RESEARCH ARTICLE

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Psychotropic drugs and the risk of fall injuries, hospitalisations and mortality among older adults

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Objective: To investigate whether psychotropics are associated with an increased risk of fall injuries, hospitalizations, and mortality in a large general population of older adults.

Methods: We performed a nationwide matched (age, sex, and case event day) case–control study between 1 January and 31 December 2011 based on several Swedish registers (n = 1,288,875 persons aged ≥65 years). We used multivariate conditional logistic regression adjusted for education, number of inpatient days, Charlson co-morbidity index, dementia and number of other drugs.

Results: Antidepressants were the psychotropic most strongly related to fall injuries ($OR_{adjusted}$: 1.42; 95% CI: 1.38–1.45) and antipsychotics to hospitalizations ($OR_{adjusted}$: 1.22; 95% CI: 1.19–1.24) and death ($OR_{adjusted}$: 2.10; 95% CI: 2.02–2.17). Number of psychotropics was associated with increased the risk of fall injuries, (4 psychotropics vs 0: $OR_{adjusted}$: 1.53; 95% CI: 1.39–1.68), hospitalization (4 psychotropics vs 0: $OR_{adjusted}$: 1.27; 95% CI: 1.22–1.33) and death (4 psychotropics vs 0: $OR_{adjusted}$: 2.50; 95% CI: 2.33–2.69) in a dose–response manner. Among persons with dementia (n = 58,984), a dose–response relationship was found between number of psychotropics and mortality risk (4 psychotropics vs 0: $OR_{adjusted}$: 1.99; 95% CI: 1.76–2.25).

Conclusions: Our findings support a cautious prescribing of multiple psychotropic drugs to older patients. © 2016 The Authors. *International Journal of Geriatric Psychiatry* Published by John Wiley & Sons, Ltd.

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Introduction

Mental disorders are a concern in old age (Volkert *et al.*, 2013). Pharmacological treatment with psychotropic drugs (i.e. antipsychotics, anxiolytics, hypnotics, and antidepressants) is usually standard treatment and provision of psychotherapy is scarce in this age group (Alvidrez and Arean 2002). In addition to treatment of mental health problems, such as depression, anxiety, and insomnia, psychotopic drugs are also prescribed to older patients for behavioural and psychological symptoms of dementia (BPSD) (Gustafsson *et al.*, 2013). Thus, psychotropic drugs are used extensively among older people (Johnell and Fastbom 2012) and there is a risk that these drugs are used long-term and off-label (Maust *et al.*, 2015a).

With aging come altered pharmacokinetics and pharmacodynamics, which result in prolonged and increased effects of many drugs. The altered pharmacodynamics of the aging brain leads to a higher sensitivity to central nervous system acting agents (Shi *et al.*, 2008) and these drugs are estimated to cause up to 20% of all drug-related hospitalizations in older persons (Salvi *et al.*, 2012). Psychotropic drugs are a well-documented risk factor for fall

injuries (Bloch *et al.*, 2011), which can cause serious adverse outcomes in older persons including increased mortality risk (Alamgir *et al.*, 2012). Studies have also suggested a direct link between antipsychotic use and increased mortality in frail older persons (Huybrechts *et al.*, 2012; Kales *et al.*, 2012; Maust *et al.*, 2015b; Rochon *et al.*, 2008). However, few previous investigations have analyzed risk of fall injuries, hospitalizations, and mortality within the same study.

The cumulative effect of use of multiple psychotropic drugs has gained little previous attention, although polypharmacy is a recognized problem in old age pharmacotherapy. The burden of multiple uses of psychotropic drugs on the aging brain can increase the risk of adverse drug reactions and should therefore be avoided in elderly patients (Hartikainen *et al.*, 2005). Nevertheless, concurrent use of several psychotropics is common in the older population in Sweden, although this is considered as inappropriate prescribing in national guidelines (Johnell *et al.*, 2007).

Sweden has excellent possibilities for large-scale epidemiological studies through the long-standing tradition of national registers with almost complete coverage. These registers can be individually record-linked to enable detailed analyzes of rich databases with high statistical precision. The introduction of the Swedish Prescribed Drug Register in 2005 was an important addition to the national health data in Sweden and represents one of the largest pharmacoepidemiological databases in the world (Wettermark *et al.*, 2007). This extensive register allows detailed analyzes of drug exposures. Analyzes of these large databases can circumvent shortcomings of other studies based on small and selected samples of older individuals.

Thus, we aimed to investigate whether psychotropic drugs are associated with an increased risk of fall injuries, hospitalizations, and mortality in a large general population of older adults by applying a register-based case–control design.

Material and methods

We performed a nationwide matched case–control study based on several Swedish registers through record-linkage based on the personal identification number. We analyzed whether use of psychotropic drugs was associated with risk of three outcomes: fall injuries, hospitalizations, and mortality (n = 1,288,875 older adults). The study was approved by the regional ethical review board in Stockholm.

Study population

First, information about hospitalizations and diagnoses were collected from the Swedish Patient register, which covers all inpatient and specialized outpatient care in the whole of Sweden (Ludvigsson *et al.*, 2011). Diagnoses are registered according to the International Classification of Diseases 10 (ICD 10). We selected all persons aged 65 years and older who had been hospitalized after a fall between 1 January and 31 December 2011. Similarly, we also selected all persons aged 65 years and older who had an unplanned hospitalization for any cause. Mortality during the same period was collected from the Swedish Cause of Death Register. However, we excluded suicides and deaths because of an event of undetermined intent (ICD 10 codes X60-X84 and Y10-Y14).

Second, from the Register of the Total Population, we selected five controls matched for age in 5-year classes and sex by using an incidence density sampling scheme (Lubin and Gail 1984). Hence, for each case, we selected controls from the age and gender specific at-risk populations.

Third, we obtained drug data from the Swedish Prescribed Drug Register, which has detailed individual-based information about all prescribed dispensed drugs in Sweden including Anatomical Therapeutic Chemical (ATC) codes (Wettermark *et al.*, 2007). Drug data was collected for the time period of one year before the outcome (i.e. fall injuries, hospitalizations or mortality).

Finally, information about educational level of the patients on 31 December 2010 was collected from the Swedish Education Register, where the highest attained level of formal education is registered for individuals aged 16 years and older.

Measurements

Fall injuries were identified through fractures of the femur (ICD 10 codes S72-S74) following a falling accident (ICD 10 codes W00, W01, W03-W11, W18, and W19). Number of inpatient days the year before the adverse outcome was calculated as an overall measure of co-morbidity (Schneeweiss *et al.*, 2001). Also Charlson co-morbidity index (Charlson *et al.*, 1987) was used as a continuous variable of co-morbidity based on inpatient and specialized outpatient data within five years prior to the outcome. We also collected information about diagnosis of dementia (ICD 10 codes F00-F03, G30, G31) within five years prior

to the outcome. This information together with data on anti-dementia drugs (ATC code N06D) from the drug register was used to form the dementia variable.

Psychotropic drugs (Wastesson *et al.*, 2014) included antipsychotics (ATC code N05 excluding N05AN01), anxiolytics (N05B), hypnotics/sedatives (N05C), and antidepressants (N06A) and use was defined as filling of at least three prescriptions. The individual effect of each drug class of psychotropics as well as the combined effect of use of several psychotropic drug classes were analyzed. Number of other drugs (continuous variable), excluding psychotropic drugs, was also used as an overall proxy for co-morbidity and polypharmacy (Schneeweiss *et al.*, 2001).

Educational level was categorized into primary school, secondary school, and university (Wastesson *et al.*, 2015).

Statistical analysis

Both univariate and multivariate conditional logistic regression analysis was used for investigating the association between use of psychotropic drugs and the three outcomes; fall injuries, hospitalizations, and mortality. In the univariate model, the cases and controls were matched for age, sex, and case event day, but otherwise unadjusted. The multivariate model was additionally adjusted for education, number of inpatient days, Charlson co-morbidity index, dementia, and number of other drugs. The results are expressed as odds ratios (ORs) with 95% confidence intervals (CIs). The ORs from this design, in which controls are selected from the at-risk group, can be interpreted as incidence rate ratios (Rodrigues and Kirkwood 1990). We also repeated the analyzes separately for the subgroup of individuals with dementia. All analyzes were performed in SAS, version 9.2.

Results

For the outcomes fall injuries and mortality, the mean age was similar (82.3 years and 83.9 years, respectively), whereas the subpopulation for hospitalizations was younger (79.1 years) (Table 1). The proportion of women was similar for hospitalizations and mortality (53.5% and 53.6%, respectively), but higher for fall injuries (66.6%). Approximately 86,843 elderly persons experienced two or more of the three detrimental outcomes during the observed study period.

The subpopulation for hospitalizations had on average a higher educational level compared with the two other outcomes (Table 1). The subpopulation for mortality had the highest number of mean hospital days. Dementia was about twice as common in the mortality group and among elderly hospitalized after a fall injury (13.3% and 11.5%, respectively) than among elderly persons hospitalized for any cause. Use of psychotropic drugs, also concomitantly, was most common in the fall injury and mortality groups.

Antidepressants were the psychotropic most strongly related to fall injuries (adjusted OR: 1.42; 95 CI: 1.38–1.45) (Table 2). Also antipsychotics, but less so hypnotics and sedatives, were associated with fall injuries. Moreover, number of psychotropic drugs was associated with increased risk of fall injuries in a dose–response manner (4 psychotropics vs 0: adjusted OR: 1.53; 95% CI: 1.39–1.68). Many hospital days, a high level of co-morbidity, dementia, and use of many other drugs were also associated with a greater risk for fall injuries.

Antipsychotics were the psychotropic most strongly related to hospitalizations (adjusted OR: 1.22; 95% CI: 1.19–1.24) (Table 3). Number of psychotropic drugs was also related to risk of hospitalization in a dose–response manner (4 psychotropics vs 0: adjusted OR: 1.27; 95% CI: 1.22–1.33). Recent hospital stay was associated with recurrent hospitalization. Dementia and number of other drugs were also risk factors for hospitalization.

Use of antipsychotics was strongly associated with risk of death (adjusted OR: 2.10; 95% CI: 2.02–2.17) (Table 4). Also antidepressants and anxiolytics were associated with a higher risk of death, whereas hypnotics and sedatives were associated with a lower risk. Number of psychotropic drugs was also strongly related to death in a dose–response manner (4 psychotropics vs 0: adjusted OR: 2.50; 95% CI: 2.33–2.69). Recent hospital stay was strongly associated with death in a dose–response fashion. Dementia was also a strong predictor of death (adjusted OR: 2.14; 95% CI: 2.08–2.20).

We also repeated the analyzes separately for the subgroup of individuals with dementia (n = 58,984; data not shown in table). In this analysis, there was no association between use of psychotropic drugs and fall injuries. However, antidepressants were associated with a decreased risk of hospitalizations (adjusted OR: 0.93; 95% CI: 0.89–0.96). On the other hand, there was an increased risk of death associated with use of antipsychotics (adjusted OR: 1.50; 95% CI: 1.41–1.60), antidepressants (adjusted OR: 1.14; 95% CI: 1.08–1.21) and anxiolytics (adjusted OR: 1.33; 95% CI: 1.25–1.41). Finally, a dose–response relationship was found between number of

Table 1 Socio-demographic characteristics and psychotropic drug use in cases (fall injuries, hospitalizations or death), and controls among persons aged 65 years and older in Sweden 2011

	Fall injury		Hospitalization		Mortality	
	Case	Control	Case	Control	Case	Control
	n = 47,290	n = 236,450	n = 313,625	n = 1,568,125	n = 77,749	n = 388,745
Age, mean	82.3	82.1	79.1	79.0	83.9	83.6
Women, %	66.6	66.6	53.5	53.5	53.6	53.6
Education, %						
Primary school	52.8	51.6	49.5	47.2	57.1	52.5
Secondary school	31.7	31.4	33.5	33.6	29.1	30.7
University	13.1	14.4	14.7	17.0	10.6	13.9
Missing information	2.4	2.7	2.3	2.1	3.3	2.9
Inpatient days, n, %						
0–5	62.7	84.3	71.4	91.0	40.3	81.5
6–10	3.2	4.6	4.4	3.0	7.5	5.1
11–15	4.1	2.9	3.9	1.7	7.6	3.4
16–20	4.3	2.0	3.3	1.1	6.9	2.4
21–25	4.1	1.4	2.8	0.8	6.2	1.8
26–30	3.4	1.1	2.3	0.5	5.3	1.3
31–	18.0	3.7	11.9	1.8	26.2	4.6
Charlson co-morbidity index, mean	2.0	1.3	2.6	1.2	3.2	1.4
Dementia, %	11.5	6.1	6.3	4.4	13.3	6.4
Psychotropic drugs, %						
Antidepressants	29.1	16.8	20.7	13.6	29.1	16.7
Antipsychotics	6.3	3.4	4.4	2.6	9.6	3.6
Anxiolytics	18.4	12.1	15.1	9.4	22.0	12.2
Hypnotics and sedatives	32.7	23.5	27.2	19.1	31.6	23.9
Psychotropic drugs, n, %						
0	49.5	63.8	58.9	70.2	45.8	63.5
1	25.4	21.9	22.6	18.8	27.8	22.1
2	15.8	9.6	11.9	7.6	16.4	9.8
3	7.7	3.9	5.5	2.9	8.0	3.9
4	1.5	0.7	1.1	0.5	1.9	0.7
Other drugs, n, mean	12.8	9.0	13.3	8.1	12.6	9.1

psychotropics and risk of death (4 psychotropics vs 0: adjusted OR: 1.99; 95% CI: 1.76–2.25).

Discussion

Main findings

Our large study of a general population of older persons shows that psychotropic drugs, particularly when combined, are associated with risk of fall injuries, hospitalizations, and mortality among older persons. This risk existed also after adjustment for co-morbidity and dementia.

To our knowledge, this is the largest investigation of multiple uses of psychotropics and risk of fall injuries, hospitalizations, and death within the same study. Research into psychotropics as risk factors for fall injuries begun already in the late eighties (Campbell 1991). Since then, reviews have established use of psychotropics as a risk factor for falls (Bloch *et al.*, 2011; Woolcott *et al.*, 2009). However, these studies have often been limited by small and selected study samples. We can now confirm these findings in large national data and with high statistical precision. Among the psychotropic drugs, antidepressants were most strongly related to fall injuries. This is in line with recent research that has pointed out the risk of falls associated with these drugs (Huang *et al.*, 2012). Given that antidepressants are used extensively by older persons (Johnell and Fastbom 2009), particularly in the institutional setting (Johnell and Fastbom 2012), the amount of exposure to these presumably fall-inducing drugs in the elderly population is substantial. Safer alternatives to pharmacological treatment of depression in old age might be

Table 2 Matched unadjusted and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for fall injuries in persons aged 65 years and older in Sweden 2011

	Fall injury, OR (95% CI)	
	Unadjusted*	Adjusted**
Education		
Primary school	Reference	Reference
Secondary school	0.99 (0.96–1.01)	0.98 (0.95–1.00)
University	0.89 (0.86–0.92)	0.92 (0.89–0.95)
Missing information	0.83 (0.77–0.89)	0.84 (0.78–0.90)
Inpatient days, n		
0–5	Reference	Reference
6–10	0.95 (0.90–1.00)	0.73 (0.69–0.78)
11–15	1.98 (1.88–2.09)	1.44 (1.37–1.52)
16–20	3.09 (2.93–3.26)	2.17 (2.05–2.29)
21–25	4.13 (3.90–4.37)	2.76 (2.60–2.93)
26–30	4.60 (4.32–4.91)	3.04 (2.85–3.25)
31–	6.71 (6.49–6.93)	3.76 (3.63–3.90)
Charlson co-morbidity index (cont.)	1.18 (1.17–1.18)	1.03 (1.02–1.04)
Dementia	2.03 (1.96–2.10)	1.79 (1.73–1.86)
Psychotropic drugs		
Antidepressants	2.08 (2.03–2.12)	1.42 (1.38–1.45)
Antipsychotics	1.90 (1.82–1.99)	1.21 (1.15–1.27)
Anxiolytics	1.66 (1.62–1.71)	0.97 (0.94–1.00)
Hypnotics and sedatives	1.61 (1.57–1.64)	1.05 (1.02–1.07)
Psychotropic drugs, n		
0	Reference	Reference
1	1.55 (1.51–1.59)	1.16 (1.13–1.19)
2	2.22 (2.15–2.29)	1.39 (1.35–1.44)
3	2.67 (2.56–2.78)	1.44 (1.37–1.50)
4	3.04 (2.78–3.32)	1.53 (1.39–1.68)
Other drugs (cont.)	1.09 (1.09–1.09)	1.05 (1.05–1.05)

*Matched for age, sex, and case event day.
**Matched for age, sex, and case event day and adjusted for all variables in table.

Table 3 Matched crude and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for hospitalizations in persons aged 65 years and older in Sweden 2011

	Hospitalization, OR (95% CI)	
	Unadjusted*	Adjusted**
Education		
Primary school	Reference	Reference
Secondary school	0.95 (0.94–0.96)	0.95 (0.95–0.96)
University	0.82 (0.81–0.83)	0.88 (0.87–0.89)
Missing information	0.97 (0.94–1.00)	0.98 (0.95–1.01)
Inpatient days, n		
0–5	Reference	Reference
6–10	1.96 (1.92–2.00)	1.25 (1.23–1.28)
11–15	3.23 (3.16–3.30)	1.83 (1.78–1.87)
16–20	4.15 (4.05–4.25)	2.12 (2.06–2.18)
21–25	5.18 (5.04–5.33)	2.46 (2.39–2.54)
26–30	6.04 (5.85–6.23)	2.72 (2.63–2.82)
31–	9.33 (9.18–9.48)	3.37 (3.31–3.43)
Charlson co-morbidity index (cont.)	1.32 (1.32–1.33)	1.16 (1.16–1.17)
Dementia	1.48 (1.45–1.50)	1.26 (1.23–1.28)
Psychotropic drugs		
Antidepressants	1.69 (1.67–1.70)	1.07 (1.06–1.08)
Antipsychotics	1.70 (1.67–1.74)	1.22 (1.19–1.24)
Anxiolytics	1.75 (1.73–1.77)	1.03 (1.02–1.04)
Hypnotics and sedatives	1.62 (1.60–1.63)	0.99 (0.98–1.00)
Psychotropic drugs, n		
0	Reference	Reference
1	1.49 (1.47–1.50)	1.00 (0.99–1.01)
2	1.97 (1.94–1.99)	1.09 (1.07–1.10)
3	2.39 (2.34–2.43)	1.16 (1.14–1.18)
4	2.69 (2.58–2.80)	1.27 (1.22–1.33)
Other drugs (cont.)	1.13 (1.12–1.13)	1.08 (1.08–1.08)

*Matched for age, sex, and case event day.
**Matched for age, sex, and case event day and adjusted for all variables in table.

psychotherapy in cognitively intact persons (Karlin *et al.*, 2015; Krishna *et al.*, 2011) and improved care strategies for dementia patients (American Geriatrics Society and American Association for Geriatric Psychiatry, 2003). In particular, our data suggest more attention to psychotropic polypharmacy as a target for preventive strategies for fall injuries in older people.

Concomitant use of several psychotropics was also a risk factor for hospitalizations in a dose–response manner. This is, to our knowledge, the first time that this relationship has been reported in the international scientific literature.

For the most serious outcome of all—death—antipsychotics was the number one risk factor among the psychotropics. There is a growing body of evidence that has pointed out use of antipsychotics in advanced age as a risk factor for mortality (Huybrechts *et al.*, 2012; Kales *et al.*, 2012; Rochon *et al.*, 2008). Most of these studies, however, have been conducted in dementia patients. Here, we can show that antipsychotics are associated with death also in a general population of older persons, independently of dementia status. We also found that, although to a less extent, antidepressants, and anxiolytics were associated with a higher risk of death, whereas hypnotics and sedatives were associated with a lower risk. There is limited research on antidepressants and mortality (Coupland *et al.*, 2011) and more studies are needed. The most common type of anxiolytic—benzodiazepines—has previously been investigated in relation to mortality among older people. However, the findings have so far been inconsistent (Charlson *et al.*, 2009). We can

Table 4 Matched crude and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for mortality in persons aged 65 years and older in Sweden 2011

	Mortality, OR (95% CI)	
	Unadjusted*	Adjusted**
Education		
Primary school	Reference	Reference
Secondary school	0.86 (0.85–0.88)	0.86 (0.84–0.87)
University	0.69 (0.67–0.70)	0.73 (0.71–0.75)
Missing information	1.03 (0.98–1.08)	1.12 (1.06–1.17)
Inpatient days, n		
0–5	Reference	Reference
6–10	3.05 (2.95–3.15)	2.51 (2.42–2.59)
11–15	4.61 (4.46–4.77)	3.56 (3.44–3.69)
16–20	6.01 (5.80–6.23)	4.45 (4.28–4.62)
21–25	7.29 (7.01–7.58)	5.10 (4.90–5.32)
26–30	8.46 (8.11–8.84)	5.81 (5.55–6.08)
31–	11.64 (11.37–11.91)	7.29 (7.10–7.50)
Charlson co-morbidity index (cont.)	1.33 (1.33–1.34)	1.21 (1.20–1.21)
Dementia	2.26 (2.20–2.31)	2.14 (2.08–2.20)
Psychotropic drugs		
Antidepressants	2.10 (2.06–2.14)	1.43 (1.40–1.46)
Antipsychotics	2.87 (2.79–2.96)	2.10 (2.02–2.17)
Anxiolytics	2.08 (2.04–2.12)	1.35 (1.32–1.38)
Hypnotics and sedatives	1.49 (1.47–1.52)	0.91 (0.89–0.93)
Psychotropic drugs, n		
0	Reference	Reference
1	1.83 (1.80–1.87)	1.42 (1.39–1.45)
2	2.47 (2.42–2.53)	1.74 (1.69–1.78)
3	3.01 (2.91–3.10)	1.99 (1.92–2.06)
4	3.91 (3.66–4.16)	2.50 (2.33–2.69)
Other drugs (cont.)	1.08 (1.08–1.09)	0.99 (0.99–0.99)

*Matched for age, sex, and case event day.
**Matched for age, sex, and case event day and adjusted for all variables in table.

now provide support for anxiolytics as possible risk factors for mortality in old age. However, hypnotics and sedatives were related to a lower risk of death in our study. This contradictory finding might be explained by dosing and frequency of exposure. Hypnotics and sedatives may likely be used on a regular basis, whereas anxiolytics are probably used more irregularly. The timing of dosage during the day might also be of importance. Hypnotics and sedatives are taken before bedtime and may therefore exert influence only during sleep, whereas anxiolytics are used during day time and may therefore be more related to adverse outcomes such as day time excessive sedation, injuries, falls, and fractures (Johnell *et al.*, 2014).

There was a strong relationship between psychotropic polypharmacy and risk of death. Smaller studies of dementia patients have also found an association between use of several psychotropics and mortality (Hartikainen *et al.*, 2005). However, our study is probably the first to confirm this finding in a dose–responsive manner in a very large and unselected population of older persons. The Swedish National Board of Health and Welfare discourages prescribing of psychotropic polypharmacy (i.e. ≥3 psychotropics) to older patients in their national guidelines (Johnell *et al.*, 2007). Our findings support this recommendation.

Dementia was a predictor of all three outcomes, particularly death. This underlines that prevention and treatment of dementia must be prioritized for improving the health and well-being of elderly persons.

Limitations

The Swedish Prescribed Drug Register does not include information about the underlying indications and diagnoses for prescription of drugs. Therefore, we do not know for which psychiatric symptoms the psychotropic drugs were prescribed for. The Swedish Prescribed Drug Register does not either include data on over-the-counter drugs. However, the included psychotropic drugs are only available through prescriptions in Sweden. In addition, the register does not include drugs used in hospitals or from drug storerooms sometimes used in nursing homes.

Our study may be affected by confounding by indication and disease severity. However, psychotropic drugs are often prescribed without a documented diagnosis to elderly patients (Akincigil *et al.*, 2011). We also lacked data from primary care, where many older patients with psychiatric problems are treated. Thus, it is difficult to obtain data about mental disorders in old patients and therefore also to adequately adjust for underlying psychiatric diagnoses. This may confound the results.

Dementia status was assessed from the Swedish Patient Register and the Swedish Prescribed Drug Register. This underestimates the number of dementia cases, as we lack information about dementia diagnoses in primary care (not included in the Patient register) and undiagnosed dementia.

We adjusted for co-morbidity through the Charlson co-morbidity index, number of inpatient days, and number of other drugs. However, there may still be residual confounding regarding differences in co-morbidity levels. There are also other

potential residual confounding factors, example lifestyle and physical status, which were not available in our data.

Finally, a general limitation related to drug register data is that actual drug use is not assessed given that adherence to treatment can be low.

Conclusion

Our large nationwide study of a general population of older persons suggests that multiple psychotropic drug use is associated with a higher risk of fall injuries, hospitalizations, and death in a dose–response manner. These findings support a cautious prescribing of multiple psychotropic drugs to older patients. Safer non-pharmacological alternatives may be considered given the individual suffering and large societal economic burden related to these serious adverse outcomes.

Conflict of Interest

No conflicts of interest were declared for all authors.

Key points

- Our data suggest a dose–response relationship between multiple psychotropic drug use and risk of fall injuries, hospitalizations, and death among older persons
- Our findings support a cautious prescribing of multiple psychotropic drugs to older patients.

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