Risk of falls and its associated factors in hospitalized older adults

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Abstract

Objective: To analyze the risk of falls and its association with demographic and clinical variables, cognitive status, risk of sarcopenia and frailty among older adults hospitalized in a medical clinic of a university hospital. *Method:* A quantitative, observational, cross-sectional analytical study of 60 older adults hospitalized in the medical clinic of a university hospital in São Paulo city, São Paulo state, Brazil, was carried out. Questionnaires collecting demographic profile and clinical data, the Mini-Mental State Examination, Morse Scale, SARC-F Scale and Tilburg Frailty Indicator were applied. Descriptive analyses and the Kolmogorov-Smirnov normality test were performed. Spearman's correlation test was used for quantitative variables and the Mann-Whitney U-test for categorical variables. Multiple linear regression was used to identify the associations and a significance level of 5% was adopted. *Results:* The study sample comprised predominantly individuals that were female, aged 60-79 years and without a partner. Overall, 80% had cognitive impairment, 88.3% were diagnosed as frail, 60% were at risk for sarcopenia, and 75% had a high risk of falls during hospitalization. Cognitive impairment, frailty and sarcopenia risk were associated with risk of falls in the hospitalized older adults. *Conclusion:* High risk of falls in the hospitalized older adults was directly associated with the presence of cognitive impairment, frailty syndrome and sarcopenia risk, confirming that these factors warrant attention from managers and nursing professionals.

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INTRODUCTION

Population aging is a challenging and complex process because, the growth in the older adult population is accompanied by an increase in demand for health care and in hospital admissions[1]. The World Health Organization (WHO) estimates that a third of older adults experience at least one fall per year. These figures make falls the second-leading cause of death from unintentional injuries, defined as an involuntary event where the body falls to the ground or onto another surface[2].

Hospitalized older adults often present changes and physiological complications affecting the body, such as decreased tonus, loss of muscle mass, flexibility, balance, cognitive changes, polypharmacy, and complications due to chronic non-communicable diseases (NCDs). This scenario gives rise to vulnerabilities and limitations, making this group more susceptible to unfavorable health outcomes such as falls[3,4].

A fall in the intra-hospital environment poses a challenge for health professionals and health services, potentially resulting in increased morbidity and mortality, longer hospital stay and higher care costs. In addition, falls can cause injuries, fractures, traumatic brain injury and fear of falling again, which are linked to immobility and a progressive loss of independence[5].

The pathophysiology of falls can vary depending on individual circumstances. The even is typically the result of an imbalance between the individual's ability to maintain postural stability and the demands placed on them by the physical environment in which they are. This means that falls can result from an imbalance between sensory, motor and cognitive information necessary to maintain postural stability under normal conditions[6].

The pathophysiology of falls in older adults is more complex due to the changes associated with the aging process, including musculoskeletal and neurosensory changes. These sensory changes can make it difficult to perceive obstacles and/or recognize changes in ground surface, which can cause a loss of balance[6].

Falls are an avoidable multifactorial incident and, for preventive measures to be implemented, it is fundamental for nurses to identify fall risk at the time of patient admission and whenever their clinical picture changes. Several risk assessment scales are available in the literature to aid diagnosis and nurses must be able to apply the assessment in an institutional protocol[7].

This event cannot and should not be considered as an isolated occurrence, and its associated factors must also be analyzed. Thus, it is considered necessary and timely to conduct studies which contribute to comprehensively assessing the health status of hospitalized older adults.

This study seeks to understand the association between the risk of falls and several relevant variables, based on the need to improve prevention and intervention in falls, thereby promoting greater safety and health of older patients in the hospital environment.

In view of the above, the objective of this study was to analyze the risk of falls and its association with demographic and clinical variables, cognitive status, risk of sarcopenia and frailty among older adults hospitalized in a medical clinic of a university hospital.

METHOD

A quantitative, observational, cross-sectional analytical study of patients hospitalized in the medical clinic of a University Hospital in the city of São Paulo, Brazil, from August 2021 to January 2022 was carried out. The hospital is a public state teaching institution with a secondary level of care complexity. The facility currently has a maximum capacity of 236 beds, but 141 beds were active in 2021. The hospital serves employees of the University of São Paulo and also an estimated population of more than 500,000 in the surrounding area and users of the Unified Health System (Sistema Único de Saúde - SUS)[8]. The medical ward has 28 active beds, split equally between two wards, and receives patients requiring treatment from minimal to high-dependency care, classified according to the degree of dependency scale adopted in the unit, and handles about 270 admissions per quarter.

The study sample size was calculated using a type I error rate with an alpha of 0.05, a beta equivalent to a type II error rate of 0.30, and an expected correlation coefficient of 0.30, yielding an estimated total of 67 participants.

The study population was selected using convenience sampling by interviewing 60 older adults hospitalized at the medical clinic. The following inclusion criteria were defined for participation in the study: patients aged ≥60 years, hospitalized in the medical clinic, and evaluated within the first 72 hours. Exclusion criteria were: inability to communicate verbally, altered level of consciousness, and patients with suspected covid-19 placed in isolation for droplets and aerosols, as determined by the Hospital Infection Control Commission.

The information was collected by a researcher with previous training by the study coordinator via a patient interview and by extracting information from the patient's medical record, using:

- Demographic profile questionnaire: to identify information such as gender (male or female); age (years); marital status (single, married, widowed or divorced) and monthly income (Brazilian Reals (BRL) – R$).

- Clinical data questionnaire: data such as blood pressure, heart rate, respiratory rate and pulse oximetry were obtained from the medical records upon admission to the unit.

- Mini-Mental State Examination (MMSE): this test was used to assess cognitive function of participants. It consists of questions grouped into seven categories, each of which has the objective of assessing different specific cognitive functions: orientation to time (5 points), orientation to place (5 points), three-word registration (3 points), attention and calculus (5 points), delayed recall of words (3 points), language (2 points), sentence repetition(1 point), visuoconstruction ability (1 points), comprehension of commands (3 points), sentence writing (1 point) and drawing (1 point). Scale score ranges from 0 to 30 points; the cut-off point for illiterate individuals is 20 points, 24 for those with 1-4years of formal education, 26.5

for 5-8 years, 28 for 9-11 years, and 29 points for individuals with >11 years of education[9].

- Morse Fall Scale: this was used to assess the risk of falling in hospitalized patients, translated and validated into Portuguese[10]. The scale consists of six domains with different scores ranging from 0 to 125 points. The evaluated domains are: history of falling; secondary diagnosis; use of intravenous device; ambulatory aid; gait; and mental status. A patient scoring 0-24 points is classified as having a low risk of falling during hospitalization; 25-44 as a moderate risk; and ≥45 as having a high risk of falling[10].

- SARC-F: a simple questionnaire for rapidly diagnosis of sarcopenia (by screening the risk of sarcopenia in older adults. The SARC-F version was validated for use in Portuguese and consisted of five objective questions about strength, walking, rising from a chair, climbing a flight of stairs and falls history. In addition, it includes measurement of calf circumference. Scale score ranges from 0 to 20, and older adults scoring 0-10 points do not present signs suggestive of sarcopenia, while scores of 11-20 are suggestive of sarcopenia[11].

- Tilburg Frailty Indicator (TFI): this instrument measures the frailty level of older adults. The TFI has been validated and translated into Portuguese[12.] and is made up of 15 objective self-reported questions, of which 11 are answered with "yes or no" and 4 also provide the option "sometimes". These questions are divided into three domains: physical, psychological and social. The final score ranges from 0-15 points, with scores ≥ 5 points indicating the individual is considered frail[12].

Descriptive analyses were performed to analyze the information. Categorical variables were expressed as frequency and percentages, while numerical variables were expressed as measures of central tendency (mean and standard deviation). In addition, the normality of the data was tested using the Kolmogorov-Smirnov test.

Having confirmed the data did not display normality, non-parametric statistics using the

Spearman's correlation test and Mann-Whitney U test-were employed. Multiple linear regression was used to identify the association of fall risk with demographic and clinical variables, cognitive status, risk of sarcopenia and frailty. A significance level of 5% was adopted for all statistical tests.

The participants and researchers signed the Informed Consent Form (ICF) in two copies before starting data collection, with one copy retained by the participant. The present study was approved by the Ethics Committee of the School of Nursing of the University of São Paulo under permit number 4.960.408 and by the University Hospital under permit number 4.994.951, complying with the requirements of Resolution No. 466/2012.

RESULTS

Analysis of the sociodemographic characteristics of the 60 participants showed that 53.3% were female, 71.7% aged 60-79 years, mean age 73.9 years (SD=8.70), and 56.7% had no partner. For the sample assessed, mean number of years of formal education was 6.9 (SD=4.18), 76.7% were retired, and mean income was R$3,401.67 (SD=3,040.21). In addition, 81.7% lived with a mean of 3.2 (SD=2.2) other people (Table 1).

For the clinical evaluation, mean results for vital signs were within the normal range and mean oxygen saturation was 93.5% (SD=3.7). Overall, 80% of the sample had cognitive impairment according to the scale used, while 88.3% were categorized as frail, 60% at risk for sarcopenia and 75% high-risk for falling during hospitalization (Table 2).

A correlation was identified on the bivariate analysis of age ($p=0.020$), frailty ($p=0.002$) and sarcopenia ($p=0.001$) with the risk of falling (Table 3).

Comparison of the means revealed an association between cognitive status ($p= 0.003$) and risk of falling (Table 4).

The regression analysis showed that cognitive impairment, frail status and sarcopenia risk were associated with risk of falling in the hospitalized older adults (Table 5).

Table 1. Sociodemographic data of older adults hospitalized at the medical clinic of a hospital in São Paulo, Brazil, 2021.

Variable	n (%)
Gender	
Female	32 (53.3)
Male	28 (46.7)
Age (years)	
60-79	43 (71.7)
≥80	17 (28.3)
Marital status	
No partner	34 (56.7)
Has partner	26 (43.3)
Employment status	
Retired	46 (76.6)
Homemaker	9 (15.0)
Self-employed	3 (5..0)
Employed	1 (1..7)
Unemployed	1 (1..7)
Lives alone	
No	49 (81.7)
Yes	11 (18.3)

Table 2. Clinical evaluation of older adults hospitalized at the medical clinic of a hospital in São Paulo, Brazil, 2021.

Variable	n (%)	Mean (=SD)
Cognitive status (MMSE)		
Impairment	48 (80.0)	
No impairment	12 (20.0)	
Frailty (TFI)		
Frail	53 (88.3)	
Not frail	7 (11.7)	
Sarcopenia (SARC-F)		
At risk	36 (60.0)	
No risk	24 (40.0)	
Risk of falling (MORSE)		
Low risk	4 (6.7)	
Moderate risk	11 (18.3)	
High risk	45 (75.0)	
Systolic blood pressure (mmHg)		128.32 (25.3)
Diastolic blood pressure (mmHg)		88.42 (91.8)
Heart rate (bpm)		82.32 (16.5)
Respiratory rate (rpm)		21.20 (3.9)
Oxygen saturation (%)		93.52 (3.7)

Table 3. Correlation of demographic and clinical variables with risk of falling in older adults hospitalized at the medical clinic of a hospital in São Paulo, Brazil, 2021.

Variable	Correlation	p-value
Age	0.29	0.020
Education	-0.14	0.270
Frailty	0.39	0.002
Sarcopenia	0.43	0.001
Systolic blood pressure	0.01	0.910
Diastolic blood pressure	-0.16	0.220
Temperature	0.15	0.240
Heart rate	0.09	0.450
Respiratory rate	0.09	0.450
Oxygen saturation	0.04	0.700

Spearman's correlation = $p<0.05$

Table 4. Analysis of risk of falling for demographic variables and cognitive status of older adults hospitalized at the medical clinic of a hospital in São Paulo, Brazil, 2021

Variable	n	Mean risk of falling (Morse scale)	p-value
Sex			0.62
Female	32	29.47	
Male	28	31.68	
Marital status			0.66
Has partner	26	29.38	
No partner	34	31.35	
Lives alone			0.29
No	49	31.61	
Yes	11	25.55	
Cognitive status (MMSE)			0.003
Impairment	48	33.78	
No impairment	12	17.38	

Mann-Whitney U = $p<0.05$

Table 5. Association of risk of falling with clinical variables of older adults hospitalized at the medical clinic of a hospital in São Paulo, Brazil, 2021.

Variable	B	p-value	95%CI
Cognitive status (no impairment) (MMSE)	17.66	0.030	1.49 – 33.84
Frailty (TFI)	2.94	0.010	1.55 – 5.33
Sarcopenia (SAC-F)	1.41	0.010	1.30 – 2.53

Multiple linear regression = $p<0.05$.

Variables excluded from the model were age, gender, number of people living with the older adult, marital status, education, heart rate, respiratory rate, blood pressure, temperature, and oxygen saturation.

DISCUSSION

The study population comprised predominantly females and younger older adults without a partner. The risk of falling was greater among older adults with impaired cognitive status, presence of frailty and risk of sarcopenia at hospital admission. These results corroborate the national and international literature, where similar studies show that the older adult population is mostly female with a mean age of 70 years[13-16].

A total of 75% of the participants in this study were at risk of falls during hospitalization. Similar results were found in a study that also used the Morse Fall Scale to assess the risk of falls[17]. The authors of the study found that more than half of the sample of hospitalized older adults had a high risk of fall events[17].

It is noteworthy that falling is associated with the presence of intrinsic factors such as age, multimorbidity, psychomotor agitation, mental confusion, history of falls, visual impairment, muscle weakness, gait disorders, incontinence, hypotension, and may be aggravated by frailty, polypharmacy and possible drug-drug interactions[5,17,18]. The authors of an integrative review concluded that the main risk factors for falls among older adults in the hospital environment were visual impairment and polypharmacy[19].

In addition, falling is also associated with the presence of extrinsic factors within the hospital environment, which include inadequate lighting in

the wards and rooms, slippery floors, poorly placed furniture, excess furniture, non-adapted bathrooms, stairs and lack of bed rails[5,18,20]. Although many risk factors are not unique to hospital settings, they may be more commonly associated with hospitals due to their higher prevalence among hospitalized patients[21].

Hospitalized older adults were found to have a predominance of cognitive impairment. In a study carried out in Saudi Arabia of 130 hospitalized older adults, the authors found that 48.6% had cognitive impairment[22]. Another study carried out in Germany involving 1,469 hospitalized older adults showed that 40% of participants had cognitive impairment[23].

According to the results of the present study, older adults with MMSE results suggestive of cognitive impairment had a 17.66 times greater risk of falling. This result is similar to other national studies[24-26]. These data are also consistent with international studies. For example, a study conducted in the United States comparing risk of fall scores determined using two different evaluation forms found that older adults with cognitive impairment were 14 times more likely to have postural instabilities and consequent falls[27].

Hospitalization itself is recognized as a risk factor for functional and cognitive decline in older adults as, in this situation, they are subject to immobility, loss of autonomy and complications[24,28]. Cognitive impairment and high risk of falling may be associated due to the link between motor and sensory systems during the neurological processes involved in the cognition needed for motor planning, dual-tasking and adaptation to the environment. Thus, older adults with cognitive impairment may slow down their movements to react to imbalances and impaired mobility, constituting factors which contribute to fall events[26].

Over half of the participants in the present study were diagnosed as frail. In a Brazilian study determining the prevalence of frailty syndrome in older adults and its relationship with the risk of falling in 101 older adults of both sexes, results showed that 84.1% of the sample were at risk of falls and that fall prevalence among those classified as frail was 100%[29].

There is agreement among scholars on the subject regarding the senescence process associated with

changes to multiple systems, favoring the emergence of the frailty syndrome and unfavorable health outcomes which can, in turn, lead to hospitalizations and falls[30].

Science and research have long recognized and investigated the relationship between frailty syndrome in older adults and the risk and occurrence of falls[30,31]. Frailty is considered a clinical syndrome of a multifactorial nature, characterized by a decrease in energy reserves and reduced resistance to stressors; these conditions result from the cumulative decline of physiological systems[32]. Thus, a strong association has been found between frailty and the occurrence of falls, as explained by the increase in comorbidities, cognitive impairment and sarcopenia[33].

This study showed a predominance of high risk for falling in older adults at greater risk for sarcopenia in a directly proportional relationship. Sarcopenia is defined as a progressive generalized muscle disorder which is directly associated with a greater probability of developing complications such as fractures and physical immobility[34]. The European consensus on sarcopenia (EWGSOP 2) highlighted a loss of muscle strength as an important predictor for adverse outcomes, thus defining it as a primary parameter of sarcopenia; and sarcopenia is considered severe when associated with low physical performance[34].

A Japanese study in which the SARC-F was used (same tool used in the present investigation for sarcopenia screening), found a statistical association between SARC-F score and in-hospital falls. A SARC-F score ≥2 was found to be significantly associated with a higher incidence and risk of falls. Among the subitems of the SARC-F, the hazard ratios for climbing stairs and for a history of falls were significantly higher. These findings suggests that the SARC-F score can help predict falls among hospitalized older adults[26].

Sarcopenia is part of the complex picture of frailty as a key element in this syndrome due to its relationship with the significant loss of muscle mass, and is associated with fall events in older adults[33]. The multiple causes of sarcopenia are congruent with the causes of frailty syndrome, including hormonal and nutritional alterations, physical inactivity, decline in motor neurons and chronic inflammation[35].

The present study has an important limitation with regard to the small number of older adult participants. The factors associated with the risk of falling might have stronger links if investigated in a larger sample. Nevertheless, the results reported are relevant in providing theoretical and practical support to devise strategies for reducing fall risk in hospitalized older adults. Identifying the risk of falling in hospitalized older adults is a nurse's responsibility to improve patient safety. On a broader level, identifying the factors which contribute to increased risk leads to greater safety of this population, thereby avoiding injuries, longer hospitalization and premature death.

CONCLUSION

The results showed that the high risk of falling in older adults hospitalized in the medical clinic of a university hospital was directly associated with the presence of cognitive impairment, frailty syndrome and the risk of sarcopenia, confirming that these factors warrant attention from health managers and nursing professionals.

The study makes a strong contribution toward planning nursing care for hospitalized older adults, provides easily accessible scales that can be incorporated and applied in protocols for evaluating older adults, thereby preventing falls and other complications while accommodating the particularities and health demands of this group.

Future studies in the area could collect data in different wards to identify health conditions that can cause older adults to sustain more falls. Nursing professionals should thoroughly investigate the variables involved in the risk and occurrence of in-hospital falls, together with the associated factors revealed in this study, to improve protocols for the prevention of falls and health-related complications of hospitalized older adults and improving patient safety.

AUTHORSHIP

- Gideany Maiara Caetano - Responsible for all aspects of the work, ensuring that issues related to the accuracy or integrity of any part of the work are resolved.

- Alexandre Pereira dos Santos Neto - Data interpretation, article writing and approval of the version to be published.

- Luciana Soares Costa Santos - Writing of the article and approval of the version to be published.

- Jack Roberto Silva Fhon - Responsible for all aspects of the work, ensuring that issues relating to the accuracy or completeness of any part of the work are resolved.

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REFERENCES

1. Nascimento MM. Na overview of human aging theories. Saúde e Desenvolvimento Humano, 2020; 8(1): 161-168. Available from: https://doi.org/10.18316/sdh.v8i1.6192

2. World Health Organization [Internet]. Falls. 2021[cited 2022 Jan 10]; Available from: http://www.who.int/news-room/fact-sheets/detail/falls

3. Fhon JRS, Cabral LMS, Giacomini SBL, Reis NA, Resende MC, Rodrigues RAP. Frailty and sociodemographic and health factors, and social support network in the Brazilian elderly: A longitudinal study. Rev Esc Enferm USP. 2022;56. Available from: https://doi.org/10.1590/1980-220X-REEUSP-2021-0192

4. Giacomini SB, Fhon JRS, Rodrigues RA. Frailty and risk of falling in the older adult living at home. Acta Paul Enferm. 2020;33. Available from: https://doi.org/10.37689/acta-ape/2020AO0124

5. Silva AKM, Costa DCM, Reis AMM. Risk factors associated with in-hospital falls reported to the Patient Safety Committee of a teaching hospital. Einstein (São Paulo). 2019;17:1-7. Available from: https://doi.org/10.31744/einstein_journal/2019AO4432

6. Esquenazi D, Silva SB, Guimarães MA. Pathophysiological aspects of human aging and falls in the elderly. Revista HUPE. 2014;13(2):11-20. Available from: https://doi.org/10.12957/rhupe.2014.10124

7. Baixinho CL, Dixe MS. What are the practices of caregivers to prevent falls among institutionalized elders? Rev baiana enferm. 2020;34. Available from: https://doi.org/10.18471/rbe.v34.37491

8. HU: Hospital Universitário da Universidade de São Paulo-USP. São Paulo; 2021.

9. Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Suggestions for utilization of the mini-mental state examination in Brazil. Arq Neuro-Psiquiatr. 2003;61(3-B):77-81. Available from: https://doi.org/10.1590/S0004-282X2003000500014

10. Urbaneto JS, Creutzberg M, Franz F, Ojeda BS, Gustavo AS, Bittencourt HR, et al. Morse fall scale: translation and transcultural adaptation for the Portuguese language. Rev Esc Enferm USP. 2013;47(3):569-575. Available from: https://doi.org/10.1590/S0080-623420130000300007

11. Barbosa-Silva TG, Menezes AMB, Bielemann RM, Malmstrom TK, Gonzales AMB. Enhancing SARC-F: improving screening in clinical practice. J Am Med Direct Assoc. 2016;17:1136-1141. Available from: https://doi.org/10.1016/j.jamda.2016.08.004.

12. Santiago LM, Luz LL, Mattos IE, Gobbens RJJ. Cross-cultural adaptation of the Tilburg Frailty Indicator (TFI) for use in the Brazilian population. Cad Saúde Pública. 2012;28(9):1795-1801. Available from: https://doi.org/10.1590/S0102-311X2012000900018

13. Vu HM, Nguyen LH, Nguyen HLT, Vu GT, Nguyen CT, Hoang TN, et al. Individual and environmental factors associated with recurrent falls in elderly patients hospitalized after falls. Int J Environ Res Public Health. 2020;17(7):2441. Available from: https://doi.org/10.3390/ijerph17072441

14. Uchmanowicz I, Kuśnierz M, Wleklik M, Jankowska-Polańska B, Jaroch J, Loboz-Grudzień K. Frailty syndrome and rehospitalizations in elderly heart failure patients. Aging Clin Exp Res. 2018;30(6):617-623. Available from: https://doi.org/10.1007/s40520-017-0824-6

15. Gutierrez BAO, Silva HSD, Chubaci RYS, Borja-Oliveira CR. Complexity of care of hospitalized older adults and its relationship with sociodemographic characteristics and functional independence. Rev bras geriatr gerontol. 2020;22(6). Available from: https://doi.org/10.1590/1981-22562019022.190167

16. Silva IGP, Peruzzo HE, Lino IGT, Marquete VF, Marcon SS. Sociodemographic and clinical profile of elderly at risk for falls in southern Brazil. J Nurs Health. 2019;9(3):e199308. Available from: https://doi.org/10.15210/jonah.v9i3.16808

17. Canuto CPAS, Oliveira LPBA, Medeiros MRS, Barros WCTS. Safety of hospitalized older adult patients: an analysis of the risk of falls. Rev Esc Enferm USP. 2020;54. Available from: https://doi.org/10.1590/S1980-220X2018054003613

18. Agência Nacional de Vigilância Sanitária. Assistência segura: uma reflexão teórica aplicada à prática. Brasília: Anvisa; 2017.

19. Diniz AC. Risk factors related to falls in hospitalized elderly people. Brasília: UniCEUB. 2020. 14p.

20. Oliveira JS, Diniz MMP, Falcão RMM, Chaves BJP, Souza SVO, Fernandes AM, et al. Extrinsic factors for the risk of falls in hospitalized elderly. Rev enferm UFPE. 2018;12(7):1835-1840. Available from: https://doi.org/10.5205/1981-8963-v12i7a231271p1835-1840-2018

21. World Health Organization (WHO). Step safety: strategies for preventing and managing falls across the life-course. Geneva: WHO; 2021.

22. Abd-El Mohsen SA, Algameel MM, Hawash M, Abd Elrahman S, Wafik W. Predicting cognitive impairment among geriatric patients at Asir central hospital, Saudi Arabia. Saudi J Biol Sci. 2021;28(10):5781-5785. Available from: https://doi.org/10.1016/j.sjbs.2021.06.023

23. Bickel H, Hendlmeier I, Heßler JB, Junge MN, Leonhardt-Achilles S, Weber J, et al. The prevalence of dementia and cognitive impairment in hospitals — results from the General Hospital Study (GHoSt). Dtsch Arztebl Int. 2018;115. Available from: https://doi.org/10.3238/arztebl.2018.0733

24. Santos BP, Amorim JSC, Poltronieri BC, Hamdan AC. Association between functional disability and cognitive deficit in hospitalized elderly patients. Braz J Occup Ther 2021;29(1):e2101. Available from: https://www.cadernosdeterapiaocupacional.ufscar.br/index.php/cadernos/article/view/2780

25. Sutil B, Carli A, Donato AA, Vieira CP, Fontana T, Rockenbach CWF, et al. Risk of falls, peripheral muscle strength and functional capacity in hospitalized elderly. ConScientiae Saúde. 2019;18(1):93-104. Available from: https://doi.org/10.5585/ConsSaude.v18n1.10738

26. Yuria Ishida, Keisuke Maeda, Junko Ueshima, Akio Shimizu, Tomoyuki Nonogaki, Ryoko Kato, et al. The SARC-F Score on Admission Predicts Falls during Hospitalization in Older Adults. J Nutr Health Aging. 2021;25(3):399-404. Available from: https://doi.org/10.1007/S12603-021-1597-3.

27. Chua KWD, Fauble BM, Gans RE. Association of cognitive impairment and fall risk in older adults: an analytical cross-sectional study. J Otolaryngology-ENT Research. 2022;14(1):8-12. Available from: https://doi.org/10.15406/joentr.2022.14.00497

28. Duarte YAO, Nunes DP, Andrade FB, Corona LP, Brito TRP, Santos JLF, et al. Frailty in older adults in the city of São Paulo: Prevalence and associated factors. Rev Bras Epidemiol. 2019;21(2). Available from: https://doi.org/10.1590/1980-549720180021.supl.2

29. Taguchi CK, Menezes PDL, Melo ACS, Santana LSD, Conceição WRS, Souza GFD, et al. Síndrome da fragilidade e riscos para quedas em idosos da comunidade. In CoDAS. Sociedade Brasileira de Fonoaudiologia. 2022;34(6):e20210025. Available from: https://doi.org/10.1590/2317-1782/20212021025pt

30. Tkacheva ON, Runikhina NK, Ostapenko VS, Sharashkina NV, Mkhitaryan EA, Onuchina JS, et al. Prevalence of geriatric syndromes among people aged 65 years and older at four community clinics in Moscow. Clin interv aging. 2018;13:251-259. Available from: https://doi.org/10.2147/cia.s153389

31. Zhou BY, Yu DN, Tao YK, Shi J, Yu PL. Relationship between fall and frailty index in elderly adults of urban community in Beijing. Zhonghua Liu Xing Bing Xue Za Zhi. 2018;39(3):308-12. Available from: https://doi.org/10.3760/cma.j.issn.0254-6450.2018.03.011

32. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al.; Cardiovascular Health Study Collaborative Research Group. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci. 2001;56(3):146–56.

33. Dantas IR, Nogueira TBSS, Santos EVL, Sousa MNA. Frailty syndrome related to the prevalence of falls in the elderly. Tópicos em Ciências da Saúde. 2020;18(2):15-27.

34. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, et al. Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing. 2019;48(1):16-31. Available from: https://doi.org/10.1093/ageing/afy169

35. Pontes VDCB. Sarcopenia: rastreio, diagnóstico e manejo clínico. J Hosp Sci. 2022;2(1):4-14. Available from: https://jhsc.emnuvens.com.br/revista/article/view/32/22hsc.emnuvens.com.br/revista/article/view/32/22