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## A rehabilitation approach to the falls of geriatric patients

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### Abstract:

**Background:** Falls of the elderly are not only in themselves one of the most common problems of geriatric patients, but also the cause of many complications that affect permanently or for a shorter period of time affect the quality of life of people over 65 years of age. These changes affect not only the efficiency and motility of the elderly but also may reduce self-esteem, limit social life or cause loss of self-confidence.

**Material and methods:** Analysis of available literature, articles in the Google Scholar database and PubMed using keywords: falls, geriatrics, aging process, problem

**Results:** In clinical practice, many tests and scales are used to prevent the fall of older people and related complications. These include: Timed Up & Go (TUG), Tinetti scale, Dynamic Gait Index (DGI), One Leg Standing (OLS), Four Square Step Test (FSST), Berg test or Functional Reach (FR). Preventing falls can primarily be achieved by the use of appropriate rehabilitation methods, which include, among others, kinesitherapy and properly selected orthopedic equipment. The aim of individually selected kinesitherapy is to restore or maintain the patient's

full fitness through the use of physical exercises to improve the balance, increasing mobility and efficiency. In the case of orthopedic supplies, the most common are baby walkers (without wheels, walker with wheels, using a triangular and quadrangular base) and orthopedic balls.

**Conclusions:** Prophylaxis to prevent destructive effects of falls of geriatric patients should be carried out in a comprehensive manner and cover a wide range of activities. There is a further need for research and discussion on the effectiveness of forms of rehabilitation to prevent the falls of older people

**Keywords:** : falls, geriatrics, aging process, problem

## **Introduction**

The phenomenon of aging is characteristic of developed countries. According to current forecasts, this process will continue to intensify. Many unfavorable phenomena, including diseases, are associated with aging. Changes and disease processes in the body, including balance disorders, mobility problems lead to an increased risk of falls [11].

By definition, a fall is an unintentional and sudden event, as a consequence of which man found himself on the ground, the ground. Falls are a serious geriatric, economic and social problem. According to epidemiological data, falls are the main cause of disability, and are ranked fifth among the causes of deaths of people over 75 years of age. This causes that seniors constitute a large group that benefits from health care as well as social services in society. According to a PolSenior study published in 2012 in Poland, during the year, the falls concern 23.1% of people over 65, more than half of them are women. Statistically, women fall three times more often than men. The frequency of falls increases with age. Contrary to appearances, they do not come to them during sports. Most often falls take place when walking, as well as when standing up or sitting down. Statistically, 60% of falls take place at home [10, 11, 12].

Apart from physical injuries, consequences of falls include also psychological consequences. Fear of a fall, or rather its consequences, leads to isolation and withdrawal from social life. In older people, falls can lead to appear „post-fall syndrome”. Prevention of fractures should not be limited only to a proper diet supporting bone strength. Physical activity and patient education are essential. It causes that the role of physiotherapy in preventing falls of older people increases [10, 11].

### **Causes of falls of the elderly**

The aging process of the body is characterized by reduced exercise tolerance and efficiency of organs and systems. Ongoing revolutionary processes in the movement apparatus such as reduction of muscle mass and strength, locomotion disorders or decline in motor coordination, affect the dysfunction of postural stability and thus the ability to maintain an attitude towards endogenous and exogenous factors. Another risk factor for falling is an altered pattern of walking occurring in the course of neurological diseases, previous injuries or weak muscle tone. Lack of removing the soles from the ground, walking with small steps create difficulties in mobility and overcoming obstacles [11, 22].

Progressive changes in the nervous system typical of old age weaken the functioning of sensory organs: sight, hearing, superficial and deep feeling which makes the senior unable to react quickly to the obstacle [11].

The incidence of falls among geriatric people is influenced by the condition of the cardiovascular system. Orthostatic hypotension defined as a drop in blood pressure results in a balance disorder and dizziness which may result in an uncontrolled fall of the senior during a dynamic change of position. The same situation will occur in the case of vertebral arterial failure often occurring in people with discopathy of the cervical spine [11, 12].

Exogenous factors, i.e. conditioned by the external environment, include inappropriate adaptation of the environment for older people. Thresholds, slippery surfaces, lack of handrails and unnecessary rugs in the senior's apartment increase the risk of falls. The frequency of sight dysfunction among the elderly and especially the lack of binocularity, reduced focus or narrowing of the field of view requires adjusting the appropriate lighting in public places and homes of the elderly [12].

### **Complications of falls of the elderly**

Falls of older people are associated with many physical and psychological consequences that burden their health - that is related to the movement system and the other resulting from contact with others.

The most common physical complications include orthopedic injuries, such as fractures, sprains and dislocations, which very often require surgical treatment and then extend during convalescence. They can significantly reduce the activity of older people, and in the case of hip fractures even lead to the prevention of movement. Long-lasting hospitalization is associated with the immobilization of such people, which in turn increases the risk of bedsores and chafes, carries the risk of thromboembolism and urinary tract infections. In addition, the course of

physical consequences of falls is more serious than in younger people. It is determined by a weakened skeletal system of the elderly, which is caused mostly by osteoporosis, in the course of which bones are much more susceptible to injuries [1, 2, 3].

Remaining in the sphere of the movement system, other effects of falls include soft tissue damage, such as bruises, extensive hematomas, as well as open wounds. Unfortunately, in addition to these less harmful complications are also those that lead to death. The nature and manner of impact of some of them on the elderly population results in deaths, the number of which is estimated in tens of thousands per year and mainly concern people over 65 years of age [1].

Unfortunately, not only physical complications are a problem for older people. In addition to them, they are struggling with difficulties regarding their mental state. The leading expression of his range is the "fall syndrome", which is not a complication of the fall, but also an internally caused reason for limiting the activity of older people, which at this age does not remain at a high level. The fall together with its consequences is a great experience for older people. States from a fall are expressed through fear and fear of another fall, and as a result of its occurrence, elderly people encounter difficulties in performing everyday activities, and also avoiding frequent leaving the home. Movement is associated with the possibility of a recurrence of the fall, trying to do as little activity as possible so that the similar incident does not happen again. They are aware of the difficulties that he caused in the past. Such limitation of activity causes a radical deterioration of physical fitness, and the risk of falling increases at the same time [1, 2].

Older people characterized by high contact and striving for interpersonal interactions, due to the effects of falls, are for some time forced to reduce them. Long-lasting hospital treatment makes it impossible to maintain social activity at the same level as before the fall. Therefore, among the problems of mental state is also distinguished by isolation from society and its associated depression as well as loneliness [1].

One should also not forget that in addition to the above-mentioned obstacles related to both types of complications of falls, the financial coverage of the treatment plays an important role. Orthopedic supplies, as well as paid outpatient rehabilitation (spas, nursing homes) tend to be a heavy material burden for the elderly, who very often are not able to face such costs. Particularly high expenses concern spinal cord injuries as well as cranial-cerebral injuries, for which rehabilitation lasts a long period. The waiting time for reimbursed rehabilitation is not always determined, and its receipt includes, among others, the necessity of writing a referral by the attending physician, waiting for a place, and in the case of hospital rehabilitation - also

obtaining the consent of a doctor in a given department for rehabilitation of a given patient. It happens that this time is too long, and the condition of the elderly is so serious that the improvement process must start immediately. It involves a large financial effort [3].

### **Kinesiotherapy in preventing falls**

The goal of physiotherapy is to restore and maintain the ability to function independently, and in the elderly especially in the field of basic activities of everyday life. Improving the quality of life is of great importance in the elderly. Geriatric rehabilitation is a trend that deals, among others, with the prevention of falls and improvement actions directed to individual organs and systems that are accompanied by various dysfunctions. Movement therapy is the basis of physiotherapy, and its main goal is to restore full physical fitness (when it is possible) or maximal efficiency in chronic diseases, in which the changes are irreversible [2, 4].

In the elderly, systematic physical activity is very important. Such activity can be the morning gymnastics, which is used to mobilize a man to start everyday, systematic activity. These exercises are designed to facilitate the transition from the sleep phase to performing activities and work of everyday life. Elderly people find it difficult to move from lying to standing right after waking up, because they often have dizziness, and sometimes even fainting. It is recommended to perform such exercises as: stretching, turning from side to side, movements in the joints of the upper limbs: shoulder, elbow, wrist, clenching hands and straightening the fingers and movements in the joints of the lower limbs: hip, knee and jumping in a lying position. Then you go to sit on the edge of the bed and exercise the spine, that is, bending the trunk in the forward, backward, sideways - left and right, bent your head back and forth and head circulation. The pace of such exercises should be adapted to each senior individually, and their level of difficulty should be small. Exercises should not cause fatigue, because they are only meant to awaken the senior and stimulate him to act throughout the day. Gymnastics time should last about 15 minutes [4].

The universality of gait disturbances and the loss of muscle strength in the elderly population causes that they are mentioned as the most important causes of falls. It has been shown that there is a remarkably positive relationship between muscle weakness and increased risk of falls. Therefore, exercises should be introduced to strengthen muscle strength, in particular postural muscles and lower limbs muscles. Improvement of gait is another very important point in kinesiotherapy, because the factor that predisposes to falls is gait disturbance. Elderly people are characterized by a slower walk, with a shorter step length, without taking their feet off the ground, with the reduction of the movement of the upper limbs. Coordination and equivalent

exercises are also very important. They require a certain concentration, so they can not be performed in states of fatigue. Factors increasing the level of difficulty are: reducing the plane and changing the support surface, changing the pace and dynamics of the exercises. Physiotherapists can use sensomotor disks, exercise mats, shapes and balls to conduct exercises and to increase the difficulty of exercising [4, 5, 6].

We should not forget about the breathing exercises, which are an integral part of the rehabilitation. Breathing exercises increase the alveolar ventilation of the lungs and exercise them is important for older people. Breathing should be exercised repeatedly throughout the day, for example during a walk or longer sitting. These exercises start with a deep exhale, followed by a breath (inhale) through the nose with the simultaneous rise of the abdomen and exhalation through the mouth with the simultaneous abduction of the abdomen. It should be remembered that the exhalation should last twice as long as the inhale [4,7].

Modern clinical trials carried out all over the world indicate that performing both hospital and home-based rehabilitation reduces incidental falls in the elderly. The most often conducted form of therapy are exercises improving motor coordination. The meta-analysis conducted by Lee Seon Heui and Hee Sun Kim in 2017 showed that exercise had a preventive effect on the rate of falls (risk ratio [RR] 0.81, 95% CI 0.68–0.97). This effect was stronger when exercise combined with other fall interventions on the rate of falls (RR 0.61, 95% CI 0.52–0.72) and on the number of fallers (RR 0.85, 95% CI 0.77–0.95). Exercise interventions including balance training (i.e., gait, balance, and functional training; or balance and strength) resulted in reduced the rate of falls. Sensitivity analyses indicated that exercise interventions resulted in reduced numbers of recurrent fallers (RR 0.71, 95% CI 0.53–0.97) [8, 9].

### **Orthopedic equipment**

The most commonly used orthopedic equipment, which reduce the risk of falls among seniors are: balconies and crutches. There are several types of walkers: no wheels, walker with wheels, triangular and quadrangular base. In the elderly, walker with two wheels at the front and two support places at the back are particularly recommended. Other models are used for small balance disorders. The walkers are used when the elderly person can not move with the help of elbow crutches [1, 21].

In the case of good neuromuscular coordination, older people can use elbow crutches. The patient uses one or two crutches. However, attention should be paid to the posture of the body while walking, when a person uses one crutches - one body tilts towards one side. It is not

recommended to use axillary crutches, because there may be pressure on the arteries and nerve in the axillary region [4, 21].

One of the most common complications of falls of the elderly is the fracture of the femoral neck. To avoid this, special hip protectors can be used. They are put inside the special underwear and protect the older person's hip joint. It is important to choose the right footwear for the elderly. The sole should be non-slip and stabilize the ankle [4, 12].

The equipment should be individually selected for the elderly, and before using it, we should teach the patient to use it properly. Poor use of a walker or crutches can contribute to a fall. It is important that the elderly apartment is equipped with aids to prevent falls: a shower chair, anti-slip mats, handles, an elevated toilet seat in the bathroom [12, 21] .

### **Diagnostic tests and scales**

There are many functional tests that can assess the risk of falling older people. It is important to regularly check the mobility and balance of seniors. All this so that if any irregularities are detected, they can intervene as quickly as possible. In addition, thanks to finding disturbances and actions taken early, the probability of falling and related consequences decreases.

The first very popular test is Timed Up & Go (TUG), meaning "get up and go". The subject sits in a chair and her back is based. The task is to get up from the chair after hearing the "start" command, cross a section of a 3-meter-long road on an even terrain, make a 180 ° turn, return to a chair and sit in the same position as before. The result of the test is the recorded time, which is measured from the moment you say the "start" command until the subject sits in a chair. It is important that the task is carried out as quickly as possible for a given person while maintaining a safe pace. During the test you can only go, do not run. The test is carried out twice and the time is better [13].

Time standards for the test [13, 14]:

- <10 seconds - this time is considered a norm. The subject is slightly exposed to falls.
- 10 - 19 seconds - the need for a deeper analysis, because the risk of falls is on the medium level. The examined person is independent in almost every everyday activity.
- 20 - 29 seconds - the need for accurate evaluation. Exposure to falls is high. The examined person has partial limitations when performing daily activities.
- $\geq 30$  seconds - large limitations in everyday functioning. The person depends on others.

If the time is  $\geq 14$  seconds, it means that the subject is under a high probability of falling.

The next test is the Dynamic Gait Index (DGI), the so-called dynamic walking index. The test consists in the fact that the examined person performs 8 different tasks while walking. These are, for example, changing the speed of the walk, turning the head to the left and right, as well as looking up and down, turning, overcoming obstacles, climbing stairs and going down. While performing each task, fluency, speed, balance and whether a given person needs help to perform the given exercise is assessed. A maximum of 24 points can be obtained, and in each task are assigned from 0 to 3 [13, 15]:

- 0 points - a big problem with the task or inability to perform.
- 1 point - moderate difficulties appear.
- 2 points - slight problems during the task.
- 3 points - the task is performed correctly.

If the person under examination gets <19 points, it means that he / she is exposed to falls.

The next test is One Leg Standing (OLS), which is a test of standing on one leg. The static equilibrium is evaluated by the time obtained. The test is extremely easy to carry out. It involves lifting the lower limb to the height of the mid-leg of the limb, which is located on the ground. The time is measured from this moment. There are discrepancies as to where the test subject is to stand. Some recommend standing on the dominant limb, some on the contrary - on the non-dominant limb. There are also those who allow the subject to choose the limb themselves. Upper limbs hanging freely along the torso. During the test, keep your eyes open and look straight ahead. It is best to choose the point to which the eye will be directed. Three tests are carried out and the best time is recorded. If the subject is able to stay on one leg at least 30 seconds, this means that the person is not exposed to falls [16].

The Tinetti scale is important and often used. It is divided into two main parts. The first one assesses the balance and can get a maximum of 16 points. In the examined person, such skills as: ability to maintain balance during sitting, getting out of the chair, keeping balance after getting up (for 5 seconds) and while standing, maintaining a stable body posture when trying to both open and closed eyes, turning 360 ° and sitting back on a chair. The second part is to assess the walk of the subject. A maximum of 12 points can be awarded. Elements such as: starting gait, step height, length and symmetry, gait continuity and path, torso movements as well as the way of putting feet on the ground are analyzed. The possible number of points to score is equal to 28. If a person is rated at less than 26 points, then there is some disorder. On the other hand, if the result is lower than 19 points, the person is 5 times more likely to fall than



the person who has won all possible points. Receiving at least one in any activity gives information about the need to meet a physiotherapist [17].

Another test is the Four Square Step Test (FSST). It evaluates the dynamic balance. The subject moves forward, backwards and to the side, passing over an obstacle such as a stick or stick. The set that must be crossed by the subject is composed of 4 parts equal in width and length - these may be rods, sticks, etc. Arranged in the shape of a cross. In this way, 4 fields of the same size are created. The test starts with entering the field No. 1. The task consists in passing, according to the clock directions, after each field up to field number 4 and returning to the starting field, ie steps are taken successively in the following fields: 2,3,4,1, 4,3,2,1. The subject must be facing the test for the entire duration of the test. Do not attempt to hit the equipment during the test. Passing through the fields, in each of them both feet must be in contact with the ground. The task should be done in such a short time as possible. There are 2 attempts to be made. Then the better time will be taken into account. Getting time above 15 seconds means that a person is very much at risk of falling [18].

The Berg test is a tool often used to assess the balance and, at the same time, the probability of falling. The subject is tasked with 14 activities, which are rated on a scale of 0 to 4 points. You can get 4 points thanks to a fully correctly executed task. The activities to be carried out include: maintaining the position while sitting, the ability to properly get up from the chair and sit down, correct standing on the ground (with each subsequent task reduces the support surface), walk with 360 degrees rotation, gripping objects and lifting them from the ground etc. You can get 56 points in total. A gain of  $\geq 41$  points gives information that the examined person moves completely independently and is exposed to a fall only to a small extent. However, if the total number of points scored  $<20$  is a signal that the risk of falls is very high [13, 15, 19].

The next test is Functional Reach (FR). With it, you can check to what extent the examined person is able to maintain balance. The test requires only a ruler or a measure, which must be placed at the same height as the barges. The subject's task is to move forward as much as possible. The feet must be still on the ground all the time. The result is the measurement of the swing distance in cm. Getting less than 18.5 cm means that a person is at high risk of falling [20].

Each of the tests described above is easy to carry out and quickly provides information on a person's health. It should be remembered that before the test, the rules should be explained in detail and the correct way to perform the test should be presented. It is a good idea to regularly check older people in terms of risk of falls and, in the case of disorders, provide information and guidance to improve mobility.

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