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## Falls among elderly and their connection with polypharmacy and polypragmasy

Adrian Bartoszek<sup>1</sup>, Andrzej Sagan<sup>2</sup>, Wojciech Korga<sup>3</sup>, Kamil Szalast<sup>4</sup>

<sup>1</sup> Faculty of Medicine, Medical University of Lodz, Lodz, Poland

<sup>2</sup> Control Engineering and Robotics, Faculty of Electronics, Wrocław University of Science and Technology, Poland

<sup>3</sup> Computer Science, Faculty of Mathematics, Physics and Computer Science, Maria Curie Skłodowska University in Lublin, Poland

<sup>4</sup> Civil Engineering, Faculty of Civil Engineering and Architecture, Lublin University of Technology, Poland

**Corresponding author:**

**Adrian Bartoszek**

email: [adrianbartoszek96@gmail.com](mailto:adrianbartoszek96@gmail.com)

ORCID: 0000-0002-6840-7320

### Summary

Falls, as a part of so-called great geriatric problems, cause a decrease in functional capacity and negatively affect the quality of life of older people. Risk factors for falls are divided into internal and external ones.

The aim of the article is to describe the problem of falls among the elderly, with particular emphasis on recurring falls and their relationship with polypharmacy and polypragmasy.

The work presents the principles of rational pharmacotherapy for older people. It should be emphasized that in addition to rational pharmacotherapy, fall prevention programs, including strength and coordination trainings and education of the elderly in the topic of organizing a safe home environment, should be implemented.

**Key words:** falls, recurrent falls, elderly, polypharmacy, polypragmasy.

## **Introduction**

Among the many health problems of the elderly, falls, which belong to the so-called great geriatric problems, deserve special attention. They reduce functional capacity and affect the quality of life of older people around the world [1].

Fall is a sudden, unintentional change of position, caused by loss of balance during walking or performing other activities, as a result of which the elderly person is on the ground, floor or other low-lying surface. People can be called falling, if they suffered one or two falls during a given time (most often the last 12 months), while one can speak about recurrent falls when they occur two or more (according to Marcum et al.) [2] or at least three (according to Kwiatkowska et al.) [3] times during the observation period.

The aim of the article is to describe the problem of falls among the elderly, with particular emphasis on recurring falls and their relationship with polypharmacy and polypragmasy.

## **Epidemiology of falls**

Among people over 65 living in their own homes, more than 30% experience a fall at least once a year, above 80 years of age - 40%, and above 90 years of age the percentage increases to 50%. In nursing facilities, falls happen more often - to about 50% of their residents, while they also get injured more often. In almost half of these cases falls are a recurring problem [4,5,6].

In Poland, according to the Pol Senior survey, 23.1% of people aged over 65 fall, of whom 56.2% are women. With age, the frequency of falls increases - from 12% for people aged 65-69 to 35.9% for people over 89 years of age. The falls most often occur during walking (44%), getting up and sitting down, whereas they rarely occur during sports [7].

Most people fall once a year, but according to Milat et al. almost every tenth falling elderly person declared four or more falls in the last 12 months. Half of these happen at home and 80% during the day. Falls at night are mainly related to getting up to use the toilet [8].

However, the number of people falling down may be underestimated, due to lack of reporting of the incidents, especially if there were no negative consequences.

The increase in the percentage of older people falling means that the number of people at risk will constantly rise. Research by the National Institute of Geriatrics, Rheumatology and Rehabilitation (NIGRIR) predicts that by 2050 the number of falls among elderly in Poland will double due to rapidly progressing aging of the population [9].

## **Risk Factors for Falls**

Factors, which crucially increase the risk of falling are so-called internal risk of falling factors, for example advanced old age and its accompanying blurred vision, hearing impairment, changes in body shape of elderly person who suffers from hypoesthesia or proprioception disorder, sarcopenia (loss of muscle mass), which mainly affects leg muscles (difficulty in rapid reacting to suddenly appearing obstacles), besides multiple morbidities, concurrently occurrence of chronic diseases. Fall-out-related diseases include neurological, cardiovascular, musculoskeletal, metabolic, gastrointestinal, genitourinary and mental disorders. Particularly often, the fall-out tunnel predisposes Parkinson's syndrome (the risk of falling increases 10-fold). In addition, the risk of a fall increases dementia by two to three times (including behavioral disorders in the form of agitation, wandering and psychotic symptoms). The most at risk of falling are people who are able to stand up from the chair, but they require help with walking and are psychomotor-stimulated. Any sudden disease, such as

pneumonia or dehydration, worsening the general condition may contribute to a temporary increase in the risk of falls. Fall can also be the first manifestation of an acute illness or exacerbation of a chronic disease process in an elderly person [10].

The external or environmental risk factors for falling can include slippery and uneven surfaces, stairs, protruding thresholds or poor lighting, poorly selected footwear, unfit orthopedic equipment, too loose clothing [11, 12].

External factors in around 50% of cases are responsible for falls among older people. For the most part, both external and internal factors overlap with the loss of balance and consequent collapse [13]. The likelihood of experiencing the adverse consequences of falls increases in the case of recurrent falls and with an increase in the number of risk factors [14].

### **Falls as a financial factor of recurring falls**

However, the basic risk factor for subsequent falls is the occurrence of such an adverse event earlier in the patient [15, 16, 17]. It is emphasized that the reason for the recurrence of falls, more often than in the case of occasional falls, are ordinary daily activities, i.e. walking, changing position accompanied by worse performance of getting out of the chair, walking test, standing foot (tandem stand) and mid-lateral deflections on the platform (medio-lateral sway) [18]. In the Žak - Gryglewska study, it was shown that during the year of observation in the elderly people who fell, the risk of subsequent falls increases significantly in 1/3 of the subjects. The biggest threat was situations with a slight displacement of the center of gravity, i.e. a change in body position and rotation. During the year, 1/3 of the subjects suffered further falls. These people were clearly older and had worse results in the Tinetti test [19]. In the Moreira study among 148 elderly people, after a one-year follow-up period, recurring falls concerned 17.3% of respondents with a range of 2 to 9 falls [6].

Risk factors associated with recurrent falls are similar to those occurring in single falls, but because repeated falls are more likely to be injured, people with repeated falls are an important group to which preventive measures should be addressed [16]. Repeated falls are associated with a greater manifestation of loss of self-confidence, social isolation, an increase in the probability of taking home social security and death [14].

### **Consequences of falls**

The consequences of falls are most often fractures of the femur, forearm and spine leading to immobilization, pressure ulcers or pneumonia. It can even lead to death as a result of hypothermia resulting from the absence of household members or the support of neighbors immediately after the fall of the elderly at home [20]. Even if the fall did not lead to serious body injuries, it can cause so-called "fear of falling"(FOF) which is characterized by addiction, loss of autonomy and depression; dread, a fear of another fall, loss of faith in one's own strength. For fear of another fall there is a limitation of physical activity, avoiding certain activities (eg shopping, cleaning), and secondarily - impairments in fitness. Immobility contributes to the loss of bones and muscles, which increases the risk of another fall [3, 21].

The FOF may also affect people who have not experienced a fall, but have witnessed a fall or learned about its effects in someone else [22]. Tinetti et al. Estimated that 48% of older people who fell at least once experienced fear of another fall, and 26% of people decreased their daily activity because of this [23]. This is a typical example of self-inflating circles in geriatric medicine, which is accompanied by an underestimated cause of falls in the form of adverse drug reactions.

### **Connection between polypharmacy, polypragmasy and recurring falls**

An elderly person with polypathology requires adaptation of comprehensive therapeutic regimens with the use of several drugs recommended by multiple specialists simultaneously (polypharmacy), which can lead to polypragmasy [24]. Polypharmacy is the use of four or more prescription medications per day [25], whereas polypragmasy is sometimes described as the situation when the patient is taking at least one drug for which there is no indication or more drugs than is clinically indicated [26]. Adverse drug reactions in the elderly are two or even three times more common than in the young, and the multitude of diseases at this age promotes the usage of multiple drugs, also those available without a prescription. At the same time, along with the number of medicines taken, the risk of revealing their side effects increases, and the use of more than 4 drugs or psychotropic drugs clearly increases the likelihood of falling [10] and 1.5-2 times increases the likelihood of recurrent falls in the elderly [25]. It seems, however, that the strongest association with the occurrence of falls are psychotropic drugs [27]. In addition, it is believed that the risk of falls depends on the type of drug used. Also, the addition of any new drug beyond the established 4 drug regimen increases the risk by another 14% [26]. Meta-analysis by Ming et al. indicates a higher probability of recurrent falls due to the use of antidepressants (1.5-3 times), sedatives and hypnotics (1.8-4.5 times), antiepileptic drugs (3, 15 times higher probability of recurrence), analgesics (1.30-5.60), laxatives (2.1 times higher risk of multiple falls), anticholinergic (1.34 times the probability of relapses). When it comes to cardiovascular medication, older people taking vasodilators, such as nitrates, are twice as likely to experience recurrent falls, while those taking diuretics have a 1.8 times higher likelihood of recurrent falls. Polypharmacy in the meta-analysis increased from 1.5 to 2 times the probability of recurrent falls in older people [25]. According to Hilmer et al., the use of sedatives, hypnotics, anticholinergic, antidepressants, and antidiabetic agents also promotes falls [28]. Cardiac drugs, which are among the most commonly used among the elderly, may promote recurrent falls, for example by lowering blood pressure (antihypertensive drugs, diuretics, vasodilators), inducing cardiac arrhythmias (cardiac glycosides) or causing atrio-ventricular blockade (verapamil). These drugs can cause fainting, collapse, and as a consequence, slipping or falling. Orthostatic hypotension can affect about 30% of the elderly in the treatment of hypertension [10, 29, 30]. In the report of Kario et al. among people over 65 years of age falls were 2.8 times more common in people with systolic blood pressure below 140 mm Hg (standing up) compared to people with a pressure greater than or equal to 140 mm Hg, but the strongest predictor of falling was the history of past falls [31].

### **Rational pharmacotherapy as a modifiable risk factor in prophylaxis of falls.**

A rational approach to pharmacotherapy of the elderly is one of the most important aspects of their medical care, especially because treatment is usually long-term. The principles of drug use by older people include: consideration of alternative treatments (is pharmacotherapy always necessary?), use of drugs without anticholinergic action, without a strong sedative effect, with a short biological half-life, without active metabolites, which give the least interaction, with a broad therapeutic index and avoiding polypharmacy. The other principles of pharmacological treatment of older people, including prophylaxis of falls, consist of: starting the treatment with small doses and gradually increasing them (the principle of "start low and go slow"), limiting the number of prescribed drugs to the most necessary, avoiding the prescription of drugs with unproven efficacy and new, with little-known tolerance, keeping the treatment monitored in order to quickly detect possible side effects,

verification of current treatment when recommending the next preparation or the emergence of new health problems, use of pharmacotherapy for the shortest possible time, use of clear, easy and written dosing regimens as well as assessment of cognitive (the ability to understand the recommendation) and physical performance of the patient before starting treatment [32].

In the treatment of the elderly, attention should be paid to the case of self-medication (taking herbal supplements, OTC and dietary supplements by the patient without consulting a doctor) and non-compliance, in the form of conscious or accidental errors in the dosage or use of medicines, including overdosing of drugs, taking too few or too small doses of medication, ending treatment prematurely or failure to make a prescription for financial reasons [33].

In addition to rational pharmacotherapy in the prophylaxis of falls, attention should be paid to systematic assessment of the general health of an elderly person and assessment of fall risk, through the use of comprehensive Geriatric Assessment tools such as Tinetti Test and Up and Go Test.

The guidelines developed by the American Geriatrics Society and the British Geriatrics Society indicate the need to diagnose elderly people by a therapeutic team: a doctor, a nurse, a physiotherapist at least once a year to check on frequency of falling, difficulties in maintaining balance and gait[34].

## **Conclusion**

Falls among the elderly cause deterioration of physical and mental health, obstruct everyday activities, lead to isolation and as a consequence, to recurrent falls. Falls have multiple causes and preventive actions should be of multidirectional character: from rational pharmacotherapy through underestimated prevention programs that include strength trainings and education of older people in such areas like minimizing aftereffects and the adaptation of the home environment to increase safety, in which most falls occur. It should be emphasized that many of these causes are modifiable risk factors in the prevention of falls.

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