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Psychotropic drugs and falling accidents among the elderly: a nested case control study in the whole population of Scania, Sweden

Birgit Modén[1]
Juan Merlo[1]
Henrik Ohlsson[1]
Maria Rosvall[1]

[1] Social Epidemiology, Department of Clinical Sciences in Malmö, Lund University, Malmö University Hospital, Malmö, Sweden.

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Correspondence and reprint requests to:

Birgit Modén, MPh
Dep. of Social Medicine,
CRC, Malmö University Hospital,
S-205 02 Malmö, Sweden
Telephone: +46 40 391396
Email: birgit.moden@med.lu.se

ABSTRACT

Study objective: To investigate the associations between medication with psychotropic drugs and falling accidents in the whole population aged 65 years and older in the county of Scania, Sweden.

Design: Population based nested case-control study.

Subjects: Cases were persons registered in the Region Health-care database after a falling accident during the year 2006 (n=10 482). One control was matched to each case based on age, gender, date of the falling accident, living area and propensity score (based on prevalent disease).

Main results: Using psychotropic drugs within three months before the fall was associated with a more than doubled odds for a falling accident among both men (2.14, 95% CI 1.87-2.44) and women (2.21, 95% CI 2.04-2.39). The use of psychotropic drugs during the week before the accident occurred was associated with an even higher odds for a falling accident among both men (OR=5.61; 95%CI 2.54, 12.41) and woman (OR=3.40; 95% CI 2.24, 5.17). A similar pattern of association was seen for specific groups of psychotropic drugs, i.e., opioids, antidepressants and anxiolytics/hypnotics/sedatives.

Conclusions: The use of psychotropic drugs increased the odds for a falling accident among persons 65 years and older. Generally, patients using psychotropic drugs seemed to have the highest odds for falling accidents immediately after initiating therapy. Since these medications are extensively used among the elderly, the increased risk for falls associated with these kinds of drugs is an important public health problem that could be tackled by a more rational medication use.

In countries with an older population, like Sweden, falls among elderly persons is an increasing public health problem that, apart from personal suffering, is a large cost for the society. In Sweden approximately 46 000, or about 3.0% of all persons 65 years and older, were hospitalized after a fall-related injury in 2004. [1] Among all falling accidents 45% of the men and 72% of the women were 65 years and older.[1, 2] Within the group of injuries falls are the most common reason for death in Sweden, and every year 1,250 persons over the age of 65 die as a result of a falling accident.[1] Furthermore, the proportion of those who die due to a falling accident has increased from 13.7% to 22.0% during a ten year period (1994-2004) particularly among women (i.e., from 11.6% to 23.7%).[2] Therefore, the prevention of falling accidents in the elderly population is of major relevance in public health.

During the ageing process an array of factors start to appear such as impaired vision and balance, dizziness, musculoskeletal diseases and malnutrition that increase the risk of falling. [3-5] Furthermore, socioeconomic factors such as marital status and country of origin [6-10] as well as presence of previous falls [11, 12] have been shown to be associated with the risk of future falls among the elderly. However, apart from these factors, side effects from psychotropic drugs such as antidepressants and sedatives [13-17] are additional but avoidable causes of falling accidents in the elderly [18-21]. The prevalence of psychotropic drug use among the elderly in Scania, where the present study was conducted, was 40% for women and 29% for men during the year 2006. Thus, from a public health perspective, side effects related to the use of psychotropic drugs may be a relevant risk factor for falls that could be prevented by an increased rational medication use.

While there are several studies that have investigated the association between the use of psychotropic drugs and falls in specific settings such as in nursing homes and long-term care [14, 16, 22-30], there are only nine studies that have been performed on the general elderly population. [15, 29, 31-37] Out of these nine studies only four [15, 31, 34, 37] have investigated falling accidents rather than fractures.

In the present study we investigated the associations between psychotropic medication (i.e., antidepressants, anxiolytics/hypnotics/sedatives and opioids) and falling accidents among the whole population aged 65 years and older in Scania, Sweden.

METHODS

Study population

The present study was based on the whole population of men and women, 65 years and older, that were living in the region of Scania (n= 203 607) the southernmost part of Sweden, on December, 31st 2005. These individuals were followed for falling episodes until December, 31st 2006. Information was obtained from the LOMAS (Longitudinal Multilevel Analysis in Scania) database. LOMAS is a longitudinal database including all inhabitants in Scania, Sweden, during the period 1968 to 2006. The personal identification number, assigned to each person in Sweden, was used by the Swedish authorities to link different data sources. Information was contained on socioeconomic and demographic variables as well as data on hospital stays and individual medication use from different registers like the Swedish Patient Register [1], the Region Health-care database, the Swedish Medication Register [38] as well as several population based registers administered at Statistics Sweden. [39] However, the research database does not contain the real personal identification number of the individuals but rather an encrypted number that ensures the anonymity of the individuals.

The LOMAS project was reviewed and approved by the Regional Ethical Committee in South Sweden and has been assembled with the allowance and assistance of Statistics Sweden, The National Board of Health and Welfare (Centre for epidemiology), and the Region of Scania.

Assessment of variables

Outcome

We identified falling accidents from the County's health care database, during the year 2006 using diagnoses coded as W00-W019 in the International Statistical Classification of Diseases and Related Health Problems, 10th version (ICD-10)

which differentiate accidents related to falls.[40] If more than one damage occasion occurred during 2006, only the first occasion was used in the analyses.

Covariates

Income was measured at the end of 2004 and defined as disposable family income adjusted for family size. The variable was divided into three groups with the highest income group used as a reference.

Marital status was dichotomized as single (i.e., single, divorced, or widowed) or not single (i.e., married, registered partnership, or cohabiting and having common children) and the category not single was taken as the reference group.

Country of origin was categorized into 4 different groups on the basis of the financial status of the country of birth following the World Bank Classification of Country Economies. [41] This classification classifies countries according to their gross national income (GNI) per capita, using the World Bank Atlas method. The GNI categories used are (I) High-income economies, (II) Upper-middle-income economies. (III) Lower-middle-income economies and (IV) Low-income economies. The high income country category was used as the reference in the comparisons.

Exposure to psychotropic medication was identified from the national prescription database. [42] Among other data the national prescription database contains defined daily dose (DDD), the anatomical therapeutic chemical classification (ATC) code [43] and date of dispensation. We investigated four main groups of drugs, Opioids (ATC code: NO2A), Anxiolytics (ATC code: N05B), Hypnotics and Sedatives (ATC code: N05C) and Antidepressants (ATC code: N06A). The groups Anxiolytics and Hypnotics/sedatives were combined into one category. Being exposed to psychotropic drugs was based on a combination of date of collecting the drug at the pharmacy and DDD (defined daily dose). The temporal exposition to psychotropic drugs was classified into four different groups; (a) Exposed 0-7 days before the fall, i.e., having collected the drug from the pharmacy and with DDD up to or covering the day of the fall, but not covering the period of 8-85 days before the fall (P1); (b) exposed 8-85 days before the fall, i.e., having collected the drug from the pharmacy and with DDD covering the period of 8-85 days before the fall, not covering the week before the fall (P2); (c)

exposed 0-85 days before the fall, .i.e., having collected the drug from the pharmacy with DDD covering both the period P1 and P2 (P1&P2), and (d) not exposed during the last 85 days before the fall, i.e., not having collected a psychotropic drug at the pharmacy during this period or having collected the drug from the pharmacy, but with DDD not including the period of 85 days or less before the fall.

Statistical and epidemiological methods

We estimated the association between exposure to psychotropic drugs and falling accidents. A nested case control study with detailed information on temporal exposition to psychotropic medication was performed with propensity score matching (propensity score based on prevalent disease) to reduce the risk of confounding. We performed a conditional logistical regression analysis with case-control pairs matched on age, gender, municipality, propensity score (based on prevalent disease) and exact date (day) of the falling accident for determining exposure to psychoactive drugs. We adjusted the models for marital status, country of origin, income and previous falls.

Propensity Score for use of psychiatric drug

Propensity score is a method for estimating treatment effects in observational research.[44-46] In short, using a logistic regression on the whole cohort representing the base population of the nested case-control study, we obtained the probability (i.e., propensity) of using psychoactive drugs as a function of the variables indicated in table 1. We performed a stepwise logistic regression on the whole population 65 years or older and modelled the probability of being a user of psychiatric drug as a function of previous diseases (2 years). The use of psychiatric drugs (ATC –codes: N02A, N05A, N05B, N05C, N06A) was measured during the period from 2005-12-25 to 2005-12-31 (measured from last dispensation at the pharmacy and number of DDDs). For each individual, a propensity for using a psychiatric drug was calculated for each day during 2006 based on 2 years of information on previous diseases.

Matching

All cases (individuals registered with a falling accident) were matched with individuals without a fall, but with the same age, gender, municipality and

propensity of psychiatric drug use for the day of the fall. The controls were selected with replacement from the population with all individuals without a fall. For 88 % of the cases (n = 10 482) matching controls were found. The tolerance for matching was set to 1 %.

RESULTS

Table 1 shows the odds ratios for taking at least one psychotropic drug and for falling accidents in relation to each of the diseases included in the propensity score in the total elderly population of Scania, Sweden. There were strong associations between various disease entities and the use of psychotropic drugs (table 1). Furthermore, there were strong associations between prevalent disease and falling accidents. For example those having had a hip fracture had a more than fourfold increased odds of a future falling accident (OR= 4.49; 95% CI: 3.42, 5.90).

Table 1 Odds ratios (OR) and 95% confidence intervals (CI) for taking at least one psychotropic drug and for falling accidents by prevalent disease in the total elderly population in Scania, 2006

	ICD10-kod	Taking at least one psychotropic drug OR (95% CI)	Falling accidents OR (95% CI)
Diseases of the nervous system	G00-G99	1.48 (1.39, 1.57)	1.31 (1.19, 1.44)
Diseases of the genitourinary system	N00-N99	1.41 (1.34, 1.47)	1.34 (1.25, 1.44)
Ischaemic heart diseases	I20-I25	1.24 (1.19, 1.30)	1.09 (1.01, 1.17)
Hypertensive diseases	I10-I15	1.18 (1.13, 1.22)	1.08 (1.01, 1.15)
Other forms of heart disease	I30-I52	1.21 (1.16, 1.26)	1.37 (1.28, 1.46)
Cerebrovascular diseases	I60-I69	1.49 (1.41, 1.58)	1.25 (1.14, 1.36)
Diseases of the respiratory system	J00-J99	1.59 (1.52, 1.67)	1.30 (1.21, 1.40)
Diseases of the digestive system	K00-K93	1.42 (1.36, 1.49)	1.22 (1.13, 1.32)
Diabetes mellitus	E10-E14	1.20 (1.14, 1.27)	1.15 (1.06, 1.26)
Neoplasms	C00-D48	1.24 (1.18, 1.30)	1.04 (0.95, 1.13)
Arthrosis	M15-M19	1.24 (1.16, 1.33)	1.04 (0.92, 1.18)
Hip fracture	S720- S722	2.07 (1.60, 2.68)	4.49 (3.42, 5.90)
Schizophrenia and other mental disorders	F00-F09, F20-F29	4.35 (4.01, 4.72)	2.03 (1.82, 2.26)
Mood (affective) disorders	F30-F39	12.90 (11.25, 14.80)	1.41 (1.21, 1.64)
Inflammatory diseases of the musculoskeletal system	L405, M00-M03, M05-M11, M12, M315, M32-M34, M35.3	1.46 (1.35, 1.59)	1.48 (1.31, 1.67)

Table 2 showed only small differences in income between the cases and controls in both men and women. The proportion among the elderly taking psychotropic drugs was generally higher among the cases than among the controls. This was

true both for men and women and was irrespective if the exposure occurred up to 7 days before the fall (P1) or if the person had been exposed 8-85 days before the fall, but not the week before the fall (P2). In both men and women the proportion using opioids was more than twice as large in the case group as in the control group. A similar pattern was seen with regard to the use of antidepressants.

Table 2 Characteristics of the individuals with falling accidents (cases) and their control individuals from the total elderly population of Scania, Sweden, during 2006.

		Men				Women			
		Controls		Cases		Controls		Cases	
		N	%	N	%	N	%	N	%
Marital status									
Single		1107	36	1225	40	4827	65	4982	67
Not single		1957	64	1839	60	2591	35	2436	33
Income									
High		1090	36	1052	35	1764	24	1700	23
Middle		917	30	985	32	2838	38	2943	40
Low		1057	35	1016	33	2816	38	2749	37
Previous fall during last year									
Yes		70	2	294	10	295	4	949	13
No		2994	98	2770	90	7123	96	6469	87
Economic category of the country of origin									
High-income economies		2917	95	2957	97	7067	95	7157	97
Upper-middle-income economies		62	2	48	2	168	2	145	2
Lower-middle-income economies		75	2	52	2	160	2	95	1
Low-income economies		6	0	3	0	15	0	12	0
Medication									
Opioids (NO2A)	P1*	7	0	40	1	19	0	99	1
	P2*	133	4	199	7	416	6	634	9
	P1*+P2*	123	4	262	9	394	5	833	11
Anxiolytics/Hypnotics and Sedatives (NO5B, NO5C)	P1*	8	0	13	0	38	1	50	1
	P2*	6	7	225	6	726	10	717	10
	P1*+P2*	390	13	606	20	1457	20	2087	28
Antidepressants (NO6A)	P1*	1	0	9	0	10	0	12	0
	P2*	48	2	73	2	230	3	253	3
	P1*+P2*	212	7	396	13	852	12	1550	21
Psychotropic drug †	P1*	8	0	36	1	35	1	91	1
	P2*	257	8	289	9	891	12	854	12
	P1*+P2*	587	19	988	32	2072	28	3234	44

*P1= Exposed at the time of the fall and 1-7 days before the falling accident; P2=Exposed 8-85 days before the falling accident; P1+P2 Exposed at the time of the fall and 1-85 days before the falling accident
†= Use of at least one psychotropic drug i.e., N02A, N05B, N05C, and/or N06A

Table 3 shows the adjusted odds ratios for falls among the elderly by sociodemographic characteristics and the use of psychotropic drugs. Using psychotropic drugs was associated with a more than doubled odds for a falling accident among both men (2.14, 95% CI: 1.87-2.44) and women (2.21, 95% CI: 2.04-2.39) if using the drug up to 85 days before the fall (P1&P2). The use of psychotropic drugs 0-7 days (P1) before the accident occurred was associated with an even higher odds for a falling accident among both men (OR=5.61; 95%CI: 2.54, 12.41) and women (OR=3.40; 95% CI: 2.24, 5.17). In stratified analyses based on age we found similar associations in the age groups 65-79 years and 80 years or more, respectively. When using psychotropic drugs up to 85 days before the falling accident, the OR for men aged 65-79 years was 2.14 (1.78, 2.56) and for men aged 80 years or older 2.12 (1.75, 2.57). Corresponding ORs for women was 2.36 (2.08, 2.67) in the age of 65-79 years and 2.11 (1.90, 2.34) in the age group 80 years or more (data not shown in table). The results showed that single persons had higher odds for a falling accident than those who were not single. Furthermore, women with origin in lower-middle income economies had decreased odds for a falling accident compared to women from high-income economies. Moreover those with previous falls had fourfold increased odds of a falling accident in both men and women. The sex-specific age distribution of those having a falling accident were for men: mean 77 years, median 77 years, SD 7.47 years and for women: mean 80 years, median 80 years and SD 7.73 years (data not shown).

Table 3 Odds ratios (OR) and 95% confidence intervals (CI) of falls among elderly, 65 years and older, in Scania Sweden in relation to psychotropic drug use and sociodemographic variables

	Men		Women	
	Mutually adjusted OR	**95% CI**	**Mutually adjusted OR**	**95% CI**
Marital status				
Not Single	1.00	(Ref)	1.00	(Ref)
Single	1.14	(1.02, 1.28)	1.09	(1.01, 1.18)
Economic category of the country of origin				
High-income economies	1.00	(Ref)	1.00	(Ref)
Upper-middle-income economies	0.70	(0.47, 1.05)	0.84	(0.66, 1.06)
Lower-middle-income economies	0.77	(0.53, 1.14)	0.57	(0.43, 0.76)
Low-income economies	0.38	(0.09, 1.57)	0.88	(0.39, 1.98)
Income				
Low	1.00	(Ref)	1.00	(Ref)
Middle	1.05	(0.92, 1.21)	0.99	(0.92, 1.08)
High	0.94	(0.81, 1.08)	0.95	(0.87, 1.05)
Previous fall (during last year)				
No	1.00	(Ref)	1.00	(Ref)
Yes	4.48	(3.37, 5.96)	4.03	(3.45, 4.72)
Psychotropic drug †				
Not Exp	1.00	(Ref)	1.00	(Ref)
Exp P1* not P2*	5.61	(2.54, 12.41)	3.40	(2.24, 5.17)
Exp P2* not P1*	1.39	(1.14, 1.68)	1.30	(1.16, 1.45)
Exp P1* and P2*	2.14	(1.87, 2.44)	2.21	(2.04, 2.39)

*P1= Exposed at the time of the fall and 1-7 days before the falling accident; P2=Exposed 8-85 days before the falling accident; P1+P2 Exposed at the time of the fall and 1-85 days before the falling accident
†= Use of at least one psychotropic drug i.e., N02A, N05B, N05C, and/or N06A

Table 4 shows the adjusted odds ratios for falls among the elderly by sociodemographic characteristics and the use of specific psychotropic drugs, i.e., opioids, antidepressants and anxiolytics/hypnotics/sedatives. Using opioids or antidepressants was associated with nearly doubled odds for a falling accident among both men and women if using the drug up to 85 days before the fall (P1&P2). Also the use of anxiolytics/hypnotics/sedatives was associated with an increased odds of a falling accident in men (OR=1.43; 95% CI: 1.22, 1.67) and women (OR=1.33; 95% CI: 1.22, 1.46) if using the drug up to 85 days before the fall (P1&P2). The use of opioids up to 7 days before the accident occurred (P1) was associated with a higher odds for a falling accident among both men (OR=6.07; 95% CI: 2.64, 13.99) and woman (OR=5.16; 95% CI: 3.11, 8.56), than exposure during a longer period.

Table 4 Mutually adjusted odds ratios (OR) and 95% confidence intervals (CI) of falls among elderly, 65 years and older, in Scania Sweden in relation to psychotropic drug use and sociodemographic variables

	Men		Women	
	Mutually adjusted OR	**95% CI**	**Mutually adjusted OR**	**95% CI**
Marital status				
Not Single	1.00	(Ref)	1.00	(Ref)
Single	1.14	(1.02, 1.28)	1.09	(1.01, 1.18)
Economic category of the country of origin				
High-income economies	1.00	(Ref)	1.00	(Ref)
Upper-middle-income economies	0.68	(0.45, 1.02)	0.86	(0.68, 1.09)
Lower-middle-income economies	0.78	(0.53, 1.15)	0.57	(0.43, 0.75)
Low-income economies	0.33	(0.07, 1.42)	0.83	(0.37, 1.85)
Income				
Low	1.00	(Ref)	1.00	(Ref)
Middle	1.05	(0.91, 1.20)	1.00	(0.93, 1.09)
High	0.92	(0.80, 1.06)	0.96	(0.88, 1.06)
Previous fall (during last year)				
No	1.00	(Ref)	1.00	(Ref)
Yes	4.40	(3.31, 5.86)	3.90	(3.33, 4.57)
Opioids (N02A)				
Not Exp	1.00	(Ref)	1.00	(Ref)
Exp P1* not P2*	6.07	(2.64, 13.99)	5.16	(3.11, 8.56)
Exp P2* not P1*	1.37	(1.07, 1.75)	1.53	(1.33, 1.76)
Exp P1* and P2*	1.90	(1.49, 2.42)	1.92	(1.68, 2.20)
Anxiolytics/Hypnotics and sedatives(N05B, N05C)				
Not Exp	1.00	(Ref)	1.00	(Ref)
Exp P1* not P2*	1.52	(0.60, 3.83)	1.39	(0.87, 2.20)
Exp P2* not P1*	1.41	(1.13, 1.67)	1.01	(0.90, 1.14)
Exp P1* and P2*	1.43	(1.22, 1.67)	1.33	(1.22, 1.46)
Antidepressants (N06A)				
Not Exp	1.00	(Ref)	1.00	(Ref)
Exp P1* not P2*	8.09	(1.01, 64.88)	1.09	(0.45, 2.69)
Exp P2*not P1*	1.38	(0.93, 2.04)	1.16	(0.96, 1.41)
Exp P1* and P2*	1.84	(1.50, 2.25)	1.84	(1.66, 2.04)

*P1= Exposed at the time of the fall and 1-7 days before the falling accident; P2=Exposed 8-85 days before the falling accident; P1+P2 Exposed at the time of the fall and 1-85 days before the falling accident

DISCUSSION

The results of this study on the total general population in Scania showed that the use of psychotropic drugs among the elderly conveys higher odds for having a falling accident. For example, the use of opioids or antidepressants nearly doubled the odds of a falling accident among both men and women. Generally, patients using psychotropic drugs seemed to have the highest odds for falling accidents immediately after initiating therapy. Similar results have been found in earlier studies. For example, in the study by Neutel et al. [34], there was a nearly three times higher odds for hospitalizations for falls among short-time users of benzodiazepines than among long-time users.

Other studies have shown associations between socioeconomic factors such as marital status [6, 9], social support [10], country of origin [7, 8] and the risk of future falls among the elderly. For example, in a general population-based study from Stockholm covering the total elderly population, those with origin from countries outside Sweden showed lower odds of hip fractures among both men and women. [7] Moreover, those not married showed nearly three times higher odds of hip fractures than those who were married. However, there were only weak such associations in our study which might partly be explained by the use of different outcome variables and the use of different categorisations. While there were rather few individuals in the categories low and middle income countries in the present study, those born outside Sweden constituted a larger group in the Stockholm study. Furthermore, elderly persons who have experienced previous falls are at increased risk for subsequent falls.[11, 12] Similar results were found in our study with fourfold increased odds of a falling accident among those with previous falls.

This study is based on an unselected population of persons registered within medical care after a falling accident, independently of the outcome of the accident e.g., a fracture. In contrast, most previous studies have focused on fractures associated with the fall (ref non hip fractures), particularly hip fractures.[32, 33, 35, 36, 47-49] Furthermore, earlier analyses have been carried out in selected populations living in special environments like nursing homes, geriatric clinics and similar dwellings.[13, 14, 16, 22-29] A critical systematic review by Hartikainen et al [17], based on 29 articles about medication as a risk factor for

falls published between 1996 and 2004, showed that the use of CNS medicines, especially psychotropic drugs, was associated with an increased risk of a falling accident. In the review, eight of the 29 studies were population based and most of these studies had hip fracture as an outcome.[32, 33, 35, 36, 50] To the best of our knowledge there are only four population based studies on the association between psychotropic drugs and falls among the elderly. In the first study by Lawlor et al. [15] including 4 286 women from 23 towns in England, Scotland and Wales showed that the use of hypnotics, anxiolytics and antidepressants was associated with increased odds of falling, even after adjustment for chronic diseases. Drug use in this study was self reported. The results showed that those using antidepressants had higher odds of having a falling accident than non-users with an OR of 1.53 (95% CI 1.15-2.02). Furthermore the use of hypnotics and anxiolytics also showed higher odds of a future fall. The second study by Elby 1997 [31] , on a large sample of Canadians 65 years and older, showed that the frequency of falls was 60% higher among benzodiazepine (BZD) users and 120% higher among users of antidepressants than among non-users. The third study by Neutel 1996 [34], also Canadian but including all ages, with the aim to investigate incidence rates for fall-related hospitalizations among BZD users compared to unexposed controls. The results showed that the highest risk of injury due to falls was within the two weeks after receiving the prescription of BZD. The fourth study by Hanlon et al. [37], with information from a self-administered questionnaire, showed that high consumption of central nervous system medication was associated with recurrent falls.

Some methodological issues in the present study should be considered. First, we had no information about the consumption of psychotropic drugs, but only information that the person had collected the drug at the pharmacy. However, there is no reason to believe that this potential misclassification would differ between the cases and controls thus leading to a weakening of the association between use of psychotropical drugs and falls. Second, it is well known that the pharmacokinetic processes are affected by age and the ability to metabolise a specific drug is reduced with increasing age. However, stratified analyses based on age showed similar associations, in both men and women, between the use of psychotropic drugs and subsequent falls among those aged 65-79 years and those aged 80 years or more. Third, 34% of the information on falls in this study was

registered at hospitals and 66% at health centres. While there was a high validity in this registration with less than one percent missing observations among persons admitted to hospitals in Scania 2006 [42], the quality in the registration of persons visiting health centres had a lower degree of coverage, about 70% in all. However, there is no reason to believe that those missing from the latter registration would differ with regard to the use of psychotropic drugs. Fourth, we used propensity score matching. By using this score we obtained the probability of taking psychotropic drugs as a function of an array of diseases and by matching on propensity score we reduced the potential confounding effect based on differences in prevalent disease. In the ideal situation the propensity of using psychoactive drugs should be the same for cases as for controls. However, since users of psychoactive drugs are more likely to suffer from diseases that increase the risk of fall accidents, the association between psychoactive drugs and fall accidents is confounded by prevalence of the disease. By matching for the propensity score we reduced this confounding effect. We also adjusted for potential confounders such as marital status, country of origin and income. However, there may be other potential confounders not included in our analyses such as other medications, factors in the physical environment or life-style habits like alcohol consumption. Fifth, one important strength of our study is that the data covered the total general population in Scania aged 65 years or more, which minimize the risk for selection bias.

Conclusion

This study showed that the use of psychotropic drugs, especially opioids and antidepressants, was associated with higher odds for a falling accident among both men and women aged 65 years and older. This effect seemed to be the largest immediately after initiating therapy. Since psychotropic medication is extensively used among the elderly, the increased risk for falls associated with these kinds of drugs is an important public health problem that could be tackled by a more rational medication use.

What is already known on this subject?

There are several studies that investigate the association between the use of psychotropic drugs and falls in specific settings, such as in nursing homes and long-term care. However, there are few studies performed on the general elderly population using falling accidents as an outcome and none with propensity score matching.

What does this paper add?

The results of this study on the total general population in Scania showed that the use of psychotropic drugs among the elderly conveys higher odds for having a falling accident. We obtained the probability of taking psychotropic drugs as a function of an array of diseases and by matching on propensity score we reduced the potential confounding effect based on differences in prevalent disease. Since psychotropic medication is extensively used among the elderly, the increased risk for falls associated with these kinds of drugs is an important public health problem that could be tackled by a more rational medication use.

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We affirm that due care has been taken to assure the integrity of the work, and equally affirm that no conflicts of interest exist. All authors have seen and given their approval to this final version of the manuscript.

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