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EVALUATION OF BALANCE AND FALL RISK IN GERIATRIC WARD PATIENTS

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: The physical changes inherent to aging can reduce autonomy and functional independence, which may directly or indirectly lead to falls.

Aim of the study: The aim of this study was to assess the risk of falls in patients over 75 years of age.

Material and methods: Fifty elderly patients were examined. The subjects were divided into the three age groups: 75–79, 80–84 and 85–90 years old. The Berg Balance Scale was used to assess the risk of falls related to the balance skills.

Results: The average Berg Balance Scale score in the 75–79 age group was 37.6 points; for 80–84, 33.53 points; and for 85–90, 27.81 points. The difference between the youngest and oldest age group was statistically significant ($p=0.01$). The highest risk of falls was reported in the oldest age group ($p<0.05$).

Conclusions: People over 75 years of age have a high risk of falling. With age, the number of independent people decreases and the number of people who should be walking with assistance or use a wheelchair increases. It appears important to implement actions that prevent falls in older people.

KEYWORDS: aging, aged, accidental falls, geriatrics

Background

Human aging is accompanied by a gradual decline in fitness and physical ability and a decreasing level of many motor skills, for example muscle strength, endurance, flexibility, agility and coordination. Speed and flexibility are also reduced [1].

Involutional changes accompanying the aging process lead to the deterioration of functions of the body, including those responsible for maintaining proper posture and gait. The changes we observe in the muscular system are loss of muscle mass and strength, mainly in the upper and lower limbs and torso. Decreased bone mineral density is associated with increased fracture risk. Ligaments, joint capsules and articular cartilage undergo degeneration, which causes the development of degenerative-deforming processes. The posture of an elderly person is characterized by increased thoracic kyphosis and decreased lumbar lordosis; the center of gravity moves forward. The nervous system also ages. The number of neurons supplying the muscles decreases and the number of peripheral sensory neurons decreases, resulting in an increase in response time and a decrease in the speed of nerve impulses. These changes cause disturbances in gait and the maintenance of a stable posture and often lead to falls [2,3]. Moreover, the deterioration in balance, impaired vision and cognitive

abilities of an elderly person predisposes them to falls [4].

Falls are a significant geriatric problem and are the main cause of injuries for the elderly. They are the most common cause of disability in the older population worldwide [5]. In many cases, the consequent effects of a fall are physical or mental trauma. Falls can cause fear of falling and reduce independence and quality of life [6,7]. One study described that about 30% of people over 65 years of age had reported experiencing one or more falls in the past year, which entails a significant risk of hospitalization and even death [7]. In the older population, falls and injuries related to falls are the main causes of morbidity and mortality [8]. The effects of falls affect not only the seniors themselves but also their families and caregivers. They are also a challenge for health and social care services. A relatively high risk of falls is also present among long-term care patients, especially among nursing home residents [9]. As the proportion of older people in society increases, the role of geriatric medicine will increase. Because falls are the number one cause of injury-related morbidity and mortality in the elderly, evaluation of fall risk is a critical component of the patient evaluation [10].

Aim of the study

The aim of this study was to assess the balance and risk of falls in hospitalized patients over 75 years of age.

Material and methods

Study design and setting

This cross-sectional study was conducted with 50 patients (mean age 81.2±1.42) staying in the geriatric ward of Dr Józef Rostek District Hospital in Racibórz (Silesian Voivodeship, Poland). The study was conducted from January to April 2018.

Participants

In order to assess the risk of falls, respondents were divided into the three equal 4-year age groups: (1) 75–79, (2) 80–84 and (3) 85–90 years of age. In the first group there were 19 subjects – 38%; in the second group, 15 subjects – 30%; in the third group, 16 subjects – 32%. There were 32 (64%) women and 18 (36%) men in the study group.

Inclusion criteria

Inclusion criteria were more than 75 years of age, capable of independent mobility (or using apparatus or assistance of third parties), able to communicate verbally and informed consent.

Exclusion criteria

The study excluded persons in whom a disease or injury occurring within the last month may have hindered or prevented proper evaluation.

Ethical considerations

The research was conducted according to the Declaration of Helsinki. The study was approved by the Ethics Committee of Opole Medical School in Poland (No. KB/12/FI/2017).

Measures

The Berg Balance Scale (BBS) was used to assess the risk of falls [11]. The BBS is a 14-item test designed to measure the balance of older adults by assessing their performance of specific functional tasks. The items are scored from 0 to 4, with a score of 0 representing an inability to complete the task and a score of 4 representing independent item completion. A global score is calculated out of 56 possible points. Scores of 0 to 20 represent balance impairment, 21 to 40 represent acceptable balance and 41 to 56 represent good balance. The BBS measures both static and dynamic aspects of balance [12]. The test indicates that a score of 41–56 is associated with a low fall risk, 21–40 with a medium fall risk and 0–20 with a high fall risk. The ease with which the BBS can be administered makes it an attractive measure for clinicians; it involves minimal equipment (chair, stopwatch, ruler, step) and space and requires no specialized training.

The research tool was supplemented by a list of demographic questions which allowed for a more complete description of the study population. Demographic questions included the following data: 1) age (75–79, 80–84, 85–90), 2) gender (male, female) and 3) comorbidities.

Body height (cm) and body weight (kg) were measured using standard anthropometric techniques. Height was measured with an anthropometer with an accuracy of 0.1 cm, while weight was measured on physician's scales (ADE M318300) with an accuracy of 0.1 kg. The body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters. All measurements were conducted by highly skilled, trained and experienced physiotherapists.

According to the WHO criteria, average BMI in the study group was in the "overweight" range. A profile of the age and physical characteristics of the studied groups is presented in Table 1.

Table 1. Characteristics of weight, height and BMI according to age groups.

Variables	75–79 age group		80–84 age group		85–90 age group		Total	
	M	SD	M	SD	M	SD	M	SD
Age [years]	76.74	1.29	81.13	1.31	86.63	1.69	81.22	1.42
Body weight [kg]	75.81	18.05	71.33	8.46	74.93	13.12	74.02	13.21
Body height [m]	164.4	9.68	161.6	8.22	159.7	8.25	161.9	8.71
BMI [kg/m^2]	27.75	4.70	27.68	4.79	29.62	4.64	28.35	4.71

Abbreviations: M – mean, SD – standard deviation.

Participants had comorbidities: hypertension (n=34, 68%), diabetes (n=19, 38%), cataracts (n=17, 34%), osteoarthritis (n=17, 34%), hearing loss (n=11, 22%), osteoporosis (n=8, 16%), implanted pacemakers (n=5, 10%), atrial fibrillation (n=4, 8%), arrhythmia (n=3, 6%), Parkinson's disease (n=3, 6%), circulatory failure (n=2, 4%), heart valve transplantation (n=2, 4%), ischemic heart disease (n=1, 2%), rheumatoid arthritis (n=1, 2%), amblyopia (n=1, 2%), post myocardial infarction (n=1, 2%) and atherosclerosis (n=1, 2%).

Statistical analysis

The collected results were subject to statistical analysis using Statistica version 13.3 (TIBCO Inc., Tulsa, USA). Descriptive statistics were used: arithmetic mean (M), standard deviation (SD) and minimum (min) and maximum (max). Analysis of variance (ANOVA) was used to assess the variation of the average results of the BBS in particular age groups. A Tukey's HSD post-hoc test was used for detailed comparisons. Chi^2 test was used to determine the frequency of the risk of falls according to the BBS in age groups. Discrete variables were described in percentage and numbers. A significance level of α=0.05 was used throughout the study.

Results

The average BBS score for the 75–79 age group was 37.6 (±9.87) points, 80–84 was 33.53 (±9.37) points and 85–90 was 27.81 (±6.73) points (Table 2). The difference between the youngest and oldest age groups was statistically significant (p=0.01).

Table 2. Berg Balance Scale results according to age groups

Age groups	M	SD	Min	Max
1 (75–79)	37.63	9.87	17	54
2 (80–84)	33.53	9.37	20	49
3 (85–90)	27.81	6.73	17	40
Total	33.26	9.73	17	54

Abbreviations: M – mean, SD – standard deviation, min – minimum value, max – maximum value.
ANOVA p<0.01 between 1st and 3rd group.

The highest number of patients received a result in the range of 21–40 points, which is associated with a medium fall risk, i.e., in the 75–79-year-old group – 10 participants (52.6%), in the 80–84-year-old group – 9 participants (60%) and in the 85–90-year-old group – 15 participants (93.8%). In the youngest group, 7 participants (36.8%) and 5 participants (33%) from 80–84-year-old age group scored between 41–56 points, which means independent. The lowest percentage of patients scored between 0–20 points. These patients represent balance impairment and high fall risk – 2 participants from the yougest grup, 1 participant from middle grup and 1 participant from oldest group. There were no statistically significant differences between the age groups (Chi^2 p=0.08). (Fig. 1).

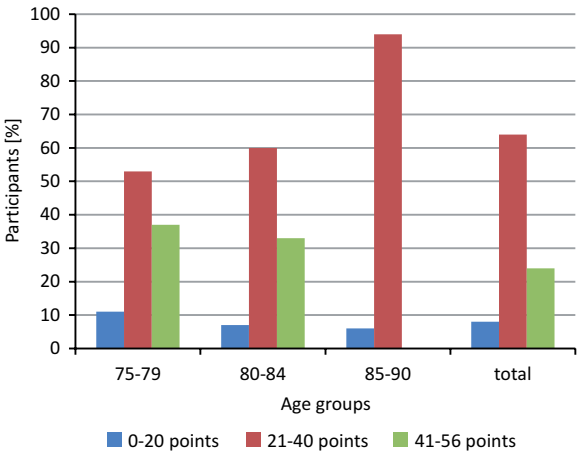

Figure 1. Risk assessment of falls according to the Berg Balance Scale in each age group

Discussion

The prevention of falls involving older people requires tests to assess the risk of a fall. The examined subjects were assessed using the BBS. The average score was 33.26 (±9.73) points for the entire population. The group of participants between 75–79 years of age obtained the highest average score, while the group of participants between 85–90 years of age achieved the lowest. The difference between the results of the two groups was statistically significant

($p<0.05$). Participants aged 85–90 had a higher risk of fall compared to people aged 75–79. Out of the entire study group, only 24% of people scored between 41–56 points, which indicates a low risk of a falls. The highest percentage (64%) of respondents performed the test within the 21–40 points range.

Borowicz et al. studied the risk of falls in people over 65 years old. People who recorded a fall in the previous 12 months scored an average Berg balance test score of 38.9 points, while people who had not recorded a fall in the interview scored an average of 43.1 points [13]. In the Borowicz et al. study, the average group age was lower than in ours – similar to the average age of the youngest group in our study – and the mean score of the participants who had experienced falls was similar to that of the 75–79-year-old group in our research ($p<0.05$).

Fear of falling reduces the activity and independence of an elderly person, thus increasing the risk of falling again [7,8]. Research by Johnson et al. has shown that difficulties in shopping for older people are related to the fear of a fall. And the inability to make purchases on their own negatively affects the nutritional condition of seniors [14].

Fall risk assessment is an important part of patient examination. High quality clinical practice guidelines in West Virginia, supported by the American Geriatric Society, recommend an annual assessment of risk of falling in the elderly. Those seniors at the greatest risk of falls will benefit from the standardized therapy protocols outlined and referral to a balance treatment center. Patients with low-to-moderate fall risk, attributed to muscle weakness or fatigue, should be prescribed lower extremity strengthening exercises to improve strength and balance [10].

Limitations of the study

Several limitations should be considered when interpreting these results. The original study design used a sample of 50 participants and should be continued in a larger group of patients. Another potential limitation is that the order of testing was not randomized, so fatigue may have factored into test performance. However, participants were given frequent rest breaks to avoid fatigue. Observational studies or surveys of the risk of falls may also provide valuable insight into the circumstances and consequences of the falls. Thus, further studies are necessary.

This study contains calculations examining only one relationship.

Clinical implications

As the proportion of the population that is elderly continues to increase, it is important to ensure that seniors are independent and self-reliant. As aging occurs on many levels, planning and implementing care for the elderly requires knowledge of the problems faced by the elderly. This is why it should be standard practice for every elderly patient to undergo a risk assessment for falls, which will allow for early implementation of preventative measures and the development of an individual, detailed improvement program. Such a program can reduce the risk of falls and increase the sense of balance among older people [15].

Conclusions

Patients aged 75–90 have a significant risk of severe fall-related injury, which increases significantly after 85 years of age. The implementation of preventative programs to prevent falls in older people is an important task in the context of the results of this research. Patients who represent the 21–40 point range for BBS should be walking with assistance, while those in the 0–20 point range should use a wheelchair.

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