

# Risk Factors for Falls Among Older Adults' Patients in an Acute Geriatric Unit in Lithuania

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*Key words:* risk factors for falls, older adults, geriatric unit.

*Summary. Abstract.* Older adults are at increased risk for a number of adverse events during hospitalizations, especially falls.

The aim of the current study was to identify risk factors for falls among older adult patients receiving care in an acute geriatric unit in a University hospital in Lithuania.

*Materials and methods.* The cross-sectional study was conducted in a 50-bed acute geriatric unit in a clinical hospital in Lithuania, data from 270 patients were collected. Data were extracted from an electronic patient record. Unconditional logistic regression models were used to estimate the association between different possible risk factors and falls in the last 12 months calculating the odds ratios (ORs) and their 95% confidence intervals (CIs). Models were adjusted for variables that differed significantly or suggestively between the groups.

*Results.* Compared to patients aged 60-74 years, those aged 75 years and older were more likely to report history of fall (50.2% vs. 34.5%)  $p = 0.038$ ). History of fall were more common among female than male (respectively, 72.8% and 27.2%  $p = 0.055$ ). Characteristics associated with an increased risk of falls in the last 12 months included patients with gastrointestinal disease (OR = 3.75, 95% CI = 1.08-12.97), faecal incontinence (OR = 5.28, 95% CI = 1.01-27.69), and syncope syndrome (OR = 7.65, 95% CI = 1.91-30.54).

*Conclusions.* Identifying patients at risk for adverse outcome is only a first step in its prevention. Comprehensive geriatric assessment needed for older patients at time of admission in acute geriatric unit. It is important to identify history of falls and gait disorders association with risk other risk factors.

## Introduction

Hospital care for older adults with acute medical disorders requires a comprehensive assessment by multidisciplinary team to support early detection of patients at highest risk of functional decline and adverse events. Older adults are at increased risk for a number of adverse events during hospitalizations, especially falls. Falls can lead to extended acute care length of stay. The rate of falls has been noted to range from 5.2 falls per 1,000 patient days in an acute care setting to 10.2 falls per 1,000 patient days in a subacute geriatric unit (Fox et al., 2012). Najafpour (2019) found that among those who experience an in-hospital fall, 63% experienced varying degrees of injuries from minor to major. Further, patients who experienced an in-hospital fall also experienced longer stay in hospital, reduced quality of life, and increased healthcare costs (Aranda-Gallardo et al., 2013; Røyset, Talseth-Palmer, Lydersen, & Farup, 2019).

The mobility of older adults is an important aspect to support wellbeing, autonomy, and independence. Gait and balance disorders are common in older adults and are a major cause of falls in this population. They are associated with increased morbidity and mortality, as well as reduced level of function and quality of life. Gait and balance disorders often involve multiple contributing factors (Salzman, 2010) and risk of falls have been attributed to age-friendly environments, access to appropriate equipment and supports, multidisciplinary health care teams, and regular review of medications (Abdalla et al., 2018). Fox (2012) found that access to acute care supports tailored for older adults from a patient-centered care perspective, frequent medical chart review, early referral to rehabilitation, discharge planning initiated early in the hospital stay, and an age-friendly environment improves patient- and system-level outcomes in acute geriatric unit.

Novel digital fall risk assessment protocols such as for the Timed up and Go Test (TUG) are intended to support the early identification of older adults at risk of falls and inform the creation of appropriate

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personalized interventions to prevent falls in the community (Greene, McManus, Redmond, Caulfield, & Quinn, 2019). The 4-meters walking test has shown a strong negative association with history of falls (Mangani et al., 2008). In contrast, Arnold & Faulkner (2007) found in their study of falls among older adults with hip osteoarthritis that the timed up and go test (TUG) was not an effective discriminator of history of falls but were related to near-falls incidence.

With the founding of the Society of Gerontology in 1960 the fields of gerontology and geriatrics in Lithuania. In 1990, Soviet rule in Lithuania ceased and the country regained its independence. With its acceptance into the European Union, the Lithuania has set goals to meet the recommended requirements for the care of the elderly (Lesauskaite, Macijauskiene, & Rader, 2006). In the post-Soviet era, Lithuania was the first to organize geriatric studies to a full extent, and in 1995 established the Geriatric Clinic in Lithuanian University of Health Sciences. In the process, geriatric wards in the hospitals became a reality following the reorganization of a large number of internal medicine beds. The organization of geriatric specialty wards, enhanced treatment and nursing plans, and emphasized the value of supporting functional mobility and treating geriatric syndrome.

Admission to an acute or subacute care geriatric unit may lead to unintended increased risk for adverse outcomes. In addition to higher rates of fall among in hospitalised patients (Bouldin et al., 2013; Healey et al., 2008) risk factors also include delirium, history of falls, and age (Mazur, Wilczyński, & Szewieczek, 2016). In Lithuania, a strong evidence base informing best practices in care delivery for fall risk prevention among older adult patients is needed to enhance understanding of how care providers, especially nurses working in the acute care setting may best support patients are at high risk of falls (King, Pecanac, Krupp, Liebszeit, & Mahoney, 2018). Therefore, the objective of the current study was to identify risk factors for falls among older adult patients receiving care in an acute geriatric unit in a University hospital in Lithuania. Focus was placed on describing more specifically the association of functional mobility and history of falls as risk factors for incident falls during time of admission in acute geriatric unit.

## Materials and methods

**Study Design and Sample.** The cross-sectional study was conducted in a 50-bed acute geriatric unit in a clinical hospital in Lithuania. This unit was the first acute geriatric unit established in Lithuania in 2013 and one of only two hospitals where specialized geriatric services are available. Unit being innovative

leader in aged care, also training base for students in geriatrics in a variety of medical specialists' programs. This unit specialized in holistic biopsychosocial comprehensive care of patients aged 60+ year to support safe discharge of older adults in community through a multidisciplinary team-based approach involving geriatricians, nurses, physiotherapists, occupational therapists, psychiatrists, psychologists, and social workers.

Data from 270 patients (response rate 97%) were collected between December 2019 and April 2020. Patients' exclusion criteria were patients fully enable walking even with assistance in current time and only lying in the bed.

**Instruments.** Data were extracted from an electronic patient record. Each electronic record included a patient case history form detailing immediate patients concerns, diagnostic tests, living conditions, past medical history, vaccinations, nutritional habits, comorbidities (diseases and disorders classified by International Classification of Diseases); falls history, sleep disturbances, physical examination of older adults. The electronic record also contained standardized geriatric tests including the Mini Mental State Examination (MMSE), Geriatric Depression Scale; Sharpened (Tandem) Romberg's test; Get up and go test. Not all tests are performed to older adults thus documentation are yet improved. Second part of patient case history included preliminary, *clinical diagnosis, pharmacological and non-pharmacological* management plan and members of interdisciplinary team. Additionally, a medical student completed an electronic version of the comprehensive geriatric assessment form in the acute geriatric unit. This geriatric assessment, an increasingly important area for evaluation and care of older persons, involved screening and evaluation for geriatric syndromes, particularly falls, urinary incontinence, frailty, and cognitive impairment, are crucial aspects of geriatric assessment (Carlson, Merel, & Yukawa, 2015).

Geriatric syndromes and condition including urinary, faecal incontinence, pain, syncope, depression, falls in last 12 months, and frailty were included in data analysis. Nutritional status was not assessed by standardized instruments, only for some cases, thus in analysis was not included. As several types of drugs have been associated with an increased fall risk (de Jong, Van der Elst, & Hartholt, 2013) three groups of medicines (Calcium channel blockers, Antiarrhythmics, Proton pump inhibitors & histamine 2 receptor antagonists) were included in the analysis

**"Timed up Up & Go" Test.** The Timed Up & Go Test (TUG) is a test of balance that is commonly used to examine functional mobility and fall risk. The test requires an older patient to stand up, walk 3

m (10 ft), turn, walk back, and sit down. Test requires no special equipment and is part of a routine clinical examination. The TUG has been commonly used to assess mobility function (Bischoff et al., 2003), and fall risk (American Geriatrics Society, British Geriatrics Society, 2001). Recommended practical cut-off value for the TUG to indicate normal versus below normal performance is 12 seconds (Bischoff et al., 2003).

**Mini-Mental State Exam.** The Mini-Mental State Exam (MMSE) is a widely used test of cognitive function among the elderly; it includes tests of orientation, attention, memory, language and visual-spatial skills. It was originally introduced by Folstein et al. in 1975. The MMSE is effective as a screening tool for cognitive impairment with older, community dwelling, hospitalized and institutionalized adults. Assessment of an older adult's cognitive function is best achieved when it is done routinely, systematically and thoroughly. In Acute Geriatric Unit MMSE is used as routine exam and as standard presented in Lithuanian Ministry of Health Law. The test takes about 5 to 10 minutes. The maximum score for the MMSE is 30. A score of 25 or higher is classed as normal. If the score is below 25, the result is usually considered to be abnormal (indicating possible cognitive impairment). Impairment may be classified as follows: mild - MMSE score of between 21 and 24, moderate - MMSE score of between 11 and 20, severe - MMSE score of 10 and less than.

**Ethical Consideration.** The study protocol was approved by the Centre of Bioethics at the Lithuanian University of Health Sciences (No. BEC-MF-123).

**Statistical analysis.** Baseline characteristics of patients were summarized using means and standard deviations (SD) for continuous variables, and frequencies and percentages for categorical variables. Characteristics were compared between different groups of patients using either unpaired t-tests (for continuous variables) or chi-squared tests (for categorical variables). Patients were grouped into 2 groups according to the TUG test timing: less than 12 seconds (< 12 s) and greater than or equal to 12 seconds (>12 s), and according to history of falls in the last 12 months outside the geriatric unit (no, yes).

Unconditional logistic regression models were used to estimate the association between different possible risk factors (diseases, syndromes, and use of medicines, MMSE score, moving with or without help) and TUG test or falls in the last 12 months calculating the odds ratios (ORs) and their 95% confidence intervals (CIs). Models were adjusted for variables that differed significantly or suggestively ( $p < 0.07$ ) between the groups. Compared: (a) age

and gender, (b) age, gender, family status (married or living as married, separated or widowed), education (elementary, secondary, university), use of calcium channel blockers (no, yes), antiarrhythmics (no, yes), proton pump inhibitors and histamine 2 receptor antagonists (no, yes), moving (without help, with help), MMSE score (11-20, 21-24, 25-30), diseases / disorders: disease of urinary system (no, yes), musculoskeletal and connective tissue disorders (no, yes) (model with diseases) and syndromes: urinary incontinence and pain (model with syndromes), (c) age, gender, family status (married or living as married, separated or widowed), education (elementary, secondary, university), use of calcium channel blockers (no, yes), antiarrhythmics (no, yes), proton pump inhibitors and histamine 2 receptor antagonists (no, yes), moving (without help, with help), MMSE (11-20, 21-24, 25-30), diseases / disorders: disease of the gastrointestinal system and mental and behavioural disorders (model with diseases), and urinary and faecal incontinence, pain, depression, syncope (model with syndromes).

The level of statistical significance was set at 0.05. All statistical tests were two-sided. Analyses were performed using Stata/IC 15 (StataCorp LLC).

## Results

Patient characteristics stratified by history of falls in the last 12 months with demographic factors, clinical characteristics and medication use are shown in Table 1. Two-thirds of participants were female and 79.3% were over the age of 75 years. Compared to patients aged 60-74 years, those aged 75 years and older were more likely to report history of fall (50.2% vs. 34.5%)  $p = 0.038$ .

A higher proportion of patients with history of falls have had diseases of gastrointestinal system and Mental & Behavioural disorders, although there was no significant difference. History of fall were more common among female than male (respectively, 72.8% and 27.2%  $p = 0.055$ ). Although medications as Calcium channel blockers, Antiarrhythmics, Proton pump inhibitors & histamine 2 receptor antagonists could be risk factors of falls, there were no significant difference use of medication between patients with history of falls and not fallers.

Patients with mild (43.2%) and moderate (43.7%) cognitive impairment my MMSE scores have had history of falls (respectively, 40.0% and 47.2%,  $p < 0.001$ ). Nearly three -quarters patients moving with assistance had history of falls (72.8%).

Higher proportion of patients with history of falls than no fallers had urinary incontinence (59.2% vs 44.0%,  $p = 0.013$ ), fecal incontinence (8.8% vs. 1.4%,  $p = 0.005$ ), syncope (8.8% vs 2.8%,  $p = 0.035$ ) and depression symptoms (23.2% vs 12.1%,  $p = 0.016$ ).

Table 1. Patients' distribution by falls in the last 12 months with sociodemographic factors, diseases, geriatric syndromes, use of medicines, Mini-Mental State Examination (MMSE), moving

Variables	Total n = 270, (%) n	Falls in last 12 months, n = 266, (%) n		p-value
		Falls 0 53.0% (n = 141)	Falls ≥1 47.0% (n = 125)	
Sociodemographic factors (age group, sex, education, marital status)				
60-74 age group	20.7(56)	65.5 (36) <sup>a</sup>	34.5 (19)	<b>0.038</b>
≥75 age group	79.3(214)	49.8 (105) <sup>a</sup>	50.2 (106)	
Female	67.0(181)	61.7 (87)	72.8 (91)	0.055
Male	33.0 (89)	38.3 (54)	27.2 (34)	
Lower basic with incomplete program	42.9(116)	40.4 (57)	45.6 (57)	<b>0.038</b>
Basic with complete program, vocational	38.9(105)	35.5 (50)	42.4 (53)	
Higher	18.2(49)	24.1 (34) <sup>a</sup>	12.0 (15)	
Married, living as married	35.2 (95)	40.4 (57) <sup>a</sup>	28.0 (35)	<b>0.033</b>
Separated or widowed	64.8(175)	59.6 (84) <sup>a</sup>	72.0 (90)	
Diseases / disorders				
Diseases of the urinary system	No	81.1(219)	78.7 (111)	0.272
	Yes	18.9 (51)	21.3 (30)	
Musculoskeletal & connective tissue disorders	No	85.6 (231)	84.4 (119)	0.645
	Yes	14.4 (39)	15.6 (22)	
Diseases of gastrointestinal system	No	93.0 (251)	95.7 (135)	0.052
	Yes	7.0 (19)	4.3 (6)	
Mental & Behavioural disorders	No	91.1 (246)	94.2 (133)	0.067
	Yes	8.9 (24)	5.7 (8)	
Medications				
Calcium channel blockers	No	68.5 (185)	63.1 (89)	0.067
	Yes	31.5 (85)	36.9 (52)	
Antiarrhythmics	No	89.6 (242)	88.7 (125)	0.643
	Yes	10.4 (28)	11.3 (16)	
Proton pump inhibitors & histamine 2 receptor antagonists	No	77.8 (210)	75.9 (107)	0.420
	Yes	22.2 (60)	24.1 (34)	
Geriatric syndromes and conditions				
Urinary incontinence	No	48.1 (130)	56.0 (79) <sup>a</sup>	<b>0.013</b>
	Yes	51.9 (140)	44.0 (62) <sup>a</sup>	
Fecal incontinence	No	95.2 (257)	98.6 (139) <sup>a</sup>	<b>0.005</b>
	Yes	4.8 (13)	1.4 (2) <sup>a</sup>	
Pain	No	64.8 (175)	57.4 (81) <sup>a</sup>	<b>0.013</b>
	Yes	35.2 (95)	42.6 (60) <sup>a</sup>	
Syncope	No	94.4 (255)	97.2 (137) <sup>a</sup>	<b>0.035</b>
	Yes	5.6 (15)	2.8 (4) <sup>a</sup>	
Depression symptoms	No	83.0 (224)	87.9 (124) <sup>a</sup>	<b>0.016</b>
	Yes	17.0 (46)	12.1 (17) <sup>a</sup>	
11-20 scores (MMSE)		34.1(92)	20.6 (29) <sup>a</sup>	<b>&lt;0.001</b>
21-24 scores (MMSE)		38.5 (104)	38.3 (54)	
25-30 scores (MMSE)		27.4 (74)	41.1 (58) <sup>a</sup>	
Moving Without assistance		38.5 (104)	48.9 (69) <sup>a</sup>	<b>&lt;0.001</b>
Moving With assistance		61.5 (166)	51.1 (72) <sup>a</sup>	

MMSE – Mini mental State Examination; <sup>a</sup> – p<0.05, comparing with patients who had history of ≥1 fall; z criteria was used.

The significant increase in the odds of slower than 12 seconds performance of TUG test associated with musculoskeletal & connective tissue disorders was seen in both adjusted models (Table 2). Compared with the individuals without these disorders, the patients with musculoskeletal & connective tissue disorders had almost 14 times higher risk (OR = 13.96, 95% CI = 2.72-71.77) to perform the test slower. Almost 3 times the risk of slower to make the test (OR = 2.96, 95% CI = 1.16-7.55) defined in patients having complains on urinary incontinence. There was no significant association of slower performed test with the use of calcium channel blockers, antiarrhythmics, proton pump inhibitors and histamine 2 receptor antagonists (Table 2).

In both adjusted models, higher cognitive function was significantly associated with better performance of the TUG test. Patients with MMSE score of 21-24 and 25-30 were 6 and 50 times (OR = 0.17, 95% CI = 0.03-0.87 and OR = 0.02, 95% CI = 0.001-0.10) less likely to perform worse

on the test (Table 3). While, people moving with help were almost 8 times (OR = 7.88, 95% CI = 2.58-24.08) more likely to perform worse on the TUG test compared to those moving without help.

After adjustment for age, gender and other factors, characteristics associated with an increased risk of falls in the last 12 months included patients with gastrointestinal disease (OR = 3.75, 95% CI = 1.08-12.97), faecal incontinence (OR = 5.28, 95% CI = 1.01-27.69), and syncope syndrome (OR = 7.65, 95% CI = 1.91-30.54) (Table 4). Additionally, an association between presence of patient mental and behavioural disorders with the risk of falls in the last 12 months was suggestive but did not emerge as statistically significant (OR = 2.79, 95% CI = 0.99-7.87). The data also showed that better cognitive function was significantly associated with lower risk of falls (Table 3). In both adjusted models, patients with MMSE score of 21-24 and 25-30 had 2- and 8-fold lower risk of falling, respectively, compared with patients with a lower test score.

Table 2. Odds ratios (ORs) and 95% confidence intervals (CIs) for the association of TUG test timing with the diseases, syndromes and use of medicines

Variable	TUG, % (n)		OR (95% CI) <sup>a</sup>	OR (95% CI) <sup>b</sup>	
	<12 s	≥12 s			
Diseases / disorders					
Diseases of the urinary system	No	71.9 (46)	173 (84.0)	1 (reference)	1 (reference)
	Yes	28.1 (18)	33 (16.0)	0.49 (0.22-1.06)	0.51 (0.15-1.78)
Musculoskeletal & connective tissue disorders	No	95.3 (61)	170 (82.5)	1 (reference)	1 (reference)
	Yes	4.7 (3)	36 (17.5)	3.96 (1.11-14.09)	13.96 (2.72-71.77)
Geriatric syndromes and conditions					
Urinary incontinence*	No	68.8 (44)	86 (41.8)	1 (reference)	1 (reference)
	Yes	31.3 (20)	120 (58.2)	2.98 (1.63-5.42)	2.96 (1.16-7.55)
Pain	No	42.2 (27)	148 (71.8)	1 (reference)	1 (reference)
	Yes	57.8 (37)	58 (28.2)	0.35 (0.19-0.65)	0.58 (0.23-1.43)
Medications					
Calcium channel blockers	No	57.8 (37)	148 (71.8)	1 (reference)	1 (reference)
	Yes	42.2 (27)	58 (28.2)	0.61 (0.32-1.16)	0.46 (0.18-1.18)
Antiarrhythmics	No	98.4 (63)	179 (86.9)	1 (reference)	1 (reference)
	Yes	1.6 (1)	27 (13.1)	8.18 (1.06-63.11)	6.35 (0.70-57.84)
Proton pump inhibitors & histamine 2 receptor antagonists	No	62.5 (40)	170 (82.5)	1 (reference)	1 (reference)
	Yes	37.5 (24)	36 (17.5)	0.53 (0.27-1.04)	0.45 (0.15-1.31)

<sup>a</sup> Adjusted for age and gender

<sup>b</sup> Further adjustment for education, family status, use of calcium channel blockers, antiarrhythmics, proton pump inhibitors and histamine 2 receptor antagonists, Mini-Mental State Examination score, moving with or without assistance, disease of urinary system, musculoskeletal and connective tissue disorders (for the diseases and use of medicines), urinary incontinence and pain (for the syndromes)

\* OR<sup>a</sup> for urinary incontinence adjusted for gender

**Table 3.** Odds ratios (ORs) and 95% confidence intervals (CIs) for the association of the TUG test timing and falls in the last 12 months with Mini-Mental State Examination (MMSE) score and moving

Variable	TUG, % (n)		OR (95% CI) <sup>a</sup>	OR (95% CI) <sup>b</sup>	Falls in 12 months, % (n)		OR (95% CI) <sup>a</sup>	OR (95% CI) <sup>c</sup>
	< 12 s	≥12 s			No	Yes		
MMSE								
11-20 scores	3.1 (2)	43.7 (90)	1 (reference)	1 (reference)	20.6 (29)	47.2 (59)	1 (reference)	1 (reference)
21-24 scores	23.4 (15)	43.2 (89)	0.16 (0.04-0.74)	0.17 (0.03-0.87)	38.3 (54)	40.0 (50)	0.43 (0.24-0.79)	0.42 (0.22-0.8)
25-30 scores	73.4 (47)	13.1 (27)	0.02 (0.00-0.08)	0.02 (0.00-0.10)	41.1 (58)	12.8 (16)	0.13 (0.06-0.28)	0.13 (0.06-0.33)
Moving								
Without help	82.8 (53)	24.8 (51)	1 (reference)	1 (reference)	48.9 (69)	27.2 (34)	1 (reference)	1 (reference)
With help	17.2 (11)	75.2 (155)	10.25 (4.70-22.34)	7.88 (2.58-24.08)	51.1 (72)	72.8 (91)	2.38 (1.33-4.28)	1.37 (0.68-2.77)

<sup>a</sup> Adjusted for age and sex

<sup>b</sup> Further adjustment for education, family status, disease of urinary system, musculoskeletal and connective tissue disorders, use of calcium channel blockers, antiarrhythmics, proton pump inhibitors and histamine 2 receptor antagonists, moving with or without assistance (for MMSE), and MMSE (for moving with or without assistance)

<sup>c</sup> Further adjustment for education, marital status, diseases of the gastrointestinal system, mental and behavioural disorders, use of calcium channel blockers, moving with or without assistance (for MMSE), and MMSE (for moving with or without assistance)

**Table 4.** Odds ratios (ORs) and 95% confidence intervals (CIs) for the association of falls down in the last 12 months with diseases, syndromes and use of medicines

Variable	Falls in 12 months, % (n)		OR (95% CI) <sup>a</sup>	OR (95% CI) <sup>b</sup>	
	No	Yes			
Diseases/disorders					
Gastrointestinal system	No	95.7 (135)	89.6 (112)	1 (reference)	1 (reference)
	Yes	4.3 (6)	10.4 (13)	2.16 (0.78-5.95)	3.75 (1.08-12.97)
Mental & Behavioural	No	94.3 (133)	88.0 (110)	1 (reference)	1 (reference)
	Yes	5.7 (8)	12.0 (15)	2.23 (0.90-5.49)	2.79 (0.99-7.87)
Geriatric syndromes and conditions					
Urinary incontinence	No	56.0 (79)	40.8 (51)	1 (reference)	1 (reference)
	Yes	44.0 (62)	59.2 (74)	1.81 (1.10-2.97)	1.36 (0.77-2.41)
Pain	No	57.4 (81)	72.0 (90)	1 (reference)	1 (reference)
	Yes	42.6 (60)	28.0 (35)	0.56 (0.33-0.94)	0.84 (0.46-1.55)
Faecal incontinence	No	98.6 (139)	91.2 (114)	1 (reference)	1 (reference)
	Yes	1.4 (2)	8.8 (11)	6.02 (1.28-28.38)	5.28 (1.01-27.69)
Depression	No	87.9 (124)	76.8 (96)	1 (reference)	1 (reference)
	Yes	12.1 (17)	23.2 (29)	1.98 (1.02-3.85)	1.47 (0.66-3.24)
Syncope	No	97.2 (137)	91.2 (114)	1 (reference)	1 (reference)
	Yes	2.8 (4)	8.8 (11)	3.38 (1.03-11.14)	7.65 (1.91-30.54)
Medicines					
Calcium channel blockers	No	63.1 (89)	73.6 (92)	1 (reference)	1 (reference)
	Yes	36.9 (52)	26.4 (33)	0.6 (0.35-1.03)	0.54 (0.29-1.00)

<sup>a</sup> Adjusted for age and gender

<sup>b</sup> Further adjustment for education, family status, use of calcium channel blockers, Mini-Mental State Examination score, and moving with or without assistance, disease of the gastrointestinal system and mental and behavioural disorders (for the diseases and use of medicines), and urinary and faecal incontinence, pain, depression, syncope (for the syndromes).

## Discussion

One of the main tasks in geriatric is to maintain the greatest possible independence of the older adults. Gait disorders that can result in falls with physical injuries and it worsen independency and quality of life of patients. Falls and gait disorders are serious problems with many risk factors, although falls and gait disorders could be a consequence of many problems, or there may be indications that a comprehensive geriatric examination is required. In the article, we present many risk factors that are related to the risk of falls, such as health problems, geriatric diseases, syndromes, medications. However, the adjusted models in our study showed that the greatest risk factors in the acute geriatric ward were cognitive function and moving with help. These factors should be the main focus of the interdisciplinary team in the geriatric ward when planning treatment, nursing, and rehabilitation.

In our study patients who performed slower on the TUG test were also more likely to experience Geriatric syndromes and conditions, be of older age and have reported experiencing one or more falls in the last 12 months prior to admission in acute geriatric unit. In both adjusted models, higher cognitive function was significantly associated with better performance of the TUG. While, patients requiring assistance with moving were more likely to perform worse on the "Up & Go" test compared to those able to move independently. Better cognitive function was significantly associated with lower history of falls. Comprehensive assessment of older patients upon admission in acute geriatric unit one of the most important part to ensure fall prevention during hospital stay.

Among the factors, gender was considered significant, in which the high risk was greater for women. With regard to age, the highlight was the age group of 70 to 79 years. The prevalence of falls higher in women, adults of advanced age (Vieira et al., 2018; Sardo, Simões, Alvarelhão, Simões, & Melo, 2016; Abdalla et al., 2018). In our study patient  $\geq 75$  age and older have had history of falls and performed the "Up & Go" test slower compared to younger age. Older there were no significant differences by gender. This is supported by previous research which also reported no significant gender interaction between physical function measures and history of falls. (Mangani et al., 2008).

Gait variability is related to functional decline in the elderly. Younger patients with higher education levels demonstrated better TUG performance, similar to findings reported by Gomes et al. (2015).

Musculoskeletal disorders are debilitating conditions that significantly impair the state of health, especially in elderly. A pathological triad of inter-related disorders that are highly prevalent

in the elderly consists of the following main "components" sarcopenia, tendinopathies, and arthritis (Minetto et al., 2020; Vieira et al., 2018). The association of pain and falls can be explained considering the musculoskeletal system, such as joint pathology or neuromuscular effects following pain (Ibrahim, Singh, Shahar, & Omar, 2017).

Urinary incontinence is a strong predictor of falls in the elderly and associated with shorter time until the occurrence of event. Urinary incontinence, concomitant with gait and balance dysfunction and use of antipsychotics was associated with falls (Abreu, Reiners, Azevedo, Silva, & Abreu, 2014).

Worsening mobility and balance scores associated with increased urinary incontinence severity, with worse scores in women with urge or mixed incontinence compared to continent patients. An association has been shown between falling and urinary leakage including the previously unreported association with stress leakage. Falling and urinary incontinence were found to be associated with physical limitations and had an impact on quality of life (Foley et al., 2012). A history of falling was significantly associated with urine incontinence, self-reported memory problems (Allain, Mwambelo, Mdolo, & Mfuno, 2014). Urinary and faecal incontinence are common, have separate associations with falls risk among women and men, and would benefit from routine screening in primary health care for older adults (Schluter, Askew, Jamieson, & Arnold, 2020).

The use of one or more of psychotropic medications and hypnotics was associated with a higher risk of falls (Abdalla et al., 2018). In our study medications were reviewed by admission in acute geriatric unit, although most of medications were prescribed after different kind of test and consultation, thus study have had limitation not all medications were listed on admission.

In a hospital setting, patients are exposed to a wide range of medications and specific conditions that may contribute towards altering the risk of falling (Matarese, Ivziku, Bartolozzi, Piredda, & De Marinis, 2014)

In our study antiarrhythmics were associated with higher risk of falls. In patients aged 65 years and older, antiarrhythmics use was associated with a higher risk of fall-related injuries and syncope (Dalgaard et al., 2019), Antiarrhythmics with vasodilator properties, such as procainamide, quinidine, and sotalol, can exacerbate orthostatic hypotension and precipitate falls in the elderly (Tinetti, 2003). Physicians and nurses at time of admission must pay attention to importance of medications and their side effects and include this assessment into comprehensive assessment early in time at acute geriatric unit since they can be missed.

Most changes in gait are related to underlying medical conditions. Physicians, nurses and other health care specialists caring for older patients should ask about falls and should examine for difficulties with gait and balance. For older adults who report a fall, physicians should ask about difficulties with gait and balance, and should assess each patient for presence of gait or balance dysfunctions as part of their comprehensive geriatric assessment. Older adults reporting a history of falls, medical conditions such as hypertension or heart disease, joint pain, vision/hearing impairment, incontinence and cataract/glaucoma have been shown to exhibit poorer “Up & Go” test performance (Ibrahim, Singh, Shahar, & Omar, 2017). Most changes in gait are related to underlying medical conditions and should not be considered an inevitable consequence of aging. Changes in gait among older adults are due to reduction in muscle mass, muscle strength, deterioration of postural stability and vestibular function. Physical performance tests provide an extensive and multidimensional evaluation of the health status in the elderly (Mangani et al., 2008). Older patients who have difficulty or demonstrate unsteadiness performing the TUG test require further assessment, usually with a physical therapist, to help elucidate gait impairments and related functional limitations.

The presence of cognitive impairment (particularly dementia) in older hospitalised patients influences a variety of clinical and health service outcomes (Fogg, Griffiths, Meredith, & Bridges, 2018). Falls remain common in older people, with higher prevalence and morbidity in those who are cognitively impaired (Montero-Odasso, & Speechley, 2018) and gait and cognition are interrelated in older adults (Montero-Odasso, Verghese, Beauchet, & Hausdorff, 2012). Cognitive impairment or dementia leads to an increased risk of falls in hospital (Härlein, Halfens, Dassen, & Lahmann, 2011) including recurrent falls (Chen, Van Nguyen, Shen, & Chan., 2011). Falls may result in fractures, which delay recovery and lengthen hospitalisation. Slower TUG test is associated with poorer performance on global cognition, executive function, and slower processing speed. Studies have also shown that reduced cognition is associated with poorer performance of the “Up & Go” test (Donoghue et al., 2012). Higher fall rates of older people with mild-moderate cognitive impairment were associated with slower reaction time, impaired balance (sway on floor and foam, semitandem, near-tandem, tandem stance), and reduced

functional mobility in community (Taylor et al., 2014). Moreover, studies have also demonstrated a connection between the control of gait and cognitive functions have supported the proposal to incorporate gait testing into memory assessment, since gait tests may have the potential to support early identification of cognitive impairment (Kikkert, Vuillerme, van Campen, Hortobágyi, & Lamothe, 2016). Gait analysis allows not only the early detection of gait deficits and fall risk, but also of cognitive deficits. Early detection allows for timely implementation of targeted interventions to improve gait and/or cognition (Bridenbaugh, & Kressig, 2015; Bahureska et al., 2017; Nielsen, Simonsen, Siersma, Hasselbalch, & Hoegh, 2018).

Assistive device users have limited mobility and an increased risk for fall injury compared with non-users. Older adults who use assistive devices generally have balance and/or mobility problems, are frail, and therefore are at increased risk of falling and sustaining an injury in the event of a fall (Andersen, Roos, Stanziano, Gonzalez, & Signorile, 2007). Given the aging of the population, it is likely that the proportion of older adults using assistive device users will increase. It is important to explore effective fall prevention interventions, innovative transportation options, and other approaches to extend the mobility of this high-risk group (West, Bhat, Stevens, & Bergen, 2015).

### Conclusions

Identifying patients at risk for adverse outcome is only a first step in its prevention. It is important to accept that the perfect screening instrument detecting older adults at risk does not yet exist (Heim et al., 2015). Our study demonstrates history of falls and gait disorders at admission in acute geriatric care, initial assessment important to identify patients possible risk factors for falls. Better cognitive function among older patients was significantly associated with lower risk of falls. While people moving with help were more likely to perform worse on the “Up & Go” test compared to those moving without help. Comprehensive geriatric assessment needed for older patients at time of admission in acute geriatric unit. It is important to identify history of falls and gait disorders association with risk other risk factors.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.



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