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ПАДЕНИЯ, КАК ПРОБЛЕМА СТАРЕЮЩЕГО НАСЕЛЕНИЯ ПЛАНЕТЫ, СОВРЕМЕННЫЙ ВЗГЛЯД НА ФАКТОРЫ РИСКА И МЕТОДИКИ ОЦЕНКИ. РОЛЬ СТРАХА ПАДЕНИЙ В УВЕЛИЧЕНИИ ИХ РИСКА

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Falls As a Problem of an Aging Population, a Modern Look at Risk Factors and Assessment Methods. Role of Fear of Falls in Increasing their Risk

Резюме

В статье приводятся современные взгляды на проблему падений у пожилых людей. В связи с мировой тенденцией изменения демографической ситуации — постоянного увеличения доли лиц пожилого и старческого возраста в общей популяции, вопросы гериатрии, как одной из медицинских специальностей становятся наиболее актуальными. В ряду проблем, которые приходится решать гериатрам и всем специалистам, принимающим участие в лечении пожилых пациентов, одной из наиболее серьезных является проблема падений. В статье приводится обзор литературы, посвященный оценке частоты падений в зависимости от пола, возраста, наличия заболеваний и внешних факторов. Подробно разбираются основные факторы риска падений и меры их профилактики. Особое внимание уделяется страху падений, как значимому фактору их риска. Приводятся методы оценки данного фактора риска с применением унифицированных опросников — «Шкалы оценки страха падений» и «Шкалы эффективности падений». Целью данной статьи является привлечение внимания практикующих врачей к проблеме падений в целом и страху падений, как одному из значимых факторов риска, методам его выявления и профилактики.

Ключевые слова: падения, старческая астения, пожилой возраст, страх падений

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Abstract

The article presents modern views on the problem of falls in the elderly. There is a global trend of changing the demographic situation — the permanent increase in the proportion of elderly and senile people in the general population, the issues of geriatrics as one of the medical specialties are becoming the most relevant. Among the problems that geriatricians and all specialists involved in the treatment of elderly patients have to solve, one of the most serious is the problem of falls. The article provides a medical review of the assessment of the frequency of falls depending on gender, age, diseases and external factors. The main risk factors for falls and their prevention measures are discussed in detail. Special attention is given to the fear of falls as a significant risk factor. The methods of validation the risk factor with the use of unified questionnaires — “The scale of assessment of the fear of falls” and “the Falls efficacy scale” are presented. The purpose of this article is to attract the attention of practitioners to the problem of falls and the fear of falls as one of the significant risk factors, methods of its identification and prevention.

Key words: falls, frailty, elderly age, fear of falls

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BP — blood pressure, AH — arterial hypertension, VAS — visual analogue scale, WHO — World Health Organization, BMI — body mass index, SA — senile asthenia, DM — diabetes mellitus, CVS — cardiovascular system, FES — the Falls Efficacy Scale

The delivery of medical care and social support to elderly people is one of the most critical challenges for humanity.

The proportion of elderly and senile people among the world's population is steadily increasing. This is primarily due to the success of medicine, as well as the development of social and psychological services aimed at supporting the elderly. According to the World Health Organization (WHO), by 2050, the elderly population will constitute 22%, which corresponds to more than 2 billion people [1–3]. The fastest growing population group is expected to be 80+: they are expected to make up 25% of the world's elderly population by 2050 [4]. More than 30 million elderly and senile people currently live in Russia. Every year, their number increases by about one million [5]. According to the average forecast by the Federal State Statistics Service, the proportion of citizens above the working age will increase from 25.5% in 2018 to 27.4% in 2025 and will amount to 40.2 million people.

The importance of the problem of population aging for humanity as a whole, both from an economic and ethical viewpoint, facilitated the emergence and development of gerontology as a science and geriatrics as a field of medicine in the 20th century.

Unlike young and middle-aged people, for the elderly, the concept of “health” is not synonymous with the complete absence of diseases [6]. Health for an elderly person

is, first of all, maintaining a satisfactory quality of life and independence from others. A combination of several factors plays an important role in maintaining the quality of life and good functional activity of the elderly. Above all, it is the adequate treatment of existing diseases and prevention of their progression and the development of complications. However, solutions to everyday and social problems and measures to preserve cognitive functions and ease depression play an equally important role. These problems can be solved only through the joint efforts of medical and social workers, together with the families of elderly people.

Assessing the possible consequences of disease, both for an individual patient and for society as a whole, WHO proposed the term “Global Burden of Disease”. This concept includes years of life lost due to disability or premature death. DALY (Disability And life-Year lost) is an important component of assessing the health of the population [6, 7]. The list of diseases and conditions that make up the main burden of disease differs among people of different ages. For people over 60 years of age, the main reasons for lost years of life due to disability are sensory disorders, pain in the spine, chronic obstructive pulmonary disease, depression and falls [6].

Falls are one of the most serious problems for elderly people. Today, the Russian Federation is actively implementing the federal project *Older Generation*. This project pays much attention to the implementation of a set of

measures to prevent falls and fractures as per the guidelines approved in 2019 [1].

Falling is an incident when a person suddenly finds himself/herself on the ground or another low surface, except for cases resulting from a blow, loss of consciousness, sudden paralysis or an epileptic seizure [8–10].

In young people, falls often occur due to external factors (ice, foreign objects under the feet, etc.) or in persons with severe diseases — neurological, cardiovascular, etc. In elderly people, falls are more often due to age-related functional disorders [11].

According to different authors, one-third of patients aged 65 years and older and half of patients older than 80 years have had a fall incident at least once in their life [3, 10, 12]. Fifteen percent of people aged 65+ had multiple falls [16]. Falls are the most common domestic accident in elderly people. Falls are especially frequent in people living in social institutions — about 40% of them fall at least twice a year. According to a study involving 92 patients, whose average age was $74.9 \text{ years} \pm 7.8 \text{ years}$, a history of falls was observed in 21.1% of men and 37.0% of women [11].

Falls in the elderly are closely associated with frailty syndrome. Senile asthenia (SA) is a key geriatric syndrome characterized by an age-associated decrease in the physiological reserve and functions of many body systems. This leads to increased vulnerability of the elderly person to the effects of endo- and exogenous factors, with a high risk of adverse health outcomes, loss of autonomy and death [13, 14].

Falls may result from such manifestations of senile asthenia as decreased muscle strength, visual impairment and impaired balance. On the other hand, repeated falls can trigger progression of SA. The senile asthenia syndrome can be considered a predictor of possible falls [13, 15]. This is because due to the consequences of injuries sustained during a fall, pain syndrome, as well as the fear of falling again, patients significantly reduce their physical activity [11]. Specifically, adequate physical activity is one of the key factors in the prevention of SA progression. In turn, the fear of falls and a decrease in functional activity, and, consequently, a complete or partial loss of independence from the people around them, leads to depression, which is another factor in the progression of SA. This creates a vicious circle — senile asthenia increases the risk of falls, repeated falls lead to increased manifestations of SA.

In a study of 3510 patients aged 60 and over (mean age $71 \text{ years} \pm 0.1 \text{ years}$) with three or more chronic diseases, falls in the anamnesis were registered in 645 (18.4%) patients. Senile asthenia was found in 54% of patients with falls, which is twice higher than in the group of patients without falls (26%). Also, such geriatric syndromes as weight loss (22 and 9%, respectively;

$p < 0.001$); urinary incontinence (22% and 13%, respectively; $p < 0.001$); low mood (76 and 38%, respectively; $p < 0.001$); memory problems (74% and 42%, respectively; $p < 0.001$); difficulties in movement (31 and 27%, respectively; $p = 0.038$) were observed in the patients with falls much more often than in the main group, and the statistical significance of this difference is high [15].

The most serious consequence of falls is injury. Twenty to thirty percent of cases of falls result in injury [12, 16, 17]. In the elderly, injuries can be serious. At an older age, bone tissue restoration is slower, which results in longer immobilization, which is dangerous due to the development of complications associated with impaired blood circulation and the development or progression of depression. Also, in older people, pain syndrome is often more pronounced and prolonged, which also limits mobility and aggravates depression. The need to take more pain relievers and sleeping pills also adversely affects many body functions. One of the most serious injuries in elderly patients is the fracture of the proximal femur. In most cases, it is caused by a fall. Every year, there are 646,000 fatal falls in the world [18].

In cases where a fall does not end with an injury, it can also cause significant harm to health due to psychological consequences: feelings of fear and depression [16, 19]. Even after uncomplicated falls, the mobility of elderly patients is significantly reduced and mortality increases: in 50% of cases, after falls, patients lost the ability to move independently; in people over 85 years of age, 20% of deaths are associated with a previous fall [8].

The incidence of falls varies by gender and age. The likelihood of falls increases with age, which is due to the progression of senile asthenia and the development of sarcopenia. The age 65 to 74 is associated with a 31% risk of falling, which rises to 37% in the 80+ age group [18]. Women fall more often than men, but this difference is most evident in the older age group [2, 8]. More frequent falls in women could be related to their more intense everyday activity. Furthermore, gait significantly changes in elderly people. The foot is less lifted from the surface, which increases the risk of tripping over small objects and uneven floors or soil.

According to a study involving 628 patients aged 65+ (mean age $76.9 \text{ years} \pm 15.5 \text{ years}$), 56.5% of people had falls during the year. The highest incidence of falls (61.36%) was in the age group 85+ ($p < 0.001$). As risk factors for falls, decreased movement speed and balancing ability were statistically significantly more frequent in women than men ($p < 0.001$) [2].

There are differences in gait between elderly men and women. Women tend to waddle with legs close together, while men usually have a flexor posture and gait with small steps with legs wide apart [20, 21]. These differences may also explain the greater risk of falls in women.

Women are at significantly higher risk of fractures from falls than men. This is associated not only with a higher incidence of falls, but also with more pronounced manifestations of osteoporosis.

The risk of falls depends on where the elderly person is: at home, in a nursing home or hospital. In hospitals, the risk of falls more than doubles [8]. This is because, in hospitals and social institutions, the high probability of falls is associated with an unusual environment — furniture, floor structure, etc. Besides, the patients who have to stay away from home have a higher level of depression. One should also take into account such an important fact that patients who need hospitalization or constant care in a boarding house are people with more severe somatic pathology or cognitive impairments.

Elderly lonely people are a special category of patients most vulnerable to falls. Often, they have to perform everyday activities that are excessive due to their somatic or cognitive state. Lonely people often cannot seek the necessary help on time after a fall or injury, which can lead to serious complications due to hypothermia, circulatory disorders, etc.

External and internal falls are distinguished depending on the place and conditions of occurrence. External falls include falls outside the home (on the street, in a store, clinic, etc.) and are more often associated with environmental factors (slippery road, uncomfortable steps). Such falls are typical for younger people who are independent of outside help. Internal falls occur in the house where the elderly person lives. Most often, they occur in persons over 80 years of age with senile asthenia syndrome [22]. The causes of internal falls can be divided into two categories: associated with the patient himself/herself and with his/her environment. The main reasons associated with the patient's health are muscle weakness, decreased vision, and dizziness. External factors are determined by poor arrangement of the apartment — slippery or rough floors, poor lighting, blocked walkways, wires on the floor, etc.

The analysis of the site of falls in 355 patients aged 65+ identified the difference in various age groups. In the 65–74 age group, falls occurred outdoors more often (in 66.25% of cases); at 75–84 years — falls indoors and outdoors occurred with a frequency of 34.88 and 48.84%, respectively. Over the age of 85, people were more likely to fall at home. [2].

Fall risk factors divided into unmodifiable (unmanaged), modifiable (managed) and partially modifiable.

Non-modifiable risk factors

- Age
- Female
- History of falls
- Multimorbidity

- Cognitive impairment
- Recent discharge from an inpatient hospital (no more than 1 month ago) due to a decrease in muscle strength and body asthenization during hospitalization [22].

Partially modifiable risk factors

- Depression
- Chronic pain syndrome
- Age-related musculoskeletal diseases
- Visual impairment
- Polypharmacy

Modifiable risk factors

- Low or high body mass index (BMI), eating disorders
- Lack of physical activity
- Smoking, alcohol abuse
- Movement and gait disorder of various origins
- Sarcopenia
- Fear of falls
- Low vitamin D levels
- Environmental factors

A common consequence of repeated falls is the fear of falling again, which leads to the development or intensification of depression. Even in the absence of trauma, loss of self-confidence, social isolation, and disorientation can develop.

Identification of risk factors and their severity is a key factor in the development of patient management tactics in order to prevent falls and their consequences.

In a study that surveyed 71 elderly patients with recurrent falls, only 21 (29.6%) patients were interviewed by a doctor about the causes and circumstances of the fall, and risk factors were corrected in only 14.1% of cases [8].

Methods of assessing the risks of falling, fear of falls

When assessing the risk of falls, data on the history and physical examination should be taken into account, and special tests and questionnaires should be used to determine the functional, cognitive and psychological characteristics of the patient's body.

The medical history should include concomitant diseases and the degree of their control, administered drugs, their amount, etc. In the structure of multimorbidity, which increases the risk of falls, the most significant are cardiovascular diseases (carotid sinus syndrome, atrial fibrillation, heart failure, orthostatic hypotension), chronic obstructive pulmonary diseases, and joint pathology [1, 8, 9].

In a study involving 155 people with a history of falls and arterial hypertension (AH), in 148 (95.5%) people, the most common risk factors for falls were previous falls (83.7%), visual (75%) and balance (63.5%) disorders, osteoarthritis (63.5%). Patients with BP below the target values had the lowest walking speed ($0.48 \text{ m/s} \pm 0.28 \text{ m/s}$) compared with patients with controlled AH ($0.83 \text{ m/s} \pm 0.34 \text{ m/s}$) and with BP above the target values ($1.11 \text{ m/s} \pm 0.63 \text{ m/s}$), $p < 0.05$. In patients with BP below the target, the incidence of falls was 2.96, BP within the range of target values — 2.56, and high BP — 2.81 per year. Therefore, both inadequate BP control and excessive BP reduction are risk factors for falls. Slow walking, most pronounced in patients with low blood pressure, contributes to the high probability [23].

When more than four drugs were used at the same time, the risk of falling increased 1.3 times compared with patients receiving less than four drugs [10, 11]. The drugs that most significantly increase the risk of falls include nitrovasodilators, diuretics, antiarrhythmics, tricyclic antidepressants, antipsychotics, non-steroidal anti-inflammatory drugs, and non-narcotic analgesics [22].

Also, a very important anamnestic factor is a previous fall. A fall in the previous 6–12 months is an independent factor that at least doubles the risk of falls [24].

During history-taking, the patient should be asked about the presence of possible external factors that may increase the risk of falls: poor arrangement of the apartment, wearing uncomfortable or slippery shoes, use of unsuitable walking aids, wrong spectacles, etc.

The level of the patient's physical activity should be determined while speaking with the patient. Lack of physical activity is a significant factor that increases the risk of falls due to the aggravation of muscle atrophy as a result of insufficient exercise. It has been shown that a decrease in daily physical activity due to illness for 14 days is associated with an increased risk of falls [8].

During a physical examination, the height and weight of the patient should be determined, and the BMI should be calculated. Determination of BMI helps identify a group of people with malnutrition or obesity. A low BMI, indicative of malnutrition, is associated with an increased risk of falls due to severe sarcopenia [22]. Patients with varying degrees of obesity also have an increased risk of falls, which is associated with low physical activity [2].

When examining a patient, besides measuring blood pressure, an orthostatic test should also be conducted. Detected orthostatic hypotension is also a risk factor for falls.

All patients aged 60 years and above who seek medical help should be screened for senile asthenia using

the Age Is Not a Hindrance questionnaire and fall risk assessment using the Fall Risk Self-Assessment Questionnaire [25]. The “stand up and walk” test identifies gait and balance disorders and allows to estimate the strength of the patient's legs.

In the presence of pain syndrome of any origin, it is important to assess the degree of pain intensity using a visual analogue scale (VAS). The intensity of pain is considered high if it is $\geq 40 \text{ mm}$ according to the VAS. In older age groups, chronic pain is associated with depression. The more pronounced the pain syndrome, especially when walking, the more pronounced the symptoms of depression are. Difficulty in sleeping associated with pain or depression can be a common contributing factor to falls. The geriatric depression scale and the health assessment scale are used to determine the emotional state [13].

In patients with intellectual and amnesic disorders, the validated Mini Mental State Examination (MMSE), the Montreal Cognitive Assessment Scale, should be used as reliable primary screening tools for cognitive impairment, including dementia.

In patients over 60 years of age with a risk of falls, a ten-year risk of osteoporotic fractures should be assessed using the FRAX scale (Fracture Risk Assessment Tool) and a decision should be made on the methods of prevention and treatment of osteoporosis [8].

Fear of falls is one of the important factors determining the quality of life in elderly patients and their functionality. Usually, doctors do not pay attention to this issue in their practical work. However, identifying the fear of falls and preventive work with the patient can improve the functional activity and reduce the risk of falls. Fear of falling is a psychological condition. Up to 70% of those who did not have it shortly before the fall, and up to 40% of those who did not fall, reported having a fear of falling. Up to 50% of people with a fear of falling limit or completely stop social and physical activity. There is a close relationship between fear and impaired postural responses [9]. About two-thirds of people experienced fear after falling, and about half subsequently tried to avoid vigorous activity due to the fear of falling [22].

To assess the fear of falls, a short scale for assessing the fear of falling is used (tab. 1). This scale assesses how much the patient is concerned about the possibility of falling while performing daily activities [1].

The falls efficacy scale (FES) evaluates the degree of fear that the patient experiences when performing everyday household activities. The patient must be assessed on a ten-point scale for the confidence of not falling when performing various activities. The scale lists the daily activities that a person needs to independently live in a social environment [26].

Table 1. A short scale for assessing the fear of falling

Action	Not at all concerned about the possibility of falling	A little concerned about the possibility of falling	Very concerned about the possibility of falling	Definitely concerned about the possibility of falling
Dressing or undressing	1	2	3	4
Taking a shower or bath	1	2	3	4
Getting up from the chair	1	2	3	4
Climbing the stairs	1	2	3	4
Going up or down the slope	1	2	3	4
Attending an event outside the home (for example, meeting with friends, relatives, religious services, theater, etc.).	1	2	3	4

Note: Interpretation of the results: 7-8 points — low fear of falling, 9-13 points-moderate fear of falling, 14-28 points-high fear of falling

Table 2. The Falls Efficacy Scale

Action	Meaning: 1 =absolutely sure 10 =not at all sure
Taking a shower or bath	
Reach for bedside tables or closets	
Moving around the house	
Prepare food, without having to carry heavy or hot objects	
Go to bed and get up from it	
Answering a doorbell or phone call	
Sit on a chair and get up from it	
Dressing or undressing	
Take care of yourself (for example, wash your face)	
Sit down on the toilet and get up from it	
Total score:	

Note: The presence of fear of falling is determined when the number of points ≥ 70

The patient must answer the question: How confident are you that you can do the following without falling? Confidence in performing the listed actions should be assessed on a scale from 1 to 10, where 1 means complete confidence, and 10 — complete lack of confidence (tab. 2).

Subsequently, the authors [27] suggested a modified scale, where they added six questions to the existing ten. These additional questions reflected more complex activities outside the home — the social life of older people: walking on slippery surfaces, visiting a friend/relative, visiting crowded places, walking on rough surfaces, walking up or down a hill, attending a social event. Concern for these activities was assessed using a four-point scale. This scale (FES I) measures anxiety when performing more challenging activities (including social activity) than the original Falls Efficacy Scale. The study, which aimed to modify the Falls Efficacy Scale, included 705 people aged 65 to 95 years (mean age 74.7 years).

The FES-I scale was highly reliable (Cronbach’s α = 0.96). Compared to FES, the modified scale showed a greater capacity to differentiate fear of falling between groups, depending on gender, age, profession, past falls, and risk factors.

Fall prevention measures

Fall prevention measures can be divided into general and differentiated [28].

General Fall Prevention Measures

- Educational materials for patients on the prevention of falls — the main objective of education is to affect the modifiable risk factors using the educational program. Only the active participation of patients allows to effectively improve their quality of life, prevent the progression of diseases and contribute to the prolongation of active longevity;

- Physical activity at least 150 minutes per week. Physical exercises for balance training (health walking, running, playing sports, gymnastics); muscle strength (lifting weights, exercising on exercise machines, swimming, cycling); restorative exercises;
- vision correction;
- hearing correction;
- cognitive training;
- a diet with a sufficient protein content should be 68 g/day for men and 61 g/day for women at the age of 60+ [22];
- elimination of environmental safety hazards;
- choosing shoes, using hip protectors, ankle orthoses, walking sticks, walkers and other devices;
- revision of the list of prescribed drugs and their adjustment, especially when it comes to psychotropic drugs;
- adjustment of daily intake of vitamin D and prevention of its deficiency. It has been proven that the incidence of falls decreased by 34% when taking 800 IU of vitamin D every day [22].

The choice *differentiated individual measures to prevent falls* depends on the existing risk factors: cardiovascular diseases (CVD), diabetes mellitus (DM), malnutrition, anemia, dizziness, cognitive impairment, depression, chronic pain, urinary incontinence, sleep disturbances, foot problems. Non-drug and drug treatment of these diseases and conditions is carried out.

Fall prevention is one of the major challenges facing doctors and society as a whole. Falls in a particular person are usually caused by a combination of medical and social factors. Therefore, a multi-level system of prevention should be developed, including social, psychological and medical aspects, with the participation of doctors of different specialties, social workers, relatives and the patient himself/herself. Identification and maximum possible elimination of the causes of falls and psychological work with the patient will help reduce the feeling of fear, which itself is a serious risk factor.

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