

PSYCHOTROPIC MEDICATIONS IN OLDER ADULTS: A REVIEW

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SUMMARY

Background: Prevalence of prescribing psychotropic medications, particularly inappropriate prescription, is widespread in older adults, both in nursing home residents as well as community-dwelling older adults. This review describes prevalence and prevention of inappropriate prescribing and risk factors associated with psychotropic medications.

Methods: MEDLINE and GOOGLE SCHOLAR data base were searched for the key words "older adults", "psychotropic drugs", "inappropriate prescribing", "nursing home residents", "community-dwelling older adults". The study was limited to the articles published in English in the period from 2007 to 2014. The list of references includes additional articles that were searched manually.

Results: The utilization of different psychotropic medications is prevalent among older adults worldwide, regardless of whether they live in nursing homes or in the community. Among older adults, nursing home residents are the most vulnerable individuals for potentially inappropriate drug prescription. The most common potentially inappropriate prescribed medications in the elderly are benzodiazepines, particularly long-acting, antipsychotics and antidepressants, particularly SSRIs. All classes of listed medications have been associated with different adverse events, particularly falls and falls-related fractures and increased risk for mortality. Many different pharmacological and non-pharmacological interventions, such as monitoring polypharmacy, reviewing medications, spending more time in the institution by a physician, reducing the number of prescribers in the institution as well as greater involvement of geriatricians, general practitioners and pharmacists should be implemented to reduce this health issue.

Conclusion: The prevalence of prescribing psychotropic medications to older adults is high. Inappropriate prescribing of psychotropic drugs and polypharmacy are present in institutionalized and non-institutionalized older adults and can cause adverse health events, and can significantly reduce the quality of life of these vulnerable groups. Multidisciplinary approach is needed in addressing widespread problem of prevalence of psychotropic medications in older adults.

Key words: older adults - psychotropic drugs - inappropriate prescribing - nursing home residents - community-dwelling older adults

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INTRODUCTION

As a growing population, older people make up an increasing proportion of the total population, not only in the developed countries, but also in countries that are rapidly developing (Giordana et al. 2010, Besdine 2011, Camargos et al. 2012). This leads to a significant burden on the health care systems in these countries, because there is a higher prevalence of multiple chronic conditions, whose treatment is complex and expensive, leading to higher costs of care in older people (Vogeli et al. 2007, Schneider et al. 2009). Mental disorders in the European countries create huge costs and represent a major burden on the health system (Gustavsson et al. 2011, Wittchen et al. 2011, Klemenc-Ketis & Kersnik 2014, Milanovic et al. 2015). More than one third of the EU total population suffers from mental disorders, and this fact contributes most to the overall morbidity in the EU (Wittchen et al. 2011). The older people suffer in substantial extent from mental disorders (Trollor et al. 2007, Chrzan et al. 2012, Boorsma et al. 2012).

One of the major problems faced by the physicians is the use of a large number of medications taken by older people (Szczepura et al. 2011), particularly psychotropic medications (Prudent et al. 2008, Hoiseth et al. 2013). Prescription drug use is increasing in ambulatory patients, as well as in hospitalized patients and nursing home residents (Ruscini 2011). Psychopharmacology in elderly people is quite specific, and tendency of older people to develop side effects to psychoactive medications is often due to physiological changes associated with aging, altered pharmacokinetics and pharmacodynamics (Ruscini 2011, Simon et al. 2010). An integral part of geriatric assessment should include the name of prescription or non-prescription medications used by older adults (Besdine 2011). Frequent checks of used medications, particularly for drug interactions and use of medications, are considered appropriate for elderly (Besdine 2011, Ruscini 2011).

Given these facts, health systems around the world must make significant efforts, and should take the advantage of all the resources to adequately respond to

emerging issues. It is also a major challenge for physicians who deal with older population, because they need to invest more skills and devote more knowledge in accessing and treating older subjects.

METHODS

We reviewed 138 published articles that contained key words: “older adults”, “psychotropic drugs”, “inappropriate prescribing”, “nursing home residents”, “community-dwelling older adults”, from the two databases: MEDLINE and GOOGLE SCHOLAR. In addition, this review was limited to the articles published in English in the period from 2007 to 2014. The list of references includes additional articles that were searched manually.

Polypharmacy

Polypharmacy is defined as a use of multiple medications, but it also means the administration of more medications than are clinically indicated, i.e. unnecessary drug use (Hajjar et al. 2007). Nearly 50% of older adults take one or more medications than is medically necessary, and studies have clearly shown a strong relationship between polypharmacy and negative clinical consequences (Maher et al. 2014). Among older adults in the United States, polypharmacy is frequently encountered (Heuberger 2012). In EU population, polypharmacy in nursing home is observed in almost 50% of residents, while excessive polypharmacy exists in almost 25% of residents (Onder et al. 2012). Excessive polypharmacy is also noted in nursing homes with special care units for dementia (Olsson et al. 2010).

Potentially inappropriate medication in the institutionalized elderly population

Psychiatric disorders are more prevalent in institutionalized than in non-institutionalized older adults. The most common psychiatric disorders among institutionalized older adults are dementia, depression and anxiety disorders (Seitz et al. 2010). Institutionalization of older adults is a predictive marker for inappropriate prescribing and prescribing omissions (Lang et al. 2010). Prevalence of potentially inappropriate antipsychotic treatments is higher in subjects with long-term care compared to those living in the community (Puyat et al. 2012). Older adults, living in care homes, have a greater chance for prescribing any psychotropic medication compared to those living in their own homes (McCowan et al. 2013). Transition of older adults from the community to care homes significantly contributes to increased use of psychotropic drugs (Maguire et al. 2013). Prevalent inappropriate prescribing was reported among older adults who were acutely admitted to hospitals, and there was no reduction of prevalence during stay of those patients to intermediate-care nursing home units (Bakken et al. 2012). The prescription of psychotropic medications, particularly antidepres-

sants, during the last 15 years, significantly increased in the EU nursing home residents. In addition, accompanying prescribing of 2 or more psychotropic medications also increased (Ruths et al. 2013).

The United States and Europe have a high prevalence of potentially inappropriate prescribed medications. Inappropriate prescribing is associated with adverse drug reactions (Gallagher et al. 2007). Adverse drug reactions and drug-drug interactions associated with polypharmacy in older adults can lead to a significant morbidity (Sabzwari et al. 2013). In the retrospective study (Wu et al. 2012), 0.75% of total annual emergency department visits among adults aged 66 years and over was found to be related to adverse drug reactions, and among these patients 21.6% were hospitalized. This represents an important public health issue, and results in significant economic burden to the health care system (Wu et al. 2012).

Among elderly population, nursing home residents are the most vulnerable individuals for potentially inappropriate drug prescription. Nearly 30% of residents in nursing homes received at least one antipsychotic medication, and of these, more than 30% had no identified clinical indication for these medications (Chen et al. 2010). Similar situation was found in the EU population, where nearly 30% of nursing home residents received at least one inappropriate psychotropic medication, and less than 10% received two inappropriate psychotropic medications (Ruggiero et al. 2009). It was reported that 50% of the elderly patients in the EU population aged 75 years or over, received at least one psychotropic medication 2 weeks before hospitalization (Prudent et al. 2008). Nearly 20% of all these prescribed psychotropic drugs were potentially inappropriate medications, and the most common among them were anxiolytics, antidepressants and antipsychotics (Prudent et al. 2008). Potentially inappropriate drug prescribing and the omission of beneficial drugs are highly prevalent in acutely ill hospitalized older people in EU and Switzerland (Gallagher 2011). The care home residents are more likely to receive psychotropic medications such as benzodiazepines, anticholinergic antihistamines, and antipsychotics, and almost 10% receive more inappropriate medications compared to those living in the community (Shah et al. 2012). These subjects are treated, on average, with 10 prescribed medications in nursing homes and in nursing homes with dementia. A very large proportion (80-85%) of those residents has prescription for psychotropic drugs. A group of slightly younger elderly (65-79 years) in those institutions has a lower quality of drug prescribing (Olsson et al. 2010). Lower quality of prescribing is negatively correlated with the number of prescribers per resident (Olsson et al. 2010). Among the most frequently prescribed inappropriate medications were benzodiazepines, amitriptyline, oxybutynin and non-steroidal anti-inflammatory drugs (Stafford et al. 2011). In Taiwanese medical inpatients aged 65 years and older, the prevalence of potentially inappropriate medi-

cation was 36%, and potentially prescribing omission was 42%. Benzodiazepines and neuroleptics were among the most potentially inappropriate medications (Liu et al. 2012). Prevalence of inappropriate prescribing among residents in Australian care homes was also very high (44%). Elderly residents in nursing homes had significantly lower use of cognitive enhancers and higher use of all psychopharmacological medications compared to community-dwellers (Rattinger et al. 2013). Concomitant use of 3 or more psychotropic and/or opioid drugs were the most commonly identified in nursing homes, while more patients in nursing home services used cardiovascular drugs, and fewer patients used psychotropic drugs (Halvorsen et al. 2012).

Potentially inappropriate medication in the community-dwelling elderly population

Among older adults living in the community, the average number of medications per person was 5 (Ryan et al. 2009). Inappropriate drug prescribing and errors of drug omissions are highly prevalent in that population (Ryan et al. 2009). Use of psychotropics in the home-dwelling elderly persons, aged 75 years or over in the EU population, was markedly higher in excessive polypharmacy group i.e. 77%, than in polypharmacy group i.e. 42%, and non-polypharmacy group i.e. 20% (Jyrkka et al. 2009). Potentially inappropriate prescribing is frequent in community-dwelling older adults with depressive symptoms (Lee et al. 2013). The prevalence of antidepressant and sedative or anxiolytic drug use in community-dwelling older men was 8.0% for antidepressants and 5.7% for sedatives or anxiolytics (Ilomaki et al. 2013). It has been shown in a large proportion, that these people use daily alcohol with psychotropic drugs (Ilomaki et al. 2013). In people >65 years, over period of 4 years, from the total number of all recorded outpatient visit, nearly 20% was associated with the prescribing of potentially inappropriate medications (Lai et al. 2009). Among the most prescribed potentially inappropriate medications were long-acting benzodiazepines, which were prescribed in more than 20% of elderly patients (Lai et al. 2009). Use of benzodiazepines is widespread in geriatric psychiatry, but information about its use in patients who are referred for hospital treatment is not reliable (Hoiseh 2013). The use of potentially inappropriate medication is very common in the elderly homebound population. On average, they take nearly 10 drugs, including over-the-counter medications and dietary supplements (Golden et al. 2011). About 30% of them used benzodiazepines and barbiturates, and 25% used at least one potentially inappropriate medication (Golden et al. 2011).

In the outpatient primary care settings, the risk factors for potentially inappropriate medications were female sex, polypharmacy and the number of primary care visits (Buck et al. 2009). Potentially inappropriate prescribing is frequent in community-dwelling older adults with depressive symptoms (Lee et al. 2013). The

prevalence of psychotropic medications prescribed in Thai patients of the primary care outpatient clinic was 9%, and this prevalence increased with older age and in female patients. The most prescribed psychotropics were intermediate-acting benzodiazepines such as lorazepam and alprazolam (Prueksaritanond et al. 2009). In addition to mental illness, these medications were prescribed for musculoskeletal disorders and chronic pain disorders (Prueksaritanond et al. 2009). Among EU non-institutionalized people aged ≥ 65 years, almost 15% received potentially inappropriate medications. The most widely prescribed medications were benzodiazepines, temazepam and diazepam, and antidepressant amitriptyline (Leikola et al. 2011). In community-dwelling older adults, 25% were taking benzodiazepines, while established benzodiazepine substance dependence was found in 10% of these subjects (Voyer et al. 2010). Factors associated with benzodiazepine dependence were female gender, presence of the cognitive impairment, panic disorder, suicidal ideation, and a degree of embarrassment in obtaining help for emotional problems (Voyer et al. 2009). Among the senior benzodiazepine users living in the community, 9.5% prevalence of benzodiazepine dependence was estimated (Nkogho Mengue et al. 2014). This dependence increased the risk of minor depression in women (Nkogho Mengue et al. 2014). Study conducted among older adults, age 65 or over, in the Center for Preventive Medicine, reported that the risk of potentially inappropriate medication consumption increased with age, number of drugs taken, and frequency of the visits to the physician (Bongue et al. 2009). This risk was also higher among women, elderly living alone, and in those with low education levels (Bongue et al. 2009).

Antipsychotics

In nursing homes, the average prevalence of prescribing antipsychotic is 19% (Tjia et al. 2014). Antipsychotic use is common among Veterans Affairs nursing home residents aged 65 and older (Gellad et al. 2012). It has been reported that 25% of residents received an antipsychotic drug, and most of them had an evidence-based indication use (Gellad et al. 2012). Residents with aggressive behavior, and polypharmacy, as well as those residing in Alzheimer/dementia special care units, were more likely to receive antipsychotics (Gellad et al. 2012). In the study about the long-term care of elderly, the use of antipsychotics was associated with disruptive behavior of residents (Monette et al. 2012). It has been found that living in rooms in institutions for long-term care of elderly people without a clock; calendar or telephone was associated with the use of antipsychotics (Monette et al. 2012). Among elderly aged 84, who were predominantly women, 23% of the residents were prescribed 1 or more antipsychotics (Nishtala et al. 2010). Psychiatric diagnosis, psychosis and dementia were associated with significantly higher

probability for the use of antipsychotic medications (Nishtala et al. 2010). Older people with dementia and comorbid mood disorders were rarer prescribed atypical antipsychotics if they were treated with antidepressants (Nishtala et al. 2010).

In nursing homes in EU population prescribing of psychotropic medications, especially antipsychotics, was significant (Richter et al. 2012). In residents transitioned into or out of nursing home, 70% received at least one psychotropic medication, mainly antipsychotic medication (Rolland et al. 2012). Psychotropic medications, and in particular antipsychotics, were significantly more frequently prescribed to demented than the non-demented residents (Rolland et al. 2012). Anti-dementia drugs (acetylcholinesterase inhibitors or NMDA receptor antagonists) were prescribed to 53.7% of demented residents (Rolland et al. 2012). A retrospective study conducted on more than 300 general practices showed that more than 1 in 6 older people were prescribed antipsychotic drugs, causing more harm than good (Guthrie et al. 2010). In 76 nursing homes, with the resident's mean age of almost 85 years, who were mainly women, the prevalence of antipsychotic utilization was greater than 30% (Azermai et al. 2011). Antipsychotics were mainly used for agitation within dementia, and psychosis with or without dementia. The main problem in prescribing antipsychotics was combining of antipsychotics and their long-term use (Azermai et al. 2011). It has been shown that 92.5% of physicians were using psychotropic medications in the treatment of agitation associated with dementia in nursing home residents, mainly haloperidol (39%), while they suggested non-pharmacological treatment like environmental change less often (Cohen-Mansfield et al. 2013). Physicians with specialty in geriatrics showed more familiarity with non-pharmacological interventions, compared to those who were non-specialized (Cohen-Mansfield et al. 2013). Behavioral and psychological disorders caused by dementia are frequently treated with antipsychotic medications (Ervin et al. 2012). The older adults with dementia, living in specialized care units in Sweden, receive in great proportion antipsychotics, especially a long-term treatment (Gustafsson et al. 2013). Elderly who behave aggressively, passively and with mild cognitive impairment, have increased risk for prescribing antipsychotics (Gustafsson et al. 2013). Dementia is common in residents in nursing homes in the USA, and almost 33% of them received antipsychotic medications, mainly atypical antipsychotics (Kamble et al. 2009). Second generation antipsychotics are often used for off-label indications in nursing home residents (Kamble et al. 2010). There is a high level of non-evidence-based use of these drugs combined with recent data on safety and efficacy (Kamble et al. 2010). Although typical and atypical antipsychotic medications are effective in treating the symptoms of delirium, they are not approved by the U.S. FDA for this indication (Catic 2011).

Benzodiazepines

Prescribing of anxiolytics, hypnotics and sedatives is frequent in the elderly population aged 65 or over, with the peak use in those aged 85-89 years (Hollingworth & Siskind 2010). The most prescribed sedative was diazepam, followed by alprazolam and oxazepam, while the most prescribed hypnotic was temazepam, followed by nitrazepam (Hollingworth & Siskind 2010). The prevalence of psychotropic, potentially inappropriate prescription among nursing homes residents in Austria is highly prevalent (Mann et al. 2013). It is estimated to be 55%, and among the most prescribed medications are prothipendyl and benzodiazepine lorazepam (Mann et al. 2013). With the long-term use of benzodiazepines in therapeutic doses, physical dependence can occur, while the use of benzodiazepines in elderly people leads to increased risk for falls (Uzun et al. 2010).

Non-benzodiazepine hypnotics (z-drugs) are frequently inappropriately used in elderly population (Neutel et al. 2012). The prevalence of chronic benzodiazepine or non-benzodiazepine hypnotics (z-drugs) use in residents in nursing home in EU population is very high (Bourgeois et al. 2012). It has been reported that 50% of residents in nursing home use benzodiazepines, mainly due to insomnia, anxiety and unrest (Bourgeois et al. 2012). Very often, daily doses of benzodiazepines exceed the upper limit for geriatric population (Bourgeois et al. 2012). In 12 nursing homes with predominantly female population, almost half of the residents had dementia and nearly 25% had depression (Petek Šter & Cedilnik 2011). Among them, nearly 75% received at least one psychotropic medication, most frequently hypnotics and sedatives, or antipsychotics, antidepressants and anxiolytics. Resident's characteristics associated with psychotropic medications were female sex, older age, permanent restlessness, dementia, depression, and the number of prescribed medications, while physician's characteristics were male sex (Petek Šter & Cedilnik 2011). In older adults in Israel, higher use of sedatives, hypnotics, and anxiolytics was detected among women, but less frequent use was observed in older religious adults (Blumstein et al. 2012). Subjects, who are older and chronically ill, have the highest risk for inappropriate use of benzodiazepines (Manthey et al. 2011). Among institutionalized nonagenarians, there is a high prevalence of psychotropic medication use, and the use of hypnotics was the most common (Lesen et al. 2011). Potentially inappropriate psychotropic medication was observed in 33% of subjects (Lesen et al. 2011). It has been found that among the majority of nursing home residents, the mean number of drugs given on regular basis per residents were 7.9 per day (Hosia-Randell et al. 2008). Utilization of potentially inappropriate medications is common among nursing home residents, and polypharmacy increases the probability of drug-drug interactions. The most prevalent potentially inappropriate drugs prescribed were short-acting benzodiazepines, at higher

doses than recommended, of which temazepam >15 mg/day was the most commonly used medication and the most common potentially inappropriate medication prescribed to all residents (Hosia-Randell et al. 2008). In the community-dwelling elderly EU population, 18% used at least 1 benzodiazepine drug (Bazin et al. 2012). More sedentary and less active lifestyle in the elderly is associated with the use of benzodiazepine (Bazin et al. 2012).

Antidepressants

The prevalence of antidepressants use among older EU and US population was significantly increased during the last 15 years (Parabiaghi et al. 2011, Ruths et al. 2013, Hanlon et al. 2010, Karkare et al. 2011). Nearly 50% of elderly nursing home residents received antidepressants (Karkare et al. 2011). The increase in prevalence was significantly pronounced in the community-dwelling elderly people, aged 75 years and over (Parabiaghi et al. 2011). In the long-stay nursing homes residents, proportion of residents with diagnosed depression who received antidepressant therapy was increased (Gaboda et al. 2011). More than 50% of residents had a diagnosis of depression, and consequently more than 80% of residents received an antidepressant medication (Gaboda et al. 2011). Comorbid conditions such as cardiovascular disease, anxiety disorder, arthritis, pain management and osteoporosis are common in older people who are taking antidepressants (Caughey et al. 2010). Treatment of comorbid conditions leads to potentially inappropriate prescribing and increases the risk for adverse events in older people taking antidepressants (Caughey et al. 2010). In older veterans who live in community centers, there was a frequent inappropriate use, overuse or underuse of antidepressants (Hanlon et al. 2011). Underuse or overuse was associated with residents who have been taking antipsychotics without evidence of schizophrenia, while moderate to severe pain and the prescribing of anxiolytic or hypnotic increased the risk of potentially inappropriate use of antidepressants (Hanlon et al. 2011). Nursing homes residents aged 85 years and over, who were not married, were less likely to receive antidepressants compared to their counterparts, and Caucasians were more likely to receive antidepressants than non-Caucasians (Karkare et al. 2011). Residents who were more independent in making decision and those who were more mobile were less likely to receive antidepressants (Karkare et al. 2011). The existence of depressed mood indicators, as well as a history of falls and fractures, increased the probability of prescribing antidepressants (Karkare et al. 2011). In the older adults aged 65 years and over with diagnosed depression, use of antidepressants was significantly associated with different adverse outcomes, such as all-cause mortality, attempted suicide/self-harm, stroke, transitory ischemic attack, hyponatremia, falls, fracture, and epilepsy/seizures (Coupland et al. 2011a,b).

Antidepressants such as mirtazapine have a unique mechanism of antidepressant action and a unique profile of unwanted adverse effects. Mirtazapine will less likely cause hypertension, tachycardia and tremor than tricyclic antidepressants, but will more likely cause weight gain, salivation, somnolence and fatigue than SSRIs (Watanabe et al. 2010). Mirtazapine causes more likely fatigue than SNRI (venlafaxine), and are more likely weight gain than trazodone (Watanabe et al. 2010). Among elderly residents in care homes with depression, SSRIs are prescribed more frequent than other antidepressants (Nishtala et al. 2009). SSRIs were the most prescribed antidepressants in older veteran nursing home residents aged 65 and over (Hanlon et al. 2011). Increased prescribing of antidepressants was related to more time spent with physician extenders, registered nurses, nurse aides and co-prescribing of sedatives and hypnotics, while protective factors were medical directors and physicians who spend more time in the institution and co-prescribing of anxiolytics and antipsychotics (Hanlon et al. 2010). It has been found that 1 in 5 prescriptions to elderly people in the primary care setting were inappropriate (Oponodo et al. 2012). Diphenhydramine and amitriptyline are the most inappropriate prescribed medications with high risk of adverse events (Oponodo et al. 2012). A prevalence rate of prescribing antidepressants in older primary care patients is nearly 4 times higher among community-dwelling elderly than in care home residents (Harris et al. 2012). It has often been found that both groups were prescribed antidepressants with no documented indication (Harris et al. 2012).

Factors that influence the prescribing of psychotropic drugs

Some socioeconomic characteristics have a great impact on psychotropic drugs utilization (Lessen et al. 2010). Individuals with low income, who are non-married, have a higher probability for utilization of potentially inappropriate psychotropic medications. Individuals not ever been married and the divorced had the highest probability (Lessen et al. 2010). Increased likelihood of polypharmacy, excessive polypharmacy and potentially inappropriate medication use is associated with lower education level in elderly, slightly more in women than in men, particularly for polypharmacy and potentially inappropriate drug use (Haider et al. 2009). Predictors of psychotropic medications prescriptions (except for antipsychotics and hypnotics) were female gender, age <80 years, and residency in special care units (Ruths et al. 2013).

Risk factors associated with psychotropic drugs

The use of antipsychotics is associated with many adverse events. Systematic literature review has shown that older people who use antipsychotics have a higher probability for cerebrovascular accidents than elderly people who do not use antipsychotics (Sacchetti et al.

2010). The risk for stroke was higher in the first weeks of treatment (Sacchetti et al. 2010). The use of first and second-generation antipsychotic medication in older adults was not significantly associated with an increased risk of cerebrovascular adverse events, but was associated with the duration of therapy longer than 30 days (Mehta et al. 2010). The use of antipsychotic quetiapine among community-dwelling older adults (aged ≥ 50 years) was associated with moderately lower risk for cerebrovascular adverse events compared with olanzapine (Chatterjee et al. 2012). Compared with the non-use, only SSRIs were associated with increased risk of ischemic stroke in elderly patients, particularly as a short-term effect (Trifiro et al. 2010 a).

In a retrospective analysis of large US hospitals database for the year 2006, it was suggested that the risk of pulmonary embolism was higher in antipsychotic users than in general population (Allenet et al. 2012). Clozapine was associated with the highest and dose-dependent risk (Allenet et al. 2012). In elderly population with dementia, increased risk for venous thromboembolism (VTE) was observed in current users, particularly in new users, and in users treated with a combination of atypical and conventional antipsychotics (Schmedt & Garbe 2013).

Among the many risk factors for aspiration pneumonia in frail elderly people are age, male gender, severe dementia and antipsychotic drugs (van der Maarel-Wierink et al. 2011). Treatments with typical and atypical antipsychotics in elderly patients are associated with risk for community-acquired pneumonia in a dose-dependent manner (Trifiro et al. 2010 b).

The utilization of psychotropic medication, including benzodiazepines, particularly long-acting medications, but also antidepressants and antipsychotics, is associated with an increased risk for falls in older adults (Bloch et al. 2011). Withdrawal of psychotropic drugs in the elderly should be a priority, because such a simple intervention can significantly prevent falls, fractures and consequent complications (Hill & Wee 2012). In older adults, opioid medications increase the risk of injuries, particularly codeine combinations (Buckeridge et al. 2010).

The use of antipsychotics leads to small increase of risk of hip fractures among older adults with dementia residing in nursing homes (Jalbert et al. 2010). Conventional antipsychotics had slightly higher risk than atypical agents (Jalbert et al. 2010). Long-term use of antipsychotics leads to greater risk of hip fracture than short-term use (Jalbert et al. 2010). The highest risk for falls was observed in elderly population; both in men and women aged ≥ 65 years shortly after initiating psychotropic drugs in the treatment (Moden et al. 2010). Using psychotropic drugs even three months before the fall was associated with more than double risk for falling accidents in men and women (Moden et al. 2010). Psychotropic medications such as opioids, antidepressants, anxiolytics, sedatives and hypnotics, showed a similar pattern of association with falls (Moden et al. 2010).

The main risk factor for falls in the institutionalized older adults was the number of diseases (Damian 2013). Other contributing risk factors were urinary incontinence, antidepressants, arrhythmias, and polypharmacy (Damian et al. 2013). High score on Neuropsychiatric Inventory scores was recognized as a significant and independent predictor of falls (Sylliaas et al. 2012). In preventing falls in nursing homes, special attention should be dedicated to residents with severe dementia, behavioral symptoms and the use of sedatives (Sylliaas et al. 2012).

Increased risk of hip fracture was associated with treatment with antidepressants, especially SSRIs in older people (Bakken et al. 2013). In older women, SSRI use was associated with a higher risk of non-spine fractures, but not with hip fractures (Diem et al. 2011). There is an increased risk for hip fracture in older people who use anxiolytics and hypnotics, including short-acting benzodiazepine anxiolytics and z-hypnotics (Bakken et al. 2014). People who use z-hypnotics had the highest risk for hip fracture at night (Bakken et al. 2014). Potentially inappropriate prescribing was associated with admission of the older people to the emergency department after falls (McMahon 2014). In these subjects, 12 months after the fall, potentially inappropriate prescribing was not significantly reduced.

The risk for mortality associated with different antipsychotics used in elderly nursing home residents differed significantly (Hybrechts et al. 2012). Use of haloperidol was associated with increased, and use of quetiapine with decreased risk for mortality, compared to risperidone use (Hybrechts et al. 2012). The effects were the strongest shortly after the initiation of treatment. There was a dose-response relation for all drugs except for quetiapine (Huybrechts et al. 2012). In a study of male veterans, aged 65 years and older, with dementia, frequently prescribed doses of haloperidol, olanzapine and risperidone, but not quetiapine, were associated with short-term increase in mortality (Rossom et al. 2010). Within the first 40 days of stay in nursing home, the risk for mortality was almost twice as great among those residents who used typical antipsychotics, compared to those that used atypical antipsychotics, and risk decreased after 40 days (Aparasu et al. 2012). Residents, who were admitted to facility with higher intensity of antipsychotic drug use, had an increased risk of death, despite similar clinical characteristics at admission (Bronskill et al. 2009). Older adults patients admitted to nursing homes, had the risks of death and femur fractures, associated with the use of conventional antipsychotics, antidepressants and benzodiazepines, which are similar or greater than the risks associated with the use of atypical antipsychotics (Hybrechts et al. 2011). Clinicians should be aware of these facts when making prescribing decisions (Huybrechts et al. 2011). Conventional antipsychotics among nursing home residents who are affected by dementia were associated with a higher risk of all-cause mortality than atypical agents (Liperoti et al. 2009).

Older adults, with Alzheimer's disease, which were treated with atypical and typical antipsychotics, had 2-5 fold higher mortality compared to non-users (Musicco et al. 2011).

Interventions

In medical practice, the most common intervention performed by physician is to write a prescription. Because of many medical conditions, older people require more medications (Bowker et al. 2012). Psychotropic medications use in older adults is most consistently associated with risk of falls (Hill & Wee 2012). As a modifiable factor, withdrawal of psychotropic drugs in the elderly should be a priority. All of the randomized trials on the prevention of falls to date showed that the largest effect was achieved by a simple intervention, which constitutes weaning users of psychotropic drugs from their medications (Hill & Wee 2012). Withdrawal of psychotropic medications, in particular benzodiazepines and benzodiazepine-related medications, in elderly aged 65 and over, can lead to a significant reduction of the risks of falls requiring medical intervention (Salonja et al. 2012). Cessation of psychotropic drugs has a positive effect on falls and cognitive status in older adults (van der Cammen et al. 2014).

Information technologies

Application of information technologies such as computer-assisted alerts and electronic prescribing tools could help in constant monitoring of these medications and thus prevent the falls in elderly people (Huang et al. 2012). Direct delivery of educational tool can change a risk perception of inappropriate prescribing in older adults (Martin et al. 2013). The incidence of medication administration errors is high in long-term residential care (Szczepura et al. 2011). A barcode medication administration system can capture medication administration errors and prevent these from occurring (Szczepura et al. 2011).

Protective factors

Protective factors against increased prescribing of antidepressants in nursing home residents were the presence of medical directors, and the presence of physicians who spend more time in the facility, and co-prescribing of anxiolytic and antipsychotic medications (Hanlon et al. 2010). The quality of prescribing in nursing homes and special care units for demented elderly people is negatively correlated with the number of prescribers per resident (Olsson et al. 2010). Reduction of the number of prescribers raises the quality of prescribing in this vulnerable population (Olsson et al. 2010). Medications with anticholinergic activity adversely affect the cognitive abilities of older adults. Recognizing the anticholinergic activity of certain medications may represent a potential tool to improve cognition (Campbell 2009).

Treatment of older adults by specialist in special aging units leads to a lower potentially inappropriate medications (Onatade et al. 2013). Among the most effective interventions that lead to a reduction of inappropriate prescription in elderly, both in community and hospital settings, are multidisciplinary case conferences including a geriatrician (Kaur et al. 2009). One time counselling by geriatrician, followed by one hour lecture about psychotropic and other related medications, had positive effects in reducing the number of regular users of benzodiazepines and similar medications (Salonja et al. 2010).

The role of general practitioner

The general practitioner has a central position, and his sensitization to inappropriate prescription allows improving health of the elders (Peppersack 2013). While most of general practitioners are willing to reduce or stop prescribing the psychotropic drugs in older people, there are some obstacles that prevent this decision, such as patient's refusal, and the absence of local offer of psychotherapy or alternative therapy (Lasserre et al. 2010). Since many patients, especially elderly with chronic diseases, receive psychotropic medications such as antidepressants, although they have poorly defined mental health conditions, or no psychiatric diagnosis, these findings require better communication between primary care providers and mental health specialists (Mojtabai & Olfson 2011). Multi-faceted approach and interventions that include different groups such as prescribers as well as consumers have a greatest chance to reduce the use of benzodiazepines (Smith & Tett 2010). Among community-dwelling older people, the introduction of Tai Chi practice was the most cost-effective falls prevention measure (Church et al. 2011). In residential aged-care facilities, the most preventive measures were medication reviews and supplementation with vitamin D (Church et al. 2011).

A role of multidisciplinary teams

Medication reviews conducted by pharmacist(s) can reduce potentially inappropriate medications in elderly in primary care settings (Milos et al. 2013). The interventions of pharmacists, either alone or as members of multidisciplinary team, showed significant improvement in suboptimal prescribing in patients aged 65 years or older (Castelino et al. 2009). Majority of these interventions were aimed to reducing the overuse or misuse of medications (Castelino et al. 2009). Multidisciplinary interventions are important for improving the care of homes residents (Burns & Nair 2014). The role of pharmacists in reducing the burden of medications in this population is increasingly important, and together with the general practitioner and care home nurse, this team can achieve better results, such as reduced use of antipsychotics, as was shown in the UK (Burns & Nair 2014). Inter-professional intervention studies that include pharmacists can reduce unnecessary

prescribing in high-risk elderly patients with polypharmacy (Maher et al. 2014). The intervention of specially trained pharmacists in monitoring the prescribing of psychotropic medications to residents of nursing homes has led to a significant reduction in inappropriate prescribing of psychotropic drugs, but had no effect on falls (Patterson et al. 2010).

Training of care home staff and monitoring of psychotropic medications can help in non-pharmacological managing of behavioral and psychological symptoms among older adults with dementia (Khan & Curtice 2011).

Older adults who suffer from anxiety disorders and generalized anxiety disorder showed a clear benefit from both pharmacological and psychotherapeutic interventions, as well as of the cognitive behavioral therapy (Goncalves & Byrne 2012, Wolitzky-Taylor et al. 2010).

All health professionals who provide health care to older people must take responsibility for appropriate prescribing (Page et al. 2010).

CONCLUSION

The prevalence of prescribing psychotropic medications to older adults remains still high. Inappropriate prescribing of psychotropic drugs and polypharmacy are present in institutionalized as well as in non-institutionalized older adults and can cause adverse health events, and might significantly reduce the quality of life of these vulnerable groups. Reduction and withdrawal of psychotropic drugs should be a priority in the treatment of older adults, but medications that are indicated, or are useful for older adults, should not be omitted. Reducing the institutionalization of older people can have a beneficial effect on the lower utilization of psychotropic medications. It is necessary to implement other proven non-pharmacological treatments, such as psychotherapy and cognitive behavioral therapy. It is important to create conditions for better communication between health care professionals, older adults, their relatives and carers.

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