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Circumstances leading to injurious falls in older men and women in the Netherlands

Nicole D.A. Boyé [a,b,*], Francesco U.S. Mattace-Raso [a], Nathalie Van der Velde [a,e], Esther M.M. Van Lieshout [b], Oscar J. De Vries [e], Klaas A. Hartholt [a,b], Albert J.H. Kerver [f], Milko M.M. Bruijninckx [g], Tischa J.M. Van der Cammen [a], Peter Patka [c], Ed F. Van Beeck [d] IMPROveFALL trial collaborators

[a] Section of Geriatric Medicine, Department of Internal Medicine, Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands
[b] Department of Surgery-Traumatology, Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands
[c] Department of Accident & Emergency Medicine, Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands
[d] Department of Public Health, Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands
[e] Department of Internal Medicine, VU University Medical Center, Amsterdam, The Netherlands
[f] Department of Surgery, Sint Franciscus Gasthuis, Rotterdam, The Netherlands
[g] Department of Surgery, IJsselland Hospital, Capelle aan den IJssel, The Netherlands

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ABSTRACT

Background: Fall-induced injuries in persons aged 65 years and older are a major public health problem. Data regarding circumstances leading to specific injuries, such as traumatic brain injury (TBI) and hip fractures in older adults are scarce.
Objective: To investigate the activity distributions leading to indoor and outdoor falls requiring an emergency department (ED) visit, and those resulting in TBIs and hip fractures.
Participants: 5880 older adults who visited the ED due to a fall.
Methods: Data is descriptive and stratified by age and gender.
Results: Two-thirds of all falls occurred indoors. However, there were higher proportions of outdoor falls at ages 65–79 years (48%). Walking up or down stairs (51%) and housekeeping (17%) were the most common indoor activities leading to a TBIs. Walking (42%) and sitting or standing (16%) was the most common indoor activities leading to a hip fracture. The most common outdoor activities were walking (61% for TBIs and 57% for hip fractures) and cycling (10% for TBIs and 24% for hip fractures).
Conclusion: In the present study we found that the indoor activities distribution leading to TBIs and hip fractures differed. Notably, about half of the traumatic brain injuries and hip fractures in men and women aged 65–79 years occurred outdoors. This study provides new insights into patterns leading to injurious falls by age, gender and injury type, and may guide the targeting of falls prevention at specific activities and risk groups, including highly functional older men and women.

Introduction

Falls affect approximately a third of the population aged 65 years and older, and are associated with major adverse consequences such as disability, loss of quality of life, institutionalisation, and high morbidity and mortality rates [1–8]. Furthermore, falls place a substantial burden on healthcare systems due to the large amount of visits to emergency departments, hospital admissions, admissions to long-term care and rehabilitation facilities, and related healthcare costs [3,4,7,9–11] making falls prevention a public health priority [12,13].

The most common injuries due to falls in the population aged 65 years and older in the Netherlands are superficial injuries, hip fractures, upper extremity fractures, and traumatic brain injury (TBI) [10]. Approximately 30% of people with a hip fracture will die within a year, and many more will experience significant functional loss [2]. Similarly, TBI is associated with serious consequences. Falls cause 61% of TBIs among persons aged 65

* Corresponding author at: Erasmus MC, University Medical Center Rotterdam, PO Box 2040, 3000 CA Rotterdam, The Netherlands. Tel.: +31 107035979; fax: +31 107034768.
E-mail address: n.boye@erasmusmc.nl (Nicole D.A. Boyé).

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years and older in the United States [14]. Furthermore, recent studies in the United States [14], the Netherlands [15], and Finland [16] showed an increase in fall-related TBIs.

An important yet overlooked aspect regarding falls in the elderly is the paucity of evidence regarding patterns in the circumstances leading to injurious falls. Falls are the most important cause of TBIs and hip fractures in older adults, thus these patterns are valuable because they could highlight subgroups that may benefit from targeted falls prevention strategies [2,15,17]. However, data on circumstances leading to major consequences of falls in older adults, such as hip fractures and TBIs are scarce; and the number of events in the available studies is relatively low [18–21].

In this study, we investigated the indoor and outdoor activities leading to injurious falls in a large number of older men and women who visited the emergency department (ED) after experiencing a fall.

Methods

Study population

For the present study, screening data were extracted from the IMPROveFALL study [22]. The IMPROveFALL study is a randomised multicenter trial investigating the effect of withdrawal of fall-risk increasing drugs *versus* 'care as usual' on reducing falls in community-dwelling older men and women. Patients meeting the following criteria were screened for potential enrolment in the IMPROveFALL study: aged 65 years or older, visited the ED due to a fall. A fall was defined as coming to rest unintentionally on the ground or a lower level with or without losing consciousness, but not induced by acute medical conditions, *e.g.* stroke, or exogenous factors such as a traffic accident [23]. All patients meeting the screening criteria were included in the current study. Screening was performed at two academic and five regional hospitals in the Netherlands, all located in highly urbanised areas. Screening started in October 2008 and was completed in October 2011. The local Medical Research Ethics Committees at all participating sites approved the study.

Data collection

Data regarding age, gender, dwelling, date of ED visit, location of fall, activity during fall, and injuries sustained were collected from ED records. Records were made by ED personnel, were free-form, and paper or electronic depending on the hospital. Records were collected and managed by the research nurse and research physician. ED personnel were not aware of specific data being collected from records, therefore, there was a fair amount of missing data. Regarding the location of the fall, 27% of the data were missing; and regarding activity prior to the fall, 34% of the data was missing. Data regarding hospital stay and hospital mortality were not collected.

Age was categorised as 65–79 years old or 80 years and older. Dwelling was categorised as community-dwelling or living in a care facility (assisted living facility or nursing home). Location at time of fall was categorised as indoors or outdoors. Activity at time of fall was categorised as walking, sitting or standing, walking up or down stairs, lavatory visit, sports and recreation, out of bed, housekeeping, cycling, or other. Season during which fall occurred was categorised as winter (December, January and February), spring (March, April and May), summer (June, July and August), and autumn (September, October and November). Injuries were defined by the International Classification of Diseases 10th revision (ICD-10) [24] and categorised as superficial injury, open wound, head injuries (*i.e.*, superficial injury, open wound, skull/facial fracture, and TBI), and fractures (*i.e.*, spine, rib, shoulder and upper arm, elbow and forearm, wrist and hand, pelvis, hip, knee and lower leg, or ankle and foot). Activity distributions leading to indoor and outdoor falls were described separately for all falls, and for the two major fall-related injuries, *i.e.* TBIs and hip fractures.

Results

In total data of 5880 fall-related ED visits of persons aged 65 years and older were included in this study. The mean age was 80 years with a standard deviation of 8, and the study population consisted of 1824 (31%) men and 4056 (69%) women.

The overall gender and age specific circumstances surrounding a fall are shown in Table 1. Data concerning dwelling was obtained

Table 1
Circumstances surrounding injurious falls stratified by gender and age.

	Total	Men			Women		
		65–79 years	≥80 years	Total	65–79 years	≥80 years	Total
	n = 5880	*n* = 1095	*n* = 729	*n* = 1824	*n* = 1851	*n* = 2205	*n* = 4056
Dwelling	*n* = 5489	*n* = 1065	*n* = 673	*n* = 1738	*n* = 1753	*n* = 1998	*n* = 3751
Community	4734 (86)	1013 (95)	561 (83)	1574 (91)	1663 (95)	1497 (75)	3160 (84)
Care facility	755 (14)	52 (5)	112 (17)	164 (9)	90 (5)	501 (25)	591 (16)
Location	*n* = 4279	*n* = 815	*n* = 562	*n* = 1377	*n* = 1306	*n* = 1596	*n* =2902
Indoor	2773 (65)	428 (53)	390 (69)	818 (59)	673 (52)	1282 (80)	1955 (67)
Outdoor	1506 (35)	387 (48)	172 (31)	559 (41)	633 (48)	314 (20)	947 (33)
Activity	*n* = 3871	*n* = 818	*n* = 472	n = 1290	*n* = 1302	*n* = 1279	*n* = 2581
Walking	1898 (49)	314 (38)	232 (49)	546 (42)	690 (53)	662 (52)	1352 (52)
Sitting & Standing	371 (10)	63 (8)	56 (12)	119 (9)	90 (7)	162 (13)	252 (10)
Walking up or down stairs	409 (11)	142 (17)	45 (10)	187 (15)	142 (11)	80 (6)	222 (9)
Lavatory visit	161 (4)	22 (3)	21 (4)	43 (3)	42 (3)	76 (6)	118 (5)
Sports & Recreation	51 (1)	21 (3)	3 (1)	24 (2)	20 (2)	7 (1)	27 (1)
Out of bed	107 (3)	15 (2)	18 (4)	33 (3)	19 (2)	55 (4)	74 (3)
Housekeeping	331 (9)	85 (10)	38 (8)	123 (10)	88 (7)	120 (9)	208 (8)
Cycling	200 (5)	74 (9)	13 (3)	87 (7)	88 (7)	25 (2)	113 (4)
Other	343 (9)	82 (10)	46 (10)	128 (10)	123 (9)	92 (7)	215 (8)
Season	*n* = 5880	*n* = 1095	*n* = 729	*n* = 1824	*n* = 1851	*n* = 2205	*n* = 4056
Winter	1258 (21)	265 (24)	160 (22)	425 (23)	437 (24)	396 (18)	833 (21)
Spring	1472 (25)	292 (27)	194 (27)	486 (27)	448 (24)	538 (24)	986 (24)
Summer	1802 (31)	306 (28)	201 (28)	507 (28)	549 (30)	746 (34)	1295 (32)
Autumn	1348 (23)	232 (21)	174 (24)	406 (22)	417 (23)	525 (24)	942 (23)

Data are given as number (percentages).