41
	%	34.1%	65.9%	100.0%
Two falls or more	No. of fallers	22	17	39
	%	56.4%	43.6%	100.0%
Total no. of falls	No. of falls	36	44	80
	%	45.0%	55.0%	100.0%

Table 3: Patients who fell twice or more, do that by slipping while walking or standing more than those who fell only once (Chi square test, $p=0.005$ 2-sided).

		Slipping		Total
		No	Yes	
One fall	No. of falls	38	3	41
	% of falls	92.7%	7.3%	100.0%
Two falls or more	No. of falls	26	13	39
	% of falls	66.7%	33.3%	100.0%
Total	No. of falls	64	16	80
	% of falls	80.0%	20.0%	100.0%

DISCUSSION

Inpatients falls are a persistent problem in rehabilitation settings. This study suggests that many complex patient characteristics, circumstances, and activities may contribute to these falls. Some patients hospitalized for rehabilitation, attempt to perform activities unassisted by others, accounting for a large proportion of falls.

The main goal for rehabilitation is to restore patients' mobility in order to allow them to return to their previous living conditions. According the data collected by the medical staff, before last admission to the hospital, all patients were able to transfer from bed to stand-up position and to walk at least in the home.

Saverino et al. [5], who reported 40 fall events among 320 patients hospitalized for rehabilitation during 7 a month-period, found that 55% of the patients were males. Hitcho et al. [11], described a cohort of 183 patients who fell during hospitalization in various departments of a general hospital and found that the only significant difference between patients who fell repeatedly

was gender: men were more likely to experience multiple falls during the study period than women. The largest proportion of patients fell in their hospital room. Rochat et al. [12], who surveyed a cohort of 4026 patients during rehabilitation stay in the hospital, found that 11.4% of patients recovered fell once and an additional 6.3% fell several times. Compared with the non-fallers, those who fell more frequently were males. Lee et al. [13], recorded 171 falls in 140 patients admitted to a rehabilitation center and fell at least once, mostly during daytime, and in the patient's room. Those admitted for stroke or amputations were at a high risk of falls.

Our results partially confirm those that appeared in the literature. In the present research, 38 of 55 patients who fell were male. Sixty-five percent of fall events ($n=52$) occurred in daytime, 55% ($n=44$) during transfer execution, 65% ($n=52$) in the patient's room close to the bed, and only 18.8% ($n=15$), in the toilet/bathroom (a common room). Most of the fallers were recovered after cerebral stroke, brainstem or cerebellar stroke ($n=31/33$).

Sze et al. [14], who investigated the risk factors of falls among Chinese stroke in-patients during rehabilitation, found that 85% of the falls occurred in daytime and 71% close to their own bed. Tutuarima et al. [2], found that 45% of the falls occurred during the day, 51% in the patient's room and 20% during the visit to the toilet or bathroom, all in patients hospitalized after stroke. Tsur et al. [9], found that 70% of falls of stroke patients in a rehabilitation department occurred during the morning or the afternoon, and 62% took place close to the patient's bed. Most of the falls occurred indoors, most frequently in the patient's room, during transfer from sitting to standing position or back and only a minority of falls occurred in the restroom.

As described by Forrest et al. [15], patients with admission diagnosis of stroke, brain injury, amputation, spinal cord injury and other neurologic disorders, are at higher risk for fall than patients whose admission diagnosis related to orthopedic disorders. Amputations, stroke and need for transfer assistance are some of the risk factors described by Vieira et al. [16], for geriatric falls in a rehabilitation hospital setting. According to different authors [17-19], patients with stroke, cognitive disorders, or hip fracture have a particularly high risk of falling.

In our research, we discovered similar findings. Our patients recovered for rehabilitation after brain, brainstem or cerebellar lesion was prone to fall more than those who suffered from lower limb amputation, orthopedic or spinal disorders. Most of the falls occurred indoors, more frequently in the patient's room, during transfer from sitting to standing position or back and only a minority of falls occurred in the restroom. The fall event occurred more frequently during activity time, in the morning or in the afternoon. Falls were less frequent between 6 p.m. and 6 a.m., most probably because of limited activity in the Rehabilitation Department. Patients, who fell only once, did so mostly during transfer from bed to wheelchair or back, in contrast to patients who fell twice or more. Patients who fell twice or more, did so by slipping while walking or even standing, more often than those who fell only once. We found no significant difference between single and multiple fallers regarding the age of the patients.

Falls and fall-related injuries are a significant clinical issue in the older population, and many effective falls prevention strategies are available. Reduced self-awareness and underestimation of fall risk have also been identified as a potential reason why the older inpatient population takes risks that lead to falls [20]. Since the likelihood of falls increases with the number of risk factors present, prevention needs to address as many risk factors as possible and involve the whole of the multidisciplinary team. Examples of interventions are to provide education for the staff about prevention of falls and fall injuries. As is customary in most hospitals, our center has an ongoing fall-prevention program in order to reduce fall events. Interventions we take into consideration in our rehabilitation departments are [21]:

- Use of stable wheelchairs with all the devices necessary to prevent those patients prone to fall from standing up without observation or slipping from the chair.
- Check the bed stoppers, the bed sides, the alarm bells and the night lighting in the patients' room.

- Check the alarm bell and the quality of lighting in the bathroom.
- Use of warning sign when the floor is wet.
- Evacuation of superfluous furniture from the patients' room.
- Instructing the patient to use the safety rail in the bathroom/restroom.
- Instructing the family members how to transfer patients from bed to wheelchair and back.
- Identification of patients prone to fall in order to locate them as close as possible to the nurses' station.

Executive functions are cognitive abilities that allow individuals to interact with their environment in an efficient and effective manner. Tests of executive functioning provide incremental information in the prediction of inpatient falls in the rehabilitation setting [22]. It seems that among patients with comparable motor abilities, falls occur more often in those with worse cognitive functions.

Study limitations

The most important limitation of this study concerns the absence of cognitive evaluation of the orthopedic patients, the amputees, and the spine-injured patients during the rehabilitation period. Cognitive tests were done only to patients hospitalized after brain lesion, but not to the others. Additional limitation is the absence of information about previous falls that may have occurred to the same patients before their hospitalization in the rehabilitation setting. Clinical information about blood pressure, heart rate, level of blood sugar and use of medications was not included in the study. Other limitations were its small sample size, and the fact that this was a single rehabilitation department study.

CONCLUSIONS

This study, done in a rehabilitation department during hospitalization for rehabilitation treatment, included 80 fall events during five years. Falls were most frequent in stroke patients. Fall during transfer from one place to another was more frequent among patients who fell once, and slipping while walking or standing happened more among the patients who fell twice or more. The overall results suggest that fall-prevention program in order to reduce fall events during in-hospital rehabilitation is not always efficient. Attention to environmental and other modifiable risk factors is essential, as are a correct use of devices.

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