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Original Research Article

Self-reported consequences and healthcare costs of falls among elderly women

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ABSTRACT

Background and objective: Although the falls in elderly people lead to serious health consequences, the economic burden is underestimated. The aim of this study was to calculate the medical costs of fall consequences in elderly women.

Materials and methods: Women aged 65 years and older were interviewed by phone recording the consequences and healthcare procedures related to every fall sustained during the previous 12 months. The healthcare costs were estimated by calculating the sum of costs for all self-reported contacts with medical care providers: ambulance, emergency department, visits to family doctor and other specialists, hospitalisations, and rehabilitation.

Results: The study population consisted of 878 community-dwelling women (mean age 72.2 ± 4.8 years). Falls were reported by 310 (35.3%) women; one in three of them had fallen twice or more. Of all women who fell, 280 (90.3%) reported their fall resulted in an injury, and 77 (15.3%) falls led to bone fractures. Fear of falling was reported by 72.9% of women. Fall-related medical care was provided to 135 women (43.5% of those fallen), and 18 (5.8%) subjects were hospitalised, mostly for the fracture. The mean estimated healthcare cost was 254 EUR per patient receiving fall-related medical care, and 116 EUR per women fallen. The highest mean cost (1289 EUR) was estimated in falls resulted in hip fracture; the lowest (135 EUR), in nonfracture injury.

Conclusion: The data on the self-reported consequences of falls in elderly women showed a significant number of fall-related injuries and a high cost of healthcare.

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1. Introduction

Falls in the elderly is a major public health problem as they can lead to irreversible health, social, and psychological consequences, and a large economic burden. More than one-third of persons 65 years of age and older fall each year, and a half of falls are recurrent [1]. Falls are not only a risk factor for fractures but also for development of traumatic cerebral or visceral hemorrhagia, traumatic pain syndromes, functional limitations, dislocations, soft tissue injuries, excess healthcare costs, and increased mortality [2]. In the year 2000 in the USA, there was an estimated 10,300 fatal and 2.6 million nonfatal but medically treated fall-related injuries in individuals above the age of 65 years [3]. Of the fall-related injuries identified through the surveillance system in Florida, about 42% resulted in hospital admission and about 50% of fall injury events that occurred at home and required hospital admission resulted in a person being discharged to a nursing home [4].

As the population of elderly people is growing fall-related injuries affect a substantial number of older adults. It is likely that the overall numbers and costs of fall-related injury hospitalizations will continue to rise [5]. Several studies have been performed in different countries estimating the economic burden of falls [6–13]. It is difficult to compare the costs between countries due to differences in populations investigated, study methods, and expenses of medical care [14], but the magnitude of economic burden was demonstrated to be significant in all these publications. In Lithuania, research has been conducted investigating fall incidence, circumstances [15,16], and hospital costs of hip fractures [17], but the costs of fall-related injuries have not yet been estimated.

The aim of this study was to analyze the consequences of falls and to estimate fall-related health care costs in elderly women.

2. Materials and methods

2.1. Sample

The participants of this cross-sectional study were community-dwelling ambulatory women aged 65 years and older who during a period of 6 months consecutively visited the out-patient clinic National Osteoporosis Centre (Vilnius, Lithuania) for either a consultation with a geriatrist or for bone mineral density measurement. Demographic data, address and phone number were collected from patient records, and a phone interview was conducted by a specially trained interviewer for each participant. Women were informed about the aim of the study and the intended duration of the interview, and an informed verbal consent to participate was obtained for each participant. An ethical approval for the study was obtained from the Regional Ethics Committee.

2.2. Data on falls and their consequences

Collecting the data, the cognitive status of each participant was assessed using a 4-item mental test: asking the participant what her age and home address were what the day of the week was, and what the name of the current President of Lithuania was. Persons who failed to provide correct answers to any of these questions were excluded from the study. Details about the fall were obtained by using a questionnaire prepared particularly for this study and containing 28 questions. The interview questionnaire covered socio-demographic characteristics, health status and medication used before falling, number of falls, consequences of each fall, and health care procedures performed because of falls. Physical health was assessed using a self-reported number of medical conditions as well as names and number of currently used medications.

The participants self-reported on falls suffered within the previous year. Respondents were asked to describe the reason and location (indoors or outdoors) of every fall. Only the outcomes of falls from standing height were analyzed in our study. The fall occurring as a consequence of accident, excess alcohol intake, or overwhelming external force, was not included into our calculation. The questionnaire contained 3 items asking the participants if they had fallen in the previous month, the previous 6 months, and the previous 12 months. Then the details of every fall were recorded separately starting with the most recent fall. Respondents were asked to describe the cause and location of every fall. Data was not recorded if the fall occurred because of an accident, or if another person was involved. Women were also asked to describe all the injuries they have sustained because of falling. All the physical injuries, e.g. sprains, strains, contusions, abrasions, and fractures, as well as fear of falling were recorded. Then participants were asked about their contacts with primary and secondary care medical services: how many times they saw a family doctor or consultant. Those women who had been hospitalised as a consequence of falling were also asked about the length of their stay in the orthopaedic or neurologic, and/or in the rehabilitation department of the hospital. Finally, the participants were asked to describe any health care procedures performed at an out-patient clinic or emergency department and any medications that had been prescribed as a result of their fall.

2.3. Cost estimation

The analysis of the health care costs was based on self-reported contacts with health care providers. Estimated out-patient costs included these medical care services: ambulance, emergency department, out-patient visits to family doctor or other specialists, and out-patient rehabilitation. In-patient treatment costs were calculated by assigning an average cost of hospital stay including surgery, intensive care unit, medical staff, radiological and laboratory services, physiotherapy, medication, nursing care and meals, and also in-patient stay at a rehabilitation department. After all these costs were summed, the mean estimated cost was calculated for each participant and also in subgroups according to age group, type of health care received, and also the presence and type of fracture. The costs were calculated based on the reference price list of the State Patient Fund, using the Diagnosis Related Group codes according to the order No. V-1118 of the Minister of Health of the Republic of Lithuania approved on December 23, 2011. The mean cost of transportation to the hospital by

ambulance was provided by the Vilnius Emergency Medical Station. The costs of prescribed medications, medical equipment and home nursing services were not included. The expenses for the health care services were calculated in local currency terms (LTL) and then converted to Euros (EUR) using the fixed exchange rate (1 EUR = 3.4528 LTL) rounded to the nearest euro.

2.4. Statistical analysis

Statistical analysis was performed with predictive analytics software SPSS (Statistical Package for Social Science) version 18.0 for Windows. The mean of variables, standard deviation (SD), and 95% confidence interval (CI) were calculated for the quantitative variables. The frequencies and relative frequencies (percentage) were calculated for categorical variables. The mean differences between two independent groups of interval variables were compared using Student *t* test.

Table 1 – Frequency of fall-related consequences in women over 65 years, by type of injury.

Type of injury	Frequency of consequences	
	n	%
Contusions	250	58.3
Abrasions	32	7.5
Back pain	26	6.1
Open wounds	15	3.5
Sprains	9	2.1
Joint dislocations	5	1.2
Skull/brain injuries	15	3.5
Fractures	77	17.9
Total	429	100
	n	**% per faller**
Fear of falling	226	72.9
Restricted daily activities	124	40
Use of pain relievers	125	40.3

3. Results

After checking the register and considering the inclusion criteria, medical records of 1287 subjects were selected for inclusion in the study. Of this number, 114 subjects could not be contacted by telephone. Of the 1173 remaining subjects approached about the study, 284 did not agree to participate. Interviews with 11 subjects could not be completed because they were not able to give correct answers to one or more questions during the mental test. The data were successfully obtained for 878 subjects, giving a response rate of 68%.

The mean age of the participants was 72.2 ± 4.8 years (65–90 years); the age of 647 (73.7%) women was 65–74 years and 231 (26.3%) women were aged 75–90 years. Falls in the previous year were reported by 310 (35.3%) participants. Among all fallers, 203 (65.4%) reported a single fall, 64 (20.6%) fell twice, 25 (8.1%) reported three falls, 7 (2.3%) reported four falls, and 11 (3.5%) reported five or more falls. Overall, there were 503 falls reported. No statistical difference was found in the mean age of those who fell and who did not (72.7 ± 4.9 and 72.0 ± 4.7 years, respectively; $P = 0.36$). Multiple falls were reported by 11% of the participants belonging to the younger age group and 15.6% of participants belonging to the older age group ($P > 0.05$).

3.1. Consequences

Of all the women who fell, 280 (90.3%) reported that their fall resulted in an injury, and a total of 331 falls were reported as resulting in injury. Some respondents reported multiple injuries from the same fall, so the injury to faller ratio was 1.38, and there were 1.53 injuries per injured faller. A vast majority of the 429 reported fall-related injuries were contusions, skin abrasions, or fractures (Table 1).

A comparison of the two age groups showed no statistical differences in the frequency of falls or in the frequency of injuries, with or without resulting fractures. The same result was found when the group of women who fell once was compared to those who sustained recurrent falls: there were no significant differences in the frequency of falls or any kind of injury (data not provided). Seventy-seven participants (24.8% of all fallers, and 27.5% of those injured) reported sustaining a bone fracture related to the fall. Among the fractures reported, 53.2% were forearm fractures; 9.1%, vertebral; 7.8%, hip fractures; and 29.9%, other fractures.

As many as 72.9% women reported the fear of falling. The fear of falling was statistically significantly more frequent among those women who sustained fractures as a result of the fall compared to those who did not (90.9% and 67%, respectively, $P < 0.01$). The same result was found when the frequency of restricted daily activities was analyzed: this outcome was reported by 63.6% of women who had sustained fall-related fractures and by 36.4% of those who had not ($P < 0.001$), and mostly was explained by the participants as resulting from fear of falling. More than one-third of the participants who fell reported that they had started using additional medications, mostly the pain killers.

3.2. Health care services

Fall-related medical care was provided to 135 women: 43.5% of those who fell and 48.2% of those who sustained injuries from falling received medical attention. The highest percentage of them reported using the out-patient medical services. The number of out-patient visits reported ranged from 1 to 13; and in 70 cases (51.9%), from 2 to 4 visits. Table 2 shows the absolute numbers of health care visits by type of specialist seen and the mean numbers of visits per women who fell.

Different types of out-patient healthcare were used by 43.5% of women who fell. The majority of specialists visited were traumatologist, surgeon, and radiologist. An ambulance service was used by 37 (11.9%), and 19.4% of the fallers saw family doctor. The mean number of health care procedures was higher in women who sustained a fracture compared to those who did not (4.9 [95% CI 4.4–5.4] and 0.67 [95% CI 0.29–0.76], respectively; $P < 0.0001$).

As many as 18 women were hospitalised for the treatment of fall-related injuries. They comprised 5.8% of all fallen subjects and 13.3% of subjects who received medical attention after a fall. Of all the women who suffered a fractured after a

Table 2 – Number of out-patient healthcare visits related to falling.

Type of visit	No. of patients	No. of visits	Mean number of visits (95% CI) per faller, $n = 310$
All visits	135	535	1.73 (1.36–2.1)
Specialist visited			
Family doctor	60	114	0.37 (0.26–0.48)
Traumatologist	54	154	0.50 (0.35–0.65)
Neurologist	5	9	0.03 (0.00–0.06)
Surgeon	48	140	0.45 (0.30–0.60)
Radiologist	97	112	0.36 (0.24–0.49)
Other	4	6	0.02 (0.00–0.04)

fall, 16 (20.8%) were admitted to hospital, and the mean duration of hospitalization was 16.5 ± 24.7 days (range: 3–90 days). All women with hip fracture were treated in hospital, while only 5 women (12.3%) with forearm fracture were hospitalised, with a mean duration of the stay being 29.7 ± 36.5 and 5.8 ± 5.5 days, respectively. Only one woman, who sustained a vertebral fracture, was admitted to hospital with duration of in-patient stay of 12 days. In-patient rehabilitation was provided to 5 subjects with fractures, and the mean duration of the hospital stay was 21.2 ± 9.26 days. In-patient treatment in traumatology department was provided to two women with non-fracture injury.

3.3. *Health care costs*

It was found that the mean total cost of health care per fall was 254 EUR per participant who received fall-related medical care. Table 3 provides the mean direct costs of health care based on the type of care received and the type of injury.

When the costs were estimated for participants with fall-related fractures, the highest cost was found in women with hip fractures, comprised mostly of in-patient hospitalization. Nine fall-related injuries resulted in medical costs exceeding 1500 EUR, all nine being hip fractures. The lowest total mean cost per fall resulting in fracture was in cases of forearm fracture, compared to falls resulting in other types of fracture ($P < 0.05$). The mean cost of out-patient health care provided for nonfracture fall amount to 81% of the mean cost of falls which resulted in forearm fractures. Although only 6.4% of the participants who sustained injuries as a result of falling were hospitalised, the costs of in-patient services raised the mean average medical costs of falling. For the sample investigated, the total expenses of out-patient healthcare were 9657 EUR, and the total expenses of inpatient healthcare were 24,634 EUR. The estimated total medical cost of falls not resulting in fractures equals to about one-third of the total cost of falls resulting in fractures (7839 and 26,452 EUR, respectively). When the healthcare cost was estimated per faller, it was found that the mean expense was 116 EUR, ranging from 0 to 2772 EUR.

4. Discussion

In this paper, fall injuries in women over 65 years of age and the related healthcare costs are presented. Reliable estimates of the incidence of fall injury events in a population-based setting are not available in Lithuania yet. Although a study population is not a nationally representative sample and obtained results may not be applied to the whole Lithuanian population, the incidence of falling in women after the age of 65 (35.3%) is similar to the data of other studies [1,6,15,16,18]. Of all the women who fell, 90.3% reported their fall resulted in an injury, and this rate exceeds the rates shown in other papers [3,6,18–22]. It may be explained by the differences of the investigation methods used, and also by the willingness of individuals to recall the injurious fall, as was shown by Peel [23].

We have found that a vast majority of fall-related injuries were contusions, skin abrasions, or fractures. According to our results, the rate of falls leading to bone fractures was lower than reported by Stevens et al. [3], and higher than reported by other authors [6,19]. Fear of falling was reported by 72.9% of women within our sample, and this consequence, was more frequent in those women who fractured comparing to those who did not. Iglesias et al, also have found that fear of falling was the largest cause of morbidity in elderly women, and it was the equivalent of the 6% decrement in a QALY per woman per year, ten times more than the amount of QALY lost due to

Table 3 – The costs of fall-related health care services.

Subgroup of subjects	Mean cost (95% CI) of health care, in Euros		
	Out-patient visits	In-patient treatment	All health services
Per person who received any health care	72 (60–75) $n = 135$	1369 (990 to 1747) $n = 18$	254 (160 to 348)
Per person who received medical care for non-fracture injury	49 (38–58) $n = 58$	2485 (−1031 to 6001) $n = 2$	135 (14 to 257)
Per person who received medical care for fracture	88 (74–92) $n = 77$	1229 (868 to 1589) $n = 16$	344 (208 to 479)
Hip fracture	99 (48–141) $n = 6$	1190 (740 to 1640) $n = 6$	1289 (809 to 1769)
Forearm fracture	89 (72–95) $n = 41$	639 (−189 to 1468) $n = 5$	167 (72 to 261)
Vertebral fracture	70 (29–104) $n = 7$	2435 $n = 1$	418 (−457 to 1293)
Other fractures	90 (67–101) $n = 23$	1724 (1724 to 1724) $n = 4$	390 (91 to 688)

fracture. Moreover, authors concluded that the main burden of morbidity is due to fear of falling rather than falls or the sequel of falls [6]. The same findings are reported by Cumming and colleagues who have found that the fear of falling has a significant impact on quality of life in Australians [24].

The incidence of fall-related injuries and fractures is different as compared to other countries. The direct comparison of our data with data of other studies is challenging due to differences in study year, size and age of population investigated. Some previous studies were based on the analysis of medical records or health registries. We have obtained study data by interviewing women who reported all the consequences and contacts with health care providers because of falls. In our study, medical records were not reviewed to check the medical care provided.

Fall-related medical care was provided almost to a half of women injured during a fall. The highest proportion of the respondents reported the use of out-patient medical services. The mean number of the health care procedures was higher in women who sustained a fracture comparing to those who did not. Falls which did not lead to a fracture required only limited health care resources, and falls leading to fractures were more often associated with extensive resource use. Overall, only in 5.8% of women fallen, the falls led to hospital in-patient stay as opposed to 20.8% of women who reported a fracture.

To the best of our knowledge, this study is the first attempt to estimate the burden of fall-related injuries in Lithuania. The results of our estimation show that the mean healthcare cost of fall was 254 EUR per patient receiving a fall-related medical care because of a fall, during previous 12 months. These costs included the costs of ambulance service, all out-patient visits and medical rehabilitation, as well as costs of in-patient treatment and in-patient rehabilitation related to fall injuries. The costs of fall reported by other countries: United States [9,20], Australia [13], some European countries [7,8,12,14] are higher than in our study, and this may be explained by the differences in the economic development level, the healthcare financing system, the expenses of medical care and by the types of healthcare service accounted. Consistently with other published reports [3,6,9,20], the majority of healthcare costs were related to the in-patient care. The global country-specific data indicating the burden of fall-related injuries is not available for Lithuania because of restricted population of our study. Although, the results of our study provides some estimates regarding the incidence, consequence and costs of fall-related injuries.

Relatively minor injuries (contusions, abrasions, back pain, wounds, and joint dislocations) accounted for 78.6% of all injuries but out-patient costs accounted for only 39.2% of all costs; the total healthcare cost for the non-fracture falls comprised about one-third of the total costs for the falls with fracture. The similar disproportion has been shown also by other investigators [3,6–8,18,20]. A hip fracture was the most expensive type of a fall-related injury, and the same result was found in several previous studies [7,8,21]. Unexpectedly, the mean cost of an out-patient healthcare provided for non-fracture fall have amounted 81% of a mean cost of fall with a forearm fracture. The medical costs related to a fall with fracture are underestimated, and this may be demonstrated on the costs of fall with consequent hip fracture. The mean healthcare cost of a fall with hip fracture (1289 EUR) calculated in the present study, is lower than the overall mean direct hospitalization cost of hip fracture (2527 EUR) estimated in other study performed in Lithuania [17]. However, this cost was not used in our calculation because of different study population included: hospitalization costs of hip fracture were estimated for men and women over 50 years. Moreover, the different method of calculation of medical costs was used in the previous study, where a hip prosthesis, an ambulance service, and the long-term care costs were incorporated into the hospitalization cost. The long-term care hospital costs have been not taken into account in the present analysis.

The strength of this analysis is that all the data on the fall-related injuries and contacts with healthcare providers were obtained directly from the women who fell. The interviews were performed by specially trained staff using the same data collection form. A limitation of our study is that the impact of other medical costs related to falls was not estimated. Only self-reported contacts with healthcare providers were accounted, and the reimbursement for drug prescriptions and assistive devices were not estimated, as well as costs of home visits. To obtain more realistic estimation, all these costs should be also included in the calculation. Some women could be still staying in a long-term care hospital, rehabilitation centre for serious brain injuries or hip fractures, or the fall could cause the death. Those persons might comprise the most part of those who have not been reached by phone or have not passed the mental test and consequently, were not included in our analysis. The overall medical costs of fall-related injuries exceed those calculated in this study and are yet unknown to us, as well as the whole economic burden to society which includes the cost of lost working days by fallen person or by family member, the decreased quality of life, and the cost of death.

5. Conclusions

This paper presents the self-reported data on the consequences of falls in elderly women and highlights the significant number of the fall-related injuries and costs of healthcare provided. As the socio-economic burden of such injuries is expected to increase remarkably due to the ageing of population, we believe the results of this study will aid to assess the magnitude of problem and the importance of fall prevention interventions.

Conflict of interest

The authors declare that they have no conflicts of interest concerning this article.

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