Interactions between drugs and geriatric syndromes in nursing home and home care: results from Shelter and IBenC projects

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Abstract

Aim

Drugs may interact with geriatric syndromes by playing a role in the continuation, recurrence or worsening of these conditions. Aim of this study is to assess the prevalence of interactions between drugs and three common geriatric syndromes (delirium, falls and urinary incontinence) among older adults in nursing home and home care in Europe.

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Methods

We performed a cross-sectional multicenter study among 4023 nursing home residents participating in the Services and Health for Elderly in Long-TERm care (Shelter) project and 1469 home care patients participating in the Identifying best practices for care-dependent elderly by Benchmarking Costs and outcomes of community care (IBenC) project. Exposure to interactions between drugs and geriatric syndromes was assessed by 2015 Beers criteria.

Results

790/4023 (19.6%) residents in the Shelter Project and 179/1469 (12.2%) home care patients in the IBenC Project presented with one or more drug interactions with geriatric syndromes. In the Shelter project, 288/373 (77.2%) residents experiencing a fall, 429/659 (65.1%) presenting with delirium and 180/2765 (6.5%) with urinary incontinence were on one or more interacting drugs. In the IBenC project, 78/172 (45.3%) participants experiencing a fall, 80/182 (44.0%) presenting with delirium and 36/504 (7.1%) with urinary incontinence were on one or more interacting drugs.

Conclusion

Drug–geriatric syndromes interactions are common in long-term care patients. Future studies and interventions aimed at improving pharmacological prescription in the long-term care setting should assess not only drug–drug and drug–disease interactions, but also interactions involving geriatric syndromes.

Keywords

Delirium

Drugs

Falls

Geriatric Syndromes

Interactions

Tailored therapy

Introduction

Older adults are a very heterogeneous population, characterized by a large number of chronic diseases, which can contribute to the development of conditions that cannot be ascribed to specific organ system pathology, the so-called geriatric syndromes (GS) [1]. The term GS refers to one symptom or a complex combination of symptoms with high prevalence in frail elderly patients, which are often associated with an increased rate of disability, mortality and poor quality of life [23456].

GS are often under-diagnosed in the older population [7]. Given the complexity of these multifactorial conditions and the interaction of multiple risk factors in their determination, the

assessment of GS often requires a multidimensional approach to define relevant mechanisms leading to their development and to target interventions [8].

Drugs are commonly involved in the determination of GS and, in particular, onset of falls, delirium and urinary incontinence might be triggered by use of drugs [910]. A large body of literature has focused on drug–drug interactions, defined as a clinically significant alteration in the effect of one drug as a consequence of co-administration of another drug, and drug–disease interactions which occur when a drug prescribed to treat one condition subsequently exacerbates coexisting chronic conditions [11], but limited data are available on possible interactions between drugs and GS, which occur when a drug plays a role in the continuation, recurrence or worsening of a GS. Drug–geriatric syndrome interactions have received little attention in the scientific literature and most studies on this topic evaluated a single GS (i.e., delirium) or drug class (i.e., psychotropic drugs), assessed in a limited number of patients in a specific setting. Therefore, the aim of the present study is to assess the prevalence of drug interactions in three common GS (delirium, falls and urinary incontinence) among older adults in nursing home or home care in European countries.

Methods

The prevalence of interactions between medications and GS has been explored in two datasets assessing older adults in nursing homes (Services and Health for Elderly in Long-TERm care—Shelter project) [12] and in home care (Identifying best practices for care-dependent elderly by Benchmarking Costs and outcomes of community care—IBenC project) in Europe [13]. Both projects were funded within the Seventh Framework Program of the European Commission.

Shelter project

The Shelter sample consisted of 4156 nursing home residents in 57 facilities of seven European Union (EU) countries (Czech Republic, England, Finland, France, Germany, Italy, the Netherlands) and one non-EU country (Israel). The project was primarily aimed at validating the interRAI instrument for Long-Term Care Facilities (interRAI LTCF), a comprehensive standardized instrument, as a tool to assess the care needs and provision of care to nursing home residents in Europe.

Methodology of the Shelter project was described in detail elsewhere [12]. Briefly, older adults residing in nursing homes participating in the study at the beginning of the study and those admitted in the 3-month enrolment period following the initiation of the study were assessed using the interRAI LTCF. The baseline data of the study collected between 2009 and 2010 were used for this study. Exclusion criteria were: age younger than 65 years and unwillingness to participate to the study.

IBenC project

The IBenC sample consisted of 2884 home care patients from six European countries: Belgium, Finland, Germany, Iceland, Italy and the Netherlands. Its primary aim was to identify best practices in community care for care-dependent elderly by benchmarking cost-effectiveness, taking into account costs of care utilization and quality of care [13]. For the project, home care was defined as ‘care provided at home by social and health care professionals’. Baseline data, which were used for this study, were collected between 2013 and 2014 amongst home care patients by the use of the interRAI instrument for Home Care (interRAI HC). Exclusion criteria were being younger than 65 years, having a terminal illness, receiving care for a short period of time, with imminent institutionalization, or experiencing cognitive problems and of whom an informal carer or legal representative could not be contacted, were excluded for participation.

InterRAI assessment

InterRAI instruments are built around a common set of assessment items relevant to a wide range of health care settings. Items included in these instruments have identical definitions, scales, observation time frames, and response codes. These features make these instruments ideal tools to compare characteristics of older adults across settings [14]. The application of InterRAI assessments in the two mentioned studies enables the comparison of the characteristics of nursing home residents in the Shelter project and home care patients in the IBenC project.

The following interRAI scales were used: The Cognitive Performance Scale (CPS) was used to assess cognitive status [15]. The CPS combines information on memory problems, level of consciousness, and executive function, with scores ranging from 0 (intact) to 6 (very severe impairment). The cognitive impairment was categorized as follows: mild to moderate (CPS score 2–4) and severe (CPS score ≥ 5). To evaluate functional status, the seven point Activities of Daily Living (ADL) Hierarchy Scale was used [16]. The ADL Hierarchy Scale ranges from 0 (no impairment) to 6 (total dependence). ADL disability was categorized as follows: assistance required (ADL Hierarchy Scale score 2–4) and dependence (ADL Hierarchy Scale score ≥ 5). The Depression Rating Scale (DRS) was used to assess the presence of depressive symptoms and a score ≥ 3 was used to detect depression [17]. Behavioral symptoms were present if the participant exhibited one or more of the following symptoms in the last 3 days prior to the assessment: wandering, verbally abusive behavior, physically abusive behavior, socially inappropriate behavior, and active resistance of care.

Geriatric syndromes

For the present study three common GS, namely delirium, falls, urinary incontinence, were selected based on interRAI assessments.

Delirium was diagnosed if, in the 3 days before the assessment, the resident/patient exhibited an acute change in mental status deviating from usual functioning (i.e., restlessness, lethargy, difficult to arouse, altered environmental perception) or if he/she had a new onset or worsening of one or more of the following symptoms: easily distracted (i.e., episodes of difficulty paying attention; person gets sidetracked); episodes of disorganized speech (i.e., speech is nonsensical, irrelevant, or rambling from subject to subject; person loses train of thought); mental function variation over the course of the day.

Falls were defined as any unintentional change in position where the person ends up on the floor, ground, or other lower level occurring in the 30 days before the assessment.

Urinary incontinence was assessed with the help of health personnel and/or with caregivers. For the present study, participants with urinary catheter or urinary collection device were not considered incontinent.

Interactions

The 2015 Beers criteria were used to identify drugs potentially interacting with falls, delirium and urinary incontinence [18]. An interaction was diagnosed if participants were presenting with one of the examined GS and receiving one or more interacting drugs. Data about drugs received in the 3 days prior to the assessment were collected gathering information from physician order sheets and drug administration records. Drug information included non-proprietary and proprietary name and Anatomical Therapeutic and Chemical code of the World Health Organization Collaborating Centre for Drug Statistics Methodology [19].

Analytical approach and study sample This text should have a bigger font similar to the other headings (i.e. Interactions or Geriatric Syndromes)

Baseline characteristics of the sample, prevalence of GS and use of interacting drugs were assessed using frequency analysis. For the Shelter project, we excluded 133 participants with missing data on drug use, leading to a final sample of 4023 participants. Similarly, for the IBenC project participants enrolled in Germany and Belgium were excluded from the analyses because data on drug use were not available. Thus, the final analyses were based on a sample of 1469 participants with valid drug data. All analyses were carried out using SPSS for Windows version 18.0 (SPSS, Chicago, IL, USA).

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Results

Study samples

Mean age of the nursing home residents was 83.5 (standard deviation, SD 9.3) years, and 2945 (73.2%) were women. Mean number of drugs used was 7.0 (SD 3.6) and 979 (24.3%) residents were on 10 or more drugs (Table 1). Overall, 373 residents (9.4%) experienced a fall in the last 30 days, 659 (16.4%) presented with delirium and 2765 (68.7%) with urinary incontinence.

Table 1

Characteristics of study samples

	SHELTER project n = 4023 n (%)	IBenC project n = 1469 n (%)
Demographics		
Age, years (mean $\pm$ SD)	83.5 $\pm$ 9.4	83.0 $\pm$ 8.6
Female gender	2945 (73.2)	1016 (69.2)
Geriatric conditions		
ADL disability ^a		
Assistance required	1661 (41.4)	276 (18.8)
Dependent	1607 (40.1)	137 (9.3)
Cognitive status ^b		
Mild/moderate impairment	1510 (38.1)	451 (30.7)
Severe impairment	1234 (31.1)	98 (6.7)
Depression ^c	1268 (32.0)	466 (31.7)
Behavioral symptoms	1605 (40.5)	146 (9.9)

Table 1		
Characteristics of study samples		
	SHELTER project n = 4023 n (%)	IBenC project n = 1469 n (%)
Polypharmacy (n of drugs)		
5–9	2002 (49.8)	570 (38.8)
10 or more	979 (24.3)	322 (21.9)
Geriatric syndromes		
Falls	373 (9.4)	172 (11.7)
Delirium	659 (16.4)	182 (12.4)
Urinary Incontinence	2765 (68.7)	504 (34.3)
ADL activities of daily living		
aAssistance required is defined by ADL hierarchical scale score 2–4, dependent by ADL hierarchical scale score 5–6		
bMild/moderate cognitive impairment is defined by Cognitive Performance Scale Score (CPS) 2–4, severe impairment by CPS 5–6		
cDepression Rating Scale score ≥ 3		

Mean age of home care patients was 83.0 (SD 8.6) years, and 1016 (69.2%) were women. Mean number of drugs used was 6.2 (SD 4.3) and 322 (21.9%) residents were on 10 or more drugs. Prevalence of falls was 11.7%, while delirium and urinary incontinence were reported in 12.4 and 34.3% of participants.

Interactions

Overall, 790 (19.6%) nursing home residents and 179 (12.2%) home care clients presented with one or more drug–geriatric syndrome interactions. Figure 1 presents the prevalence of use of interacting drugs in participants with GS. In the Shelter project, 288/373 (77.2%) residents experiencing a fall, 429/659 (65.1%) presenting with delirium and 180/2765 (6.5%) with urinary incontinence were on interacting drugs. Among residents experiencing a fall, 113 (30.3%) were on a single interacting drug, 101 (27.1%) on two, and 74 (19.9%) on three or more drugs. Among residents with delirium, 171 (25.9%) were on a single interacting drug, 155 (23.5%) on two and 103 (15.7%) on three or more drugs.

Fig. 1

Prevalence of geriatric syndromes and interacting drugs

In the home care setting, 78/172 (45.3%) patients experiencing a fall, 80/182 (44.0%) presenting with delirium and 36/504 (7.1%) with urinary incontinence were on interacting drugs. Among participants experiencing a fall, 31 (18.0%) were on a single interacting drug and 47 (27.3%) on two or more. Among patients with delirium, 41 (22.5%) were on a single interacting drug and 39 (21.5%) on two or more. All cases of interactions with urinary incontinence were caused by a single drug in both samples.

Table 2 presents the list of drugs responsible for interactions. Interacting drugs most often used by residents with falls in nursing homes were selective serotonin reuptake inhibitors (41.0%), benzodiazepines (38.9%), and antipsychotics (32.4%). In home care patients with falls, benzodiazepines (25.6%), selective serotonin reuptake inhibitors (21.5%), and opioids (16.3%) were most often prescribed. In nursing home and home care settings, psychotropic drugs were the most common interacting drugs in participants with delirium, with benzodiazepines, antipsychotics, and sedative hypnotics being commonly used in participants with this condition. Finally, the utilization of interacting drugs in urinary incontinence was low in both samples, with a prevalence < 5% for each drug examined.

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Table 2		
Prevalence of geriatric syndromes and use of interacting drugs in home care residents and home care patients		
Interacting drug (2015 Beers criteria)	SHELTER project n (%)	IBenC n (%)
	Falls	
	n = 373	n = 172
Anticonvulsants	45 (12.1)	14 (8.1)
Antipsychotics	121 (32.4)	13 (7.6)

Table 2

Prevalence of geriatric syndromes and use of interacting drugs in home care residents and home care patients

Interacting drug (2015 Beers criteria)	SHELTER project n (%)	IBenC n (%)
	Falls	
	n = 373	n = 172
Benzodiazepines	145 (38.9)	44 (25.6)
Nonbenzodiazepine, benzodiazepine receptor agonist hypnotics	37 (9.9)	21 (12.2)
Tricyclic antidepressants	8 (2.1)	6 (3.5)
Selective serotonin reuptake inhibitors	153 (41.0)	37 (21.5)
Opioids	53 (14.2)	18 (16.3)
Any	288 (77.2)	78 (45.3)
Interacting drug (2015 Beers criteria)	SHELTER project n (%)	IBenC n (%)
	Delirium	
	n = 659	n = 182
Anticholinergics	123 (18.7)	21 (11.5)
Antipsychotics	241 (36.6)	21 (11.5)
Benzodiazepines	258 (39.2)	49 (26.9)
Chlorpromazine	0	1 (0.5)
Corticosteroids	24 (3.6)	14 (7.7)
H2 receptor antagonists	16 (2.4)	1 (0.5)
Sedative hypnotics	149 (22.6)	15.4 (15.4)
Any	429 (65.1)	80 (44.0)
Interacting drug (2015 Beers criteria)	SHELTER project n (%)	IBenC n (%)
	n (%)	n (%)

Table 2

Prevalence of geriatric syndromes and use of interacting drugs in home care residents and home care patients

Interacting drug (2015 Beers criteria)	SHELTER project n (%)	IBenC n (%)
	Falls	
	n = 373	n = 172
	Urinary incontinence	
	n = 2765	n = 504
Estrogensa	57 (2.1)	18 (3.6)
Peripheral alfa1 blockersa	18 (0.7)	6 (1.2)
Anticholinergic drugs, except antimuscarinics for urinary incontinenceb	105 (3.8)	12 (2.4)
Any	180 (6.5)	36 (7.1)
aWomen only		
bMen only		

Discussion

The present study shows that the GS under study, namely falls, delirium, and urinary incontinence are common in nursing home and home care settings and the results suggest that nursing home residents and home care clients suffering from these conditions often use an interacting drugs. More specifically, about half of the patients with falls in home care are on an interacting drug, and this rate rises to 77% among those in nursing homes. Similar figures are observed for delirium, with 44% of patients in home care and 65% of nursing home residents with this condition being on an interacting drug. On the opposite, use of interacting drugs is less common in patients with urinary incontinence.

Given the high prevalence of GS and their impact on quality of life and health outcomes it is important to improve attention toward the diagnosis of these conditions and the identification of possible risk factors, including drug use. The adoption of an appropriate terminology represents a first step to achieve this goal. The term 'drug–geriatric syndrome interaction' might be, therefore, used to describe the phenomenon that occurs when a drug contributes to the continuation, recurrence or worsening of a GS, which has traditionally received little attention in the scientific literature. This might be caused by the fact that GS are often under-diagnosed [7], probably due to their multifactorial nature, which challenges traditional medical approach focus on single organ or system. Moreover, administrative data used in large pharmacoepidemiological studies do not allow the detection of GS.

Falls were observed in about 10% of study samples, with a slighter higher prevalence in home care patients than in nursing home residents. This difference is probably related to the high rate of functional dependency observed in nursing home residents and, therefore, to a limited ability to move independently or with assistance. Psychotropic drugs represent the interacting drugs most often used by participants with falls both in the Shelter and IBenC samples. These drugs may cause balance problems, gait instability, impaired reaction time performance, and other motor functions and older people are particularly vulnerable to side effects of these drugs because of the changes in their pharmacokinetics and pharmacodynamics related to aging [20].

Delirium is a common problem detected in both study samples, occurring in 12% of home care clients and in 16% of nursing home residents. As observed for falls, psychotropic drugs, which have the potential to induce or worsen delirium, are often prescribed in persons with this condition. To note, antipsychotics are often used to treat delirium, but guidelines recommend avoiding these drugs unless nonpharmacological options have failed or are not possible and the older adult is threatening substantial harm to self or others [19]. Also use of anticholinergics is common in participants with delirium. These drugs may induce cognitive and functional decline and cause or contribute to the onset of delirium. Such negative effects might be potentiated by several conditions often observed in institutionalized elderly, including polypharmacy and presence of neurodegenerative diseases (i.e., dementia) [2122].

Along with its medical, psychological, and social consequences, urinary incontinence represents a large economic burden, increasing the costs of health care [823]. This condition emerged to be the most common of the GS examined in both study samples, being diagnosed in 69% of nursing home residents and 34% of home care patients. However, use of interacting drugs is uncommon in urinary incontinence and accounts for less than 10% of cases. This low prevalence might be related to the fact that a limited number of drugs interacting with urinary incontinence are listed in the Beers' list and some interactions are gender specific.

Several strategies were proposed to improve prescribing and reduce interactions. Medication review, computer-based prescribing systems, patient and prescribers educational strategies and a comprehensive geriatric assessment and management were used to this aim [242526]. However, none of them did show a clear beneficial effect on health outcomes and available evidence on the impact of these interventions is mixed and controversial [27].

The present study has several strengths. First, this is a multicenter cross-country study, involving a large sample of older people and providing an overview on GS and interacting drugs in two different settings (home care and nursing home) in Europe and Israel. Second, this is one of the first studies to examine the issue of the interactions between drugs and GS in the home care setting. Third, we assessed the interaction between various drug classes and three different GS (delirium, falls and urinary incontinence), while most studies examining the issue of drugs and GS are focused on a single condition or on a single drug class. Finally, data were collected through interRAI's standardized and validated multidimensional assessment instruments, previously demonstrated to reliably capture the complexity of older adults assisted in different care settings and across different countries.

Some limitations of the present study need to be recognized. First, results refer to a group of medically ill older adults in nursing homes and home care and, therefore, they cannot be generalizable to healthier populations in community settings. Second, given the cross-sectional design of the study, we cannot establish a cause–effect relationship between the use of drugs and the onset of the GS. Third, to define drug–geriatric syndromes interactions we used 2015 Beers

criteria. Despite widely adopted, these criteria might not identify all possible drugs interacting with GS.

In conclusion, this study shows that GS are common in older adults in home care and nursing homes. Given the relevant impact of these conditions on the quality of life and health outcomes, it is important to diagnose them and recognize factors contributing to their onset. Our data confirm that use of drugs potentially causing or worsening GS is common in long-term care patients with these conditions and suggest that identification of drug–syndrome interactions and de-prescribing might represent a valuable and effective intervention to treat them. Future studies and interventions aimed at improving pharmacological prescription in the long-term care setting should assess not only drug–drug and drug–disease interactions, but also drug–geriatric syndromes interactions.

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Compliance with ethical standards

Conflict of interest

Authors have no conflicts of interest to declare.

Statement of human and animal rights

All procedures performed in this study involving human participants were in accordance with the ethical approval and standards of the local ethics committees.

Ethical approval

Ethical approval was obtained from the ethics committees of the participating centers.

Informed consent

All participants gave written informed consent.

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