UNIVERSITY *of the*
WESTERN CAPE

Faculty of Community and Health Sciences

RESEARCH PROPOSAL

Title: The determinants of falls among the elderly in retirement facilities in the City of Cape Town.

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Type of Thesis: Masters Full Thesis

Degree: MA Biokinetics

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Date: 24 May 2021

Keywords: falls, elderly, long-term care facility, prevalence, risk factors, Cape Town,

Definitions of Terms

Retirement facilities are housing complexes designed for older adults who are generally able to care for themselves.

Long-term care facilities provide rehabilitation, medical and personal care to patients and residents who are unable to live independently owing to chronic illnesses, disabilities and/or cognitive impairments (Díaz et al., 2020).

A risk factor is a variable which increases one's chance of developing a risk or susceptibility, which can be classified as either intrinsic or an extrinsic factor (Deandrea et al., 2010)

A fall is defined by the World Health Organization (WHO) as an event that results in a person coming to rest inadvertently on the ground or floor or other lower level (World Health Organization, 2007).

Elderly is defined as being 60 years or older in South Africa (World Health Organization, 2007).

Prevalence refers to proportion of individuals who have a condition or exposed to a risk at or during a particular period (Williams et al., 2015).

Cape Town is a port city on South Africa's southwest coast, on a peninsula beneath Table Mountain. It is named the Mother City and is the largest city of the Western Cape province.

Abstract

There are many studies across the globe focusing on the elderly in retirement facilities due to the significant increase in falls among this population. In South Africa, there is minimal literature focusing on risk factors that contribute to falls among the elderly. Therefore, the aim of the study is to identify the determinants of falls in the elderly who are living in various retirement facilities in the City of Cape Town. This study will use the social-ecological theory which functions on multiple levels, interacting on an individual level, as well as recognising the impact of the environment. The study will use a quantitative, cross-sectional, and descriptive design to investigate the elderly, aged 60 years and older, living in retirement facilities in the City of Cape Town. A study sample of 357 male and female participants will be recruited using cluster random sampling. A researcher-generated self-administered sociodemographic questionnaire on age, gender, height, weight, educational qualifications, marital status, and medical history and risk factors for falls will be used. The Fall Risk Assessment Tool (FRAT), the Berg Balance Scale (BBS), the Dynamic Gait Index (DGI) the Timed Up-and-Go (TUG) test, and the Mini Mental State Examination (MMSE) will be used as the research instruments in the study. The data will be analysed using SPSS version 26. Descriptive statistical analysis (mean, standard deviation, and frequencies) will be used for describing the variables, such as age, height, weight, etc. The Chi-squared test will be used for determining the association between the sociodemographic characteristics and the various risk factors for falls. The independent samples t-test will be used to test for significance between high and low risk groups for falls on all functional and cognitive measures. The probability of falls will be determined using odds ratio (OR). A p value <0.05 will be used to indicate statistical significance.

Ethics approval will be obtained from the Biomedical Research Ethics Committee (BMREC). Permission will be obtained from the unit manager of the various retirement facilities. Informed consent will be obtained in order to participate in the study. Participation in the study will be voluntary, and participants may decline or withdraw from the study, at any stage, without any negative consequences. The participants' information will be kept confidential, with access restricted to the researcher and supervisors only. The Helsinki declaration, as a statement of ethical principles for medical research involving human participants, will also be implemented to ensure the protection of the participants. The WHO COVID-19 safety protocol will be observed throughout the period of physical testing of the participants (WHO, 2020).

1. Introduction

Injuries are the fifth most common cause of death in older people, and falls are the most common cause of injury-related death in the elderly aged >75 years (Savira & Suharsono, 2013). A high percentage (40–60%) of falls lead to injuries, with 30–50% of these injuries being minor, 5–6% constituting major injuries, and 5% are fracture-related injuries (Savira & Suharsono, 2013). Many falls are associated with one or more identifiable risk factors, such as weakness, unsteady gait, confusion, and types of medications. Research has shown that attention to these risk factors can reduce the rates of falling dramatically (Pengpid & Peltzer, 2018).

1.1 Background to the Study

According to the World Health Organization (WHO) global report on fall prevention, people aged 65 years and older fall about 28%–35% each year, and this increases as age and frailty level also increase. Although most of the results on falls are not serious injuries, about 5% of these result in a fracture or require hospitalisation. The rates of falls and their associated complications rise steadily with age, and are doubled for individuals aged >75 years.

Older adults in long-term care (LTC) facilities have much higher rates of fall, which result in serious complications, with 10–25% of such falls resulting in fractures or lacerations (Rubenstein, 2006). Once a year, at least one out of three elderly persons report a fall (Marmamula et al., 2020). Approximately 30-50% of people living in LTC institutions fall each year, and 40% of them experience recurrent falls (World Health Organization, 2007). In 2013, the population aged >65 years numbered some 2.7 million, representing 5 per cent of the total population. By 2050, this population is estimated to reach 5.7 million, and to represent 10 per cent of the total population (Kalula et al., 2017).

Many population-based studies exist on the epidemiology of falls amongst the elderly in different settings (Rubenstein, 2006). In low- and middle-income countries, like South Africa,

environmental factors could be a contributor to intrinsic causes of falls, because of reasons such as poor infrastructure, particularly in the poorly maintained environments, such as unmaintained roads and public buildings, poor to non-existent street lighting, overcrowding and hazards in clustered, informal settlements, and outdoor hazards (Kalula et al., 2016).

Due to the social isolation of the elderly in LTC facilities from families and friends, this factor makes them more vulnerable to falls (Dhargave & Sendhilkumar, 2016). Seventy percent of the world's aging population reside in developing countries, where the prevalence and incidence of falls continue to increase at an alarming rate, and fall-related injuries are considered inevitable and largely disproportionate (WHO, 2017a).

1.2 Statement of the Problem

The realization that the world's population is swiftly ageing is heightened. The elderly population are falling at a rate of 35-40%, where they suffer the highest rates of injury, the highest rates of hospitalization, as well as the highest rates of death (Dillon, 2017).

In developing countries, 9% of the population is aged 60 years and older, and this will double by 2050, and more than triple by 2100 (United Nations Population Division, 2011). In low- and middle-income countries (LMICs), the populations are growing at a faster rate, especially in sub-Saharan Africa, with minimal attention given to the elderly (Aboderin & Beard, 2015).

Residents in retirement facilities are older, have a worse health status, need more support in daily activities, take more medications, and are physically and cognitively weaker compared to those living in the community. Consequently, they are more prone to falls and suffering from severe injuries, such as fractures (Jiang et al., 2020). Risk factors for falls, such as age, functional abilities, chronic diseases, gait disturbances, and fear of falling, have all been identified among community-dwelling older people or among hospitalized patients, but very few studies have been performed in LTC settings (Buckinx et al., 2017). Currently, there is minimal research in South Africa on the risk factors of falls amongst the elderly in LTC

facilities (Kalula et al., 2016). Therefore, this study aims to fill the gap by focusing on the prevalence of risk factors for falls among those living in retirement facilities in a developing country. Assessing the elderly who are at risk of falling, and identifying the associated risk factors for falling contributes to the literature on falls, and is important in the design and implementation of intervention programmes to prevent falls in the elderly (Kalula et al., 2016). The two research questions that will be addressed in the study are as follows:

- What are the risk factors that contribute to falls in the elderly in retirement facilities?
- How can the risk of falls among the elderly in retirement facilities be reduced?

1.3 Aim of the Study

The aim of the study is to identify the determinants of falls in the elderly who are living in various retirement facilities in the City of Cape Town.

1.4 Objectives of the Study

The objectives of the study are the following:

- To determine the prevalence of falls in the elderly in the City of Cape Town.
- To identify the determinants of falls in the elderly.
- To determine the relationship between sociodemographic characteristics and the risk factors for falls in the elderly in various retirement facilities.
- To categorize and compare the elderly in terms of risk (high versus low) groups for falls in retirement facilities.
- To determine the probability of falls in the elderly.

1.5 Hypotheses of the Study

The hypotheses of the study are the following:

- There will be a high prevalence of falls among the elderly in various retirement facilities.

- There will be significant gender-based differences associated to falls, with a higher prevalence of falls amongst the female elderly than the male elderly.
- Falling will be associated with multiple risk factors (e.g., age, medication, and cognitive impairment).
- There will be a high probability of falls among the elderly in the high-risk group.

1.6 Significance of the Study

Falls are a common health burden, with a multi-factorial origin. However, the elderly are nine times at risk for falls, especially in LTC facilities (Kioh & Rashid, 2018). Studies have shown that both intrinsic and extrinsic factors are associated with the risk of falls. Intrinsic risk factors relate to demographic factors, such as age, gender, previous occupation, history of falls, and medical comorbidities, whereas extrinsic factors include the type of medication side-effects and the environmental surroundings (Kioh & Rashid, 2018). Therefore, identifying the risk factors is important within the elderly population.

There are many studies that have identified more than 400 risk factors for falling, with no reliable classification thereof. According to Williams et al. (2015), there are numerous risk factors for falls among the elderly, which include older age, female gender, physical frailty, muscle weakness, poor gait and balance, impaired cognition, and depressive symptoms. The risk of falling increases with age, and escalates even further with comorbidities, such as cardiovascular disease, arthritis, and diabetes (Williams et al., 2015). Therefore, the present study will highlight the prevalence of risk factors for falls among the elderly living in retirement facilities in the City of Cape Town. This study will also highlight an awareness of falls in the elderly in order to reduce the morbidity and mortality amongst this vulnerable population (Naidoo, 2019).

1.7 Theoretical Framework of the Study

This study will use the social-ecological theory, first proposed by McLeroy and colleagues (1988), and later refined by numerous researchers, as the basis of the theoretical framework. This theory were chosen based on the principle that it considers the connections between the individual on all levels, as well as their environments (Towne et al., 2017). Environmental factors, such as the quality of the LTC facilities, to which the elderly must adapt, potentially increases the risk of falls and, ultimately, lowers their quality of life (Lee et al., 2018). This in turn has a huge influence on the health of the elderly, as well as their behaviour. The social-ecological model functions on multiple levels, which influence the behaviours of an individual. These levels are listed as interpersonal (knowledge, attitudes, behaviours, etc.), social environmental (family, spouse, organizations, influence of health professionals, etc.), physical environmental (institutions, availability of facilities, safety, etc.) and policies (education class, health policies, etc.). These aspects of an individual are important, and assume that appropriate changes in the social environment will produce changes in individuals, and that the support for individuals in a population is essential for implementing environmental changes (ACSM, 2014).

2. Literature Review

Fall-related injury among the elderly is a major public health issue globally (Pengpid & Peltzer, 2018), and also a common source of morbidity and mortality for the elderly (Crowe et al., 2021). The elderly living in LTC facilities have much higher rates of falls compared to the general population aged over 65 years, and falls among these individuals also tend to result in more serious complications, such as increased hospitalization rates, disability and increased mortality (Díaz et al., 2020). In 2010, approximately 80% of disability that resulted from unintentional injuries, excluding traffic accidents in adults aged older than 50 years, resulted from falls. In the same year, the disability resulting from falls in people aged 50 to 59 years was 66% in developing countries and 34% in high-income countries (Janakiraman et al.,

2019a). In 2018, 1-in-4 adults older than 65 reported a fall, and 1-in-10 reported an injurious fall, resulting in an estimated 35.6 million falls leading to more than 950 000 hospitalizations and 32 000 deaths (Crowe et al., 2021).

In the absence of an injury, falls have a dramatic consequence on the quality of life among the elderly, along with the physical and mental changes that accompany ageing (Janakiraman et al., 2019b). According to the World Health Organization reports, the burden of non-intentional falls and injuries are higher in developing countries, and older adults are at higher risk, suggesting that data on falls among LMICs is sparse.

According to Dhargave and Sendhilkumar (2016), a total of 163 elderly living in LTC homes in India were investigated, and they reported that a history of falls, poor vision, medications, chronic diseases, walking aids, vertigo and poor balance were all highly associated with falls, which was much higher in elderly women than men. The intrinsic factors were identified as the major risk factors for falls.

In a review by Callis (2016), a detailed review of the risk factors that contributed to falls amongst the elderly in a hospitalized setting was reported. The risk factors associated with in-patient falls were medications, unsteady gait, alterations in mental status, and environmental hazards. Callis (2016) concluded that risk assessment was a primary intervention for fall prevention.

A large proportion of the elderly will require long-term care, as the ageing population dramatically increases (WHO, 2017b). In the last half century, LTC has been a vital public health issue in many countries. The need for LTC haa rapidly grown and has also faced many challenges, such as financing, staff shortages and various resident complications regarding falls (Liping Fu, Zhaohui Sun, Lanping He, 2019a).

A pooer quality of life was observed in LTC facilities compared to those living in the community (De Medeiros et al., 2020). Literature has shown that the elderly living in LTC facilities have a lower educational level, a poorer health status, a higher dependency level, a

higher risk of falls, lower physical activity, lower decision-making ability, and are older (De Medeiros et al., 2020).

According to Bloch et al. (2010), identifying the sociodemographic characteristics of the elderly would produce a profile of those at risk of falling. This data could be extremely useful in advising individuals at risk, and in developing programmes that reduce fall rates. The loss of autonomy is a major risk factor for falls, and difficulties experienced with activities of daily living (ADLs) or instrumental activities of daily living (IADLs), double the risk of falling.

Diaz et al. (2020) found a significant difference between fallers and non-fallers, in which fallers were older and had lower levels of functional independence than non-fallers. Women had higher levels of physical and cognitive impairment. Pillay et al. (2021) also reported that fall-related injuries occurred more frequently in females than males. Balance, gait ability, cognitive status, and the number of medications should be considered as important risk factors for fall. Among the Chinese elderly, a broad range of factors increased the risk of falling, namely, being female, not participating in physical exercise, using multiple medications, having comorbidities, increasing age, and the fear of falling (Peng et al., 2019).

3. Research Methods

3.1 Research Design

Quantitative methods are associated with quantifying measurable variables in a systematic way, and determining the relationships between variables. For the present study, a quantitative cross-sectional study design will be used. This design is considered the most suitable for my study as it will produce consistent and reliable data that will allow for meaningful interpretation.

3.2 Sampling of Participants

There are 50 residential care facilities in the City of Cape Town, with approximately 100 residents residing in these LTC facilities, thereby, totalling a population of 5000 persons. A

total of 357 participants from four (4) retirement facilities will be randomly recruited to participate in the study, based on Slovin's formula. The sampling strategy will use a cluster randomized method to select four (4) of the fifty (50) facilities. Each facility or cluster is made up of approximately 100 residents, which when added together for the four facilities (100 x 4 = 400) will constitute the study sample size. If there are inadequate numbers after the four facilities have been sampled, then the cluster random sampling will continue to additional facilities, until the required sample size is met. Sample size is calculated using Slovin's formula:

$$n = \frac{N}{1+Ne2} \qquad n = \frac{5000}{1+ (5000 \times 0.05^2)} \qquad n = 357$$

Key: N = total population; n = sample size; e = margin of error

3.3 Delimitations of the Study

3.3.1 Inclusion Criteria of the Study

- Elderly ≥ 60 years of age living in retirement facilities in the City of Cape Town.
- Elderly residents living in the retirement facilities for a minimum of one year.
- Elderly residents who are independently ambulatory, without the support of a walking aid.

3.3.2 Exclusion Criteria of the Study

- Elderly not living in retirement facilities.
- Elderly with physical disabilities.
- Elderly who are frail, wheelchair-bound or bed-ridden.
- Elderly who are dependent on a walking aid for ambulation.

3.4 Research Procedures

Firstly, information about the study will be provided to potential participants, and then written consent will be obtained. A researcher-generated questionnaire will be used to obtain

information about the participants' age, gender, height, weight, educational qualifications, marital status, and medical history. The researcher will conduct the physical assessments at the various retirement facilities, while strictly adhering to the WHO COVID-19 protocols (WHO, 2020). Permission will be obtained from the Chief Executive Officer (CEO) of the retirement facility to conduct the tests within the facility. Each of the retirement facilities have a designated rehabilitation or therapy room that will be reserved by the researcher, and used to conduct the tests. Testing of the participants will be done on an individual basis, with the researcher, research assistant and a facility health care practitioner to assist. When conducting the physical tests, there is minimal risk to injury, such as a fall. Consequently, in addition to the researcher and an assistant, there will also be a health care staff member present to assist. However, in the unlikely situation that an injury or related trauma occurs, an appropriate referral will be made to the appropriate health care practitioner at the various LTC facilities for further assistance or intervention. Testing will be done during normal office hours (08h30 – 16h00), and the total testing time will be approximately 60-90 minutes per participant. However, if more time is needed for individual participants then the necessary provisions will be made accordingly. The participants will be familiarized about the physical assessments, firstly with a verbal description, then, with a physical demonstration. The two languages of the participants in the retirement facilities are English and Afrikaans. When applicable, the description of the test will be done in the vernacular of the participant. The FRAT is a 4-item falls-risk assessment tool, composed of two sections: part 1 entails the falls-risk status, which includes recent falls, medication, psychological and cognitive status; and, part 2 entails the risk factor checklist, which includes vision, mobility, transfers, behaviours, activities of daily living (ADL's), environment, nutrition, continence, history of falls and circumstances of recent falls.

The BBS is a 14-item scale used to objectively determine balance, with each item consisting of a five-point Likert scale ranging from 0 (lowest level of function) to 4 (highest level of function).

The DGI assessment tool tests eight components of gait and is used for determining functional balance. A 4-point Likert scale is used, ranging from 0 (lowest level of function) to 3 (highest level of function). The maximum score that can be achieved is 24. A score < 19/24 is predictive of falls in the elderly, and a score ≥ 19/24 indicates safe ambulation.

The TUG test is used to determine fall-risk and the progress of balance. An older adult who takes ≥12 seconds to complete the TUG test is at risk for falling.

To assess cognitive impairment, the MMSE is used, which includes tests of orientation, registration, attention and calculation, memory, language, and visual spatial skills. The maximum score is 30. A score ≥25 is classed as normal. A score between 10 and 20 is considered moderate risk. A score <25 indicates possible cognitive impairment.

3.5 Instrument Validity and Reliability

The research instruments used to gather data in this study will include the information sheet, and the technical equipment for taking the physical measurements. The FRAT was moderately strongly correlated with the BBS and TUG test ($r = 0.535$ to 0.690; $p < 0.001$). In a systematic review by Downs et al. (2013), they found high intra-rater (Interclass Correlation Coefficient = 0.88) and inter-rater (ICC= 0.77) score for the BBS. The DGI ICCs for test-retest and interrater reliability were good (0.96 and 0.96, respectively) and the reliability for single-item scores was moderate-to-good (Jonsdottir & Cattaneo, 2007). The DGI correlates with the BBS (0.78) and inversely with the TUG test (0.72) (Steffen, 2012). The geriatric assessment of function, such as the TUG assessment, is a sensitive predictor for recurrent falling (Fudickar et al., 2020). According to Hörnsten et al. (2020), the MMSE inter-rater reliability was high (mean kappa value 0.97) and test-retest reliability correlation coefficients ranged between 0.45 and 0.5.

3.6 Statistical Analysis

SPSS version 26 will be used in this study. Descriptive statistical analysis (mean, standard deviation, and frequencies) will be used for variables, such as age, height, weight, etc. The Chi-squared test will be used for determining the association between the risk of falling and the various risk factors for falls. The FRAT will be used to divide participants into high and low fall-risk groups, where the independent samples t-test will be used to test for statistical significance between these groups. The probability of falls will be determined using odds ratio (OR). A p value <0.05 will be used to indicate statistical significance.

3.7 Limitations of the Study

The study will not be representative of all retirement facilities, particularly private facilities. Recall bias of participants regarding falls could be a shortcoming. Also, there is no standardised instrument used for assessing balance, therefore, multiple tests will be used in order to compile a comprehensive assessment of balance.

3.8 Ethics Considerations

Ethics clearance to conduct the study will be obtained from the Biomedical Research Ethics Committee (BMREC) at the University of the Western Cape. Permission to conduct research on the elderly will be obtained from the CEO in the various retirement facilities. All participants will be given detailed information about the aims and objectives of the study, the methods, as well as the risks and benefits, and written consent will be obtained from the participants. Participation in the study will be voluntary, and participants will have the right to decide whether or not to participate in this study, and that declining to participate or stopping participation at any point will not negatively affect them in any way. When conducting the physical tests, there is minimal risk to injury, such as a fall. However, should an injury occur, of a physical or psychological nature, then participants will be treated immediately by the medical or allied medical staff at the various LTC facilities, with all associated medical

expenses covered by the LTC facilities. All the information obtained from the participants will remain confidential, and if the results are to be published, all the participants' personal information will remain confidential. Hard copies will be stored in locked filing cabinets, and electronic data will be stored in password protected computer files in the office of the supervisor. All information regarding this research will be stored securely in the SRES department, with access available to the researcher and supervisors only. All participants' information will be destroyed after a period of five years.

4. References

Aboderin, I. A. G., & Beard, J. R. (2015). Older people's health in sub-Saharan Africa. In The Lancet (Vol. 385, Issue 9968, pp. e9–e11). Lancet Publishing Group. https://doi.org/10.1016/S0140-6736(14)61602-0

Ambrose, A. F., Paul, G., & Hausdorff, J. M. (2013). Risk factors for falls among older adults: A review of the literature. Maturitas, 75(1), 51–61. https://doi.org/10.1016/j.maturitas.2013.02.009

Callis, N. (2016). Falls prevention: Identification of predictive fall risk factors. Applied Nursing Research, 29, 53–58. https://doi.org/10.1016/j.apnr.2015.05.007

Deandrea, S., Bravi, F., Turati, F., Lucenteforte, E., La Vecchia, C., & Negri, E. (2013). Risk factors for falls in older people in nursing homes and hospitals. A systematic review and meta-analysis. Archives of Gerontology and Geriatrics, 56(3), 407–415. https://doi.org/10.1016/j.archger.2012.12.006

Aboderin, I. A. G., & Beard, J. R. (2015). Older people's health in sub-Saharan Africa. In *The Lancet* (Vol. 385, Issue 9968, pp. e9–e11). Lancet Publishing Group. https://doi.org/10.1016/S0140-6736(14)61602-0

Africa, T. S. (n.d.). *Profile of older persons in South Africa*.

Bloch, F., Thibaud, M., Dugué, B., Brèque, C., Rigaud, A. S., & Kemoun, G. (2010). Episodes

of falling among elderly people: A systematic review and meta-analysis of social and demographic pre-disposing characteristics. *Clinics*, *65*(9), 895–903. https://doi.org/10.1590/S1807-59322010000900013

Buckinx, F., Croisier, J., Reginster, J., Lenaerts, C., Brunois, T., & Rygaert, X. (2017). Prediction of the Incidence of Falls and Deaths Among Elderly Nursing Home Residents : The SENIOR Study. *Journal of the American Medical Directors Association*. https://doi.org/10.1016/j.jamda.2017.06.014

Callis, N. (2016). Falls prevention: Identification of predictive fall risk factors. *Applied Nursing Research*, *29*, 53–58. https://doi.org/10.1016/j.apnr.2015.05.007

Crowe, B., Eckstrom, E., & Lessing, J. N. (2021). *Missed Opportunity for Fall Prevention A Teachable Moment Story From the Front Lines*. 1–2. https://doi.org/10.1056/NEJMcp1903252

De Medeiros, M. M. D., Carletti, T. M., Magno, M. B., Maia, L. C., Cavalcanti, Y. W., & Rodrigues-Garcia, R. C. M. (2020). Does the institutionalization influence elderly's quality of life? A systematic review and meta-analysis. *BMC Geriatrics*, *20*(1), 1–25. https://doi.org/10.1186/s12877-020-1452-0

Deandrea, S., Lucenteforte, E., Bravi, F., Foschi, R., La Vecchia, C., & Negri, E. (2010). Risk factors for falls in community-dwelling older people: A systematic review and meta-analysis. *Epidemiology*, *21*(5), 658–668. https://doi.org/10.1097/EDE.0b013e3181e89905

Dhargave, P., & Sendhilkumar, R. (2016). Prevalence of risk factors for falls among elderly people living in long-term care homes. *Journal of Clinical Gerontology and Geriatrics*, *7*(3), 99–103. https://doi.org/10.1016/j.jcgg.2016.03.004

Díaz, L. B., Casuso-Holgado, M. J., Labajos-Manzanares, M. T., Barón-López, F. J., Pinero-Pinto, E., Romero-Galisteo, R. P., & Moreno-Morales, N. (2020). Analysis of fall risk factors in an aging population living in long-term care institutions in Spain: A retrospective cohort study. *International Journal of Environmental Research and Public Health*, *17*(19), 1–10. https://doi.org/10.3390/ijerph17197234

Dillon, P. A. (2017). A Systems Approach to the Problem of Falls in Old Age. *ProQuest Dissertations and Theses*, 200. https://search.proquest.com/docview/1922575482?accountid=17192%0Ahttps://ua.gtbib.net/menu_usuario.php%0Ahttp://ua.on.worldcat.org/openurlresolver%0Ahttp://ua.on.worldcat.org/openurlresolver?genre=article&sid=ProQ:&atitle=A+Systems+Approach+to+the+Problem

Downs, S., Marquez, J., & Chiarelli, P. (2013). The Berg Balance Scale has high intra- and inter-rater reliability but absolute reliability varies across the scale: A systematic review. In *Journal of Physiotherapy* (Vol. 59, Issue 2, pp. 93–99). https://doi.org/10.1016/S1836-9553(13)70161-9

Franse, C. B., Rietjens, J. A. C., Burdorf, A., Van Grieken, A., Korfage, I. J., Van Der Heide, A., Mattace Raso, F., Van Beeck, E., & Raat, H. (2017). A prospective study on the variation in falling and fall risk among community-dwelling older citizens in 12 European countries. *BMJ Open*, *7*(6). https://doi.org/10.1136/bmjopen-2017-015827

Fudickar, S., Hellmers, S., Lau, S., Diekmann, R., Bauer, J. M., & Hein, A. (2020). Measurement system for unsupervised standardized assessment of timed "up & go" and five times sit to stand test in the community—a validity study. *Sensors (Switzerland)*, *20*(10). https://doi.org/10.3390/s20102824

Galea, M., & Woodward, M. (2005). Mini-Mental State Examination (MMSE): Commentary. *Australian Journal of Physiotherapy*, *51*(3), 198. https://doi.org/10.1016/S0004-9514(05)70034-9

Gustavsson, J., Jernbro, C., & Nilson, F. (2018). There is more to life than risk avoidance–elderly people's experiences of falls, fall-injuries and compliant flooring. *International Journal of Qualitative Studies on Health and Well-Being*, *13*(1). https://doi.org/10.1080/17482631.2018.1479586

Hörnsten, C., Littbrand, H., Boström, G., Rosendahl, E., Lundin-Olsson, L., Nordström, P., Gustafson, Y., & Lövheim, H. (2020). Measurement error of the Mini-Mental State Examination among individuals with dementia that reside in nursing homes. In *European Journal of Ageing*. https://doi.org/10.1007/s10433-020-00572-9

Janakiraman, B., Temesgen, M. H., Jember, G., Gelaw, A. Y., Gebremeskel, B. F., Ravichandran, H., Worku, E., Abich, Y., Yilak, F., & Belay, M. (2019a). Falls among community-dwelling older adults in Ethiopia; A preliminary cross-sectional study. *PLoS ONE*, *14*(9), 1–16. https://doi.org/10.1371/journal.pone.0221875

Janakiraman, B., Temesgen, M. H., Jember, G., Gelaw, A. Y., Gebremeskel, B. F., Ravichandran, H., Worku, E., Abich, Y., Yilak, F., & Belay, M. (2019b). Falls among community-dwelling older adults in Ethiopia; A preliminary cross-sectional study. *PLoS ONE*, *14*(9), 1–16. https://doi.org/10.1371/journal.pone.0221875

Jiang, Y., Xia, Q., Zhou, P., Jiang, S., Diwan, V. K., & Xu, B. (2020). Falls and Fall-Related Consequences among Older People Living in Long-Term Care Facilities in a Megacity of China. *Gerontology*, *66*(6), 523–531. https://doi.org/10.1159/000510469

Jonsdottir, J., & Cattaneo, D. (2007). Reliability and Validity of the Dynamic Gait Index in Persons With Chronic Stroke. *Archives of Physical Medicine and Rehabilitation*, *88*(11), 1410–1415. https://doi.org/10.1016/j.apmr.2007.08.109

Kalula, Sebastiana Z., Ferreira, M., Swingler, G. H., Badri, M., & Sayer, A. A. (2017). Methodological challenges in a study on falls in an older population of cape town, South Africa. *African Health Sciences*, *17*(3), 912–922. https://doi.org/10.4314/ahs.v17i3.35

Kalula, Sebastiana Zimba, Ferreira, M., Swingler, G. H., & Badri, M. (2016). Risk factors for falls in older adults in a South African Urban Community. In *BMC Geriatrics* (Vol. 16, Issue 1). https://doi.org/10.1186/s12877-016-0212-7

Lee, S., Oh, E., & Hong, G. R. S. (2018). Comparison of factors associated with fear of falling between older adults with and without a fall history. *International Journal of Environmental Research and Public Health*, *15*(5). https://doi.org/10.3390/ijerph15050982

Liping Fu, Zhaohui Sun, Lanping He, F. L. and X. J. (2019a). *Global Long-Term Care Research_ A Scientometric Review.pdf*. https://doi.org/10.3390/ijerph16122077

Liping Fu, Zhaohui Sun, Lanping He, F. L. and X. J. (2019b). *Global Long-Term Care*

Research_ A Scientometric Review.pdf. https://doi.org/10.3390/ijerph16122077

Marmamula, S., Barrenkala, N. R., Challa, R., Kumbham, T. R., Modepalli, S. B., Yellapragada, R., Bhakki, M., Friedman, D. S., & Khanna, R. C. (2020). Falls and visual impairment among elderly residents in 'homes for the aged' in India. *Scientific Reports*, *10*(1). https://doi.org/10.1038/s41598-020-70066-2

Neuls, P. D., Clark, T. L., Van Heuklon, N. C., Proctor, J. E., Kilker, B. J., Bieber, M. E., Donlan, A. V., Carr-Jules, S. A., Neidel, W. H., & Newton, R. A. (2011). Usefulness of the berg balance scale to predict falls in the elderly. *Journal of Geriatric Physical Therapy*, *34*(1), 3–10. https://doi.org/10.1097/JPT.0b013e3181ff2b0e

Nicolini-Panisson, R. D., & Donadio, M. V. F. (2013). Timed "Up & Go" test in children and adolescents. *Revista Paulista de Pediatria*, *31*(3), 377–383. https://doi.org/10.1590/s0103-05822013000300016

Peng, K., Tian, M., Andersen, M., Zhang, J., Liu, Y., Wang, Q., Lindley, R., & Ivers, R. (2019). Incidence, risk factors and economic burden of fall-related injuries in older Chinese people: A systematic review. *Injury Prevention*, *25*(1), 4–12. https://doi.org/10.1136/injuryprev-2018-042982

Pengpid, S., & Peltzer, K. (2018). *Prevalence and Risk Factors Associated with Injurious Falls among Community-Dwelling Older Adults in Indonesia*. *2018*.

Rubenstein, L. Z. (2006). Falls in older people: Epidemiology, risk factors and strategies for prevention. *Age and Ageing*, *35*(SUPPL.2), 37–41. https://doi.org/10.1093/ageing/afl084

Savira, F., & Suharsono, Y. (2013). Falls in older adults. *Journal of Chemical Information and Modeling*, *01*(01), 1689–1699.

Steffen, T. (2012). Dynamic Gait Index (DGI)/ Functional Gait Assessment (FGA). *Test and Measures*, *84*, 1–11.

Towne, S. D., Cho, J., Smith, M. L., & Ory, M. G. (2017). Factors Associated with Injurious Falls in Residential Care Facilities. *Journal of Aging and Health*, *29*(4), 669–687.

https://doi.org/10.1177/0898264316641083

United Nations Population Division. (2011). World Population Prospects: The 2010 Revision. *Population and Development Review, I.* https://doi.org/10.1553/populationyearbook2010s77

WHO. (2017a). *WHO series on long-term care*. https://www.who.int/ageing/publications/WHO-LTC-series-subsaharan-africa.pdf?ua=1

WHO. (2017b). *WHO series on long-term care*.

WHO. (2020). Guidance on COVID-19 For The Care of Older People and People Living in Long-Term Care Facilities , Other Non-Acute Care Facilities and Home Care. *World Health Organization*, 1–22. https://apps.who.int/iris/handle/10665/331913

Williams, J. S., Kowal, P., Hestekin, H., Driscoll, T. O., Peltzer, K., & Yawson, A. (2015). *Prevalence , risk factors and disability associated with fall-related injury in older adults in low- and middle-incomecountries : results from the WHO Study on global AGEing and adult health (SAGE)*. 1–13. https://doi.org/10.1186/s12916-015-0390-8

World Health Organization. (2007). WHO Global Report on Falls Prevention in Older Age. *Community Health*, 53. http://www.who.int/ageing/publications/Falls_prevention7March.pdf

Zhang, Liangwen PhDa,b; Zeng, Yanbing PhDa,b; Weng, Chenzihenga,b; Yan, Jiajina,b; Fang, Ya PhDa,b,∗ Epidemiological characteristics and factors influencing falls among elderly adults in long-term care facilities in Xiamen, China, Medicine: February 2019 - Volume 98 - Issue 8 - p e14375 doi: 10.1097/MD.0000000000014375