Tampere University of Applied Sciences

Nurses' role in risk assessment and prevention of fall injuries among elderly living in the long-term care facilities

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ABSTRACT

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Fall is an inevitable occurrence in population epidemiology, a topic of global health importance that is regarded as a leading cause of unintentional death worldwide. Several risks have been attributed to fall and fall injuries in the long-term care facility. Assessment of these risks are paramount for fall prevention strategies design.

The purpose of this thesis was to conduct a descriptive literature review on the roles of nurses in fall injury prevention in a long-term care facility. The objective of this study was to educate nurses on the assessment of risk of fall and fall injury prevention strategies in the long-term care facility.

The method of this bachelor's thesis was a descriptive literature review which was conducted using systematic methods. The process was initiated by formulating study questions, searching for literatures for data collection, screening of literatures for inclusion, assessing the quality of primary literatures data extraction, analysis of the data and presentation of our findings.

Several risk factors of falls emerged from the analysed data, and they were classified into the following categories: age, gender, previous Illnesses/ chronic disease, medications/ polypharmacy, adverse events including number of previous falls, fear of fall, types of mobility, balance disorder and risk assessment tools. On the other hand, fall prevention's themes were further classified into four categories which were: exercise, compliant flooring, deintensification of antihypertensive drugs and virtual coaching virtual reality-based balance exercises.

In conclusion, various risk factors of falls are associated with elderly living in the long-term care facilities and different preventive strategies were found useful for fall prevention. Based on our study, it was suggested that further studies should focus on fall risk assessment, fall prevention as well as the evaluation of the efficiency of interventions put in place in several LTCFs in Finland; this can be explored using both qualitative and quantitative research methods.

Keywords: Fall, fall prevention, long-term care facilities, risk assessment, role of nurses, elderly.

CONTENTS

GLOSSARY.

5T-STS	Five Times Sit to Stand
ADLs	Activities of Daily Living
CINAHL	Cumulative Index to Nursing and Allied Health Literature
FOF	Fear of Fall
FORTA	Fit For The Aged
FR	Fall-risk increasing drugs
FRA	Fall risk assessment
FRIDs	Fall-risk increasing drugs
HFRM-II	Hendrich Fall Risk Model-II
LTC	Long Term Care
LTCF	Long Term Care Facility
LTCFs	Long Term Care Facilities
MEDLINE	Medical Literature Analysis and Retrieval System Online
MFS	Morse fall scale
Mini-BESTest	Mini Balance Evaluation System Test
PICo	Population or Problem, phenomenon of Interest and context
PubMed	Public/publisher MEDLINE
START	Screening tool to alert to right treatment
STOPP	Screening tool of older people's prescriptions
TUG	Timed Up-and Go
WHO	World Health Organization

1 INTRODUCTION

Fall is an inevitable occurrence in population epidemiology, a topic of global health importance that is regarded as a leading cause of unintentional death worldwide. It is estimated that 684000 people died annually due to fall injuries where over 80% are in low-middle-income countries (WHO 2021.) Data has shown that the risk of fall is higher among elderly living in care facilities (Cameron 2018). It is estimated that 30-50% of the elderly living in long-term care facility experience fall each year in which 40% of these people who suffer from previous fall have recurrence fall within one year (WHO, 2007). While some of the injuries resulting from the fall are mild, some are severe leading to injuries such as hip fractures, traumatic brain injuries, upper limbs injuries which requires hospitalisation (Berg & Cassells 1992).

Finland is not an exemption to this global health challenge as fall is the leading cause of unintentional fall. In 2019, It was estimated that fall was responsible for more than 50% of accidental death in Finland. The number of falls has increased significantly especially among men in which 80% of these falls occur among people over 65 years (Official Statistics of Finland 2019). According to the recent population-based study of 2347 of fall-related injuries among older people in a Finnish emergency department, it was reported that the incidence rate of fall increases from 9.4% to 17.1% among those age 80-89 years and > 90 years respectively (Soukola 2020). The results of this study of Soukola (2020) also showed that 24% of the patients with fall injuries had another recurrent fall during observational period whereas 25% of patients that were discharged had fall related injury within first month of hospital discharge.

The publication of National Public Health Institute in Finland shows that ageing population in Finland is increasing which was projected; to be between 16.5% (17.7% for EU total) of the total population in 2008 and 26.0% (24.7% for EU total) of total population in 2031 respectively for people over 65years old and conversely, 4.3% (4.7% of EU total) in 2008 and 8.7% (7.5% for EU total) of the total population in 2032 (European Network of Economic Policy Research Institute 2010). This projection of increase in ageing population in Finland by 2030 which could be attributed to increase in life expectancy of the Finnish

population has led to increase in the demand for healthcare workers in Finland. Subsequently, more nurses will be required to work in the long-term facilities care for elderly. It is therefore important that the present and the future nurses are well trained in assessing the risk of fall as well as fall prevention and intervention mechanism in long-term care facilities in Finland to improve and promote the health of elderly patients.

While there are several publications on this topic, the most recent ones in Finland focuses on nurse's role in fall prevention among elderly by Rajesh (2019) and Nguyen (2019), where emphasis was on fall prevention among elderly population: in general, and; in home care respectively. This thesis focuses on long-term care facilities and subsequently will fill the knowledge gap on the role of nurses in assessment and prevention of risk of falls in LTCF and will contribute positively to professional nursing and academic communities.

This thesis is a descriptive literature review consisting of the theoretical background and the special part that includes data collection, data extraction (using deductive content analysis), data analysis and presentation of findings.

2 THEORETICAL BACKGROUND

The theoretical background of this thesis focuses on the concepts of nurse's roles, fall and fall injuries, long-term care facility, fall assessment, risk factors of fall and prevention of fall.

2.1 Fall and fall injuries

Fall is an inevitable event especially in some special group of people. The World Health Organization (WHO) defined fall as an event in a person which results in coming to rest inadvertently on the ground, floor, or a lower level (WHO 2021.) The fall events may result in fall related injuries and studies have shown that elderly living in LTCF is at moderate to severe risk of fall injuries (Terroso 2014, 51-59; Aranda-Gallardo, 2018). Falls and fall injuries in the elderly population have been linked to several risk factors in various studies (Berg & Cassells 1992; Chang & Do 2015, Gazibara 2017).

2.2 Risk factors of falls

Studies have shown that the elderly living in LTCF are at greater risk of falls than their counterparts living in community settings (Johnson 2006, 56-61; Cameron 2018; Harris-Kojetin 2018). While the risk of fall among elderly living in community is about 30%, the risk of fall in their counterparts living in LTCF is about 50%. The huge difference in the incidence of fall between these groups has been attributed to the facts those living in communities are more active, less physically dependent and have intact cognitive function compared to those in the LTCFs (Sturnierks & Tiedemann 2008, 563-569.)

Several risks have been attributed to fall and fall injuries in the LTCFs (Institute of Medicine (US) Division of Health Promotion and Disease Prevention 1992; Sharif 2018). These includes gender (Gale, Cooper & Sayer 2016, 789-794), age (Just 2020, 2144), physical and intellectual disability, previous fall history, use of walking aid, fear of falling, Parkinson's disease, vision impairment (Cameron 2018), poor nutritional status (Neyens 2013, 266; Torres 2015, 2157), medications (Michalcova, Vasut, AiraKsinen & Bielakova 2020), and environmental hazards (Qian 2021, 425). These risk factors are classified broadly as either extrinsic or intrinsic factors, while some of these factors are modifiable with specific intervention others may not (Phelan 2015, 282).

2.2.1 Intrinsic factors

The intrinsic risk factors of fall are regarded as the risk factors of fall that are individually oriented. Age and gender are the main risk factors of falls in the elderly. Aging comes with it own risks and effects such as poor vision, medical condition such as Parkinsons disease, osteoporosis: that causes the bone to be weak and easily breakable with the slightest of fall, impaired mobility and nutritional deficiencies. (Kwan & Straus 2014; Li et al. 2016.) Reduced lower limb strength contribute to the major falling for example if leg weakness is present, it increases the odds of falling multiple times. Balance impairment in the elderly may be due to changes caused by a decrease in the sensitivity of their postural control system which can lead to falling (Li et al. 2016).

2.2.2 Extrinsic factors

These are the risk factors that are external to the individual and the impacts they have are uncertain.They are the things within the environment that can cause a fall of a person (Karlsson 2013, 749.) The extrinsic risk factors includes,

environmental factors which includes poor stairway design and disrepair, unsecured mats and rugs, inadequate lighting, slippery floors, footware and clothings, inappropriate walking aids or assistive devices, unsupportive or badly arranged furniture, poorly designed tubs, toilet and fixtures in bathroom. Extrinsic factors often result in trips, slips, missteps which results in increased risk of fall (Pynoos, Steinman & Nguyen 2010, 636.)

Footwear for instance, is an extrinsic cause of fall that cannot be overlooked in fall risk assessment in older adults. However, the evidences of footwares in fall prevention are somewhat controversial. According to Kelsey (2010) wearing of footwear within the home helps to minimize the risk of falls. A study done in Finland in 2014 on footwear of 50 elderly participants in a municipal care home, showed that the indoor footwear properties of the participant were poorer than outdoor footwear properties (Stolt 2014, 38-39).The findings of Stolt et al (2014) showed that some of the footwears of their studied population; lack fixation and, have soft heels with longitudinal sole rigidity and with partly worn out outer soles. They suggested that nurses should have knowledge of footwear as an important risk factor of fall when caring for the elderly . However, according to recently published research article on the role of footwear in the risk of fall in healthy older adults, little evidence were found to support footwear recommendations as a viable fall prevention strategy (Davis, Haines & Williams 2019, 13-23).

2.3 Assessment of risks of fall

Assessment of the risk factors of fall in people living in the LTCF could be demanding since there are multiple intrinsic and extrinsic causes of fall. However, a study done by Kwan and Straus (2014), suggested that a focused history taking, and physical examination of the client is a single approach to assessing the risk of fall. Proper history taking and physical examination may be helpful in the identification of the risks of fall thus enhance the planning of fall prevention initiative in the LTCF (Kwan & Straus 2014, 610-611).

The assessment of risks of fall through history taking is important for the nurse to device the best approach to prevention of falls of their clients in the LTCF Different parameters can be assessed to take a proper history from clients or their caregivers. History taking could include information on client's gender, age, occurrence of previous falls in the past 1 year, and injuries that occurred during the fall, use of walking aids, presence of diseases such as memory problem, stroke, diabetes, impaired vison, heart disease, musculoskeletal diseases, osteoporosis, Parkinson's disease, symptoms such as dizziness and palpitation, footwear, medicine, health condition such as vision problem, poor lighting, and client's handling method (Kwan & Straus 2014, 612; Sharif 2018.)

2.3.1 Age and Gender

The age of an individual living in the long-term care facility can increase the risk of fall. Reports have shown that adults of age 60 and above are at higher risk of falling and are at increased risk of sustaining serious injury from the fall (Berg & Cassells 1992 ; WHO 2021). This information is important for nurses during assessment for risk of fall as age is a non-modifiable risk factor of fall. Gender is also an important factor in the assessment of risk of fall of individual living in the LTCF. There is evidence that women are at high risk of fall when compared with their male counterpart (Gale, Cooper & Sayer 2016).

The research done by Gale and his collegues showed that the prevalence of fall is higher in 29.1% of female than in 23.5% of male participants in their study. Other evidence of female gender presenting as high risk group for falls include the study done by Chang and Do (2015, 521). The reasons for the prevalence of fall in women than in men have also been investigated in different studies (Chang & Do 2015, 521; Johansson, Nordström & Nordström 2016, 535). A study that was done to investigate whether women are at higher risk of fall than men and to determine if the risk of fall is associated with variations in gait pattern showed that women have increased variability (15%-35%) in gait parameters such as step

length, stride length, step width, stance time, stride velocity and single support time when compared with the men (Johansson, Nordström & Nordström 2016, 535). The assessment of the risk of fall of an individual in the LTCF by a nurse should therefore take into account the gender as it is important in the fall prevention strategy to be used in the future.

2.3.2 Previous falls

Occurrence of previous falls have had significant effect on the individuals living in the long-term care facility. The WHO global report on falls prevention in older age shows that older people living in the nursing homes fall more frequently than those who are living in the community. The report also shows that approxiamately 30-50% of those living in a LTCF fall each year and 40% experience recurrent falls. (WHO 2007.) A study also reported that about 60% of clients living in LTCF falls atleast once annually and with an average frequency of 1.7 falls per year and most residents will fall recurrenly (Schooten 2017, 789).

2.3.3 Fear of fall

Any elderly who has experienced a fall or the recurrence of fall will naturally develop the fear of falling (FOF). FOF has been described by Gazibara et al. as a concern of an individual about falling. This concern has been found to be associated with decreased or loss of confidence, loss of balance and activity avoidance among the elderly in the LTCF (Gazibara 2017, 215.). The knowledge of the occurrence of previous fall and identification of the fear of fall will help for proper assessment of individual at risk of fall by a nurse.

The identification of older adult living in the LTCF which makes use of walking aids or have or previously had difficulty in walking is a good starting point for assessment of risk of fall. Relationship has been found to exist between the use of walking aid by an elderly living in the LTCF and future falls (Roman de Mettelinge & Cambier 2015, 129)

2.3.4 Medications and Polypharmacies

Medications has been attributed to increase the risk of falls. Some medications have side effects which predisposes patients especially elderly to fall risk. It has been established that the risk of falls increases as the number of drugs taken by patients are more than four, a term called polypharmacies. Some of the classes of medication which have been attributed to fall risk includes: Antihypertensive agents, diuretics, Beta-blockers, sedatives and hypnotics, neuroleptics and antipsychotics, antidepressants, benzodiazepines, narcortics and nonsteroidal anti-inflammatory drugs (Woolcott 2009.)

2.4 Fall risk assessment tools

Several tools have been developed by various researchers for the assessment of fall risk in elderly (Strini 2021; Howcroft 2013). While some of these tools are physical component such as wearable devices which can sense body movement using accelerometer (Shany 2012 ; Giansanti 2006 ; Yang 2010), some tools involves the use of questionaire to access specific or multidimensional risk of fall (Duncan, Leddy & Earhart 2011; Rose, Lucchese & Wiersma 2006). Strini et al. (2021) conducted systemaic literature review on various fall risk assessment tools and extensively identifiied twenty one various fall risk assessment tools, where some involve performing one or more physical actions during the risk assessment

and others involve the use of questionaires for risk assessment. It was further explained that the challenges attributed to the reliability and sensitivity of these tools constantly change when used in different population as earlier published by Palese (2016).

It is not uncommon to see different countries to use different risk assessment tools, for instance, Achen falls Prevention Scale used in Germany, Five Times Sit to Stand(5T-STS) United state, Fall efficacy Scale-Internaational, England, Mini Balance Evaluaation System Test (Mini-BESTest), Italy, Royal Melbourne Hospital Fall Risk Assessment tool, Australia (Strini 2021). In Finland, RAI-IKINA tool is used in assessment of indivual fall risk (Havulinna 2021)

It is important that Nurses and caregivers working with the elderly in LTCF familiarise themselves with some of these important tools to efficiently identify risk of fall among elderly for fall prevention and intervention.

2.5 Long-term care facility

Long-term care involves services and support that is required for an individual's health and personal needs over an extended period (Alic & Oberleitner 2015, 1327). Chronic health conditions or disabilities which may arise suddenly, such as heart attack and stroke, or those conditions that have developed gradually over a period, such as mental health conditions like dementia and nervous system problem like Parkinson's disease have been known to required long-term care (Van Rensbergen & Nawrot 2010). Frailness due to aging has also been identified as health circumstances that require long-term healthcare and nursing services. Those suffering from aforementioned conditions are known to require supports with activities of daily living (ADLs) such as support during walking, dressing, toileting, eating, and transfers between bed and chair. (Alic & Oberleitner 2015, 1327.) The healthcare services for these population are thus provided in specialized settings called the long-term care facility.

The long-term care facility usually consists of the population of people with advanced age (Eliopoulos 2015, 13-20). These settings includes facilities such

as nursing homes, care homes and assisted living facilities (Grabowski 2014; Eliopoulos 2015, 13-20). In these settings, the roles of nurses includes holistic care; care focused on chronic conditions and care needed for extended period of time (Eliopoulos 2015, 34) which differentiates it from those of other clinical specialities.

These afomentioned roles of nurses in care of LTC individuals in the LTCF thus requires regular planning and assessment; identification of needs and risks and changes in health status of the population (Eliopoulos 2015, 34)

2.6 The nurse's roles in fall risk assessment and prevention

Nurses play various roles in the health care setting, which includes the practitioner role, leadership role and research role (Johnson 2010). These suggests that the roles of a nurse as a practitioner are inevitable in the prevention of fall in the LTCF as much as leadership and research role have a combined effect to prevent falls in the LTCF. The nurse's roles as a practitioner in the LTCF involves meeting the needs of the patient by using direct intervention as well as collaborating with other disciplines to coordinate needed services. (Johnson 2010). These roles also include assessment of physical, mental, emotional, social, and spiritual needs; management of medications; provision of various interventions to enhance the quality of life of the residents (Eliopoulos 2015).

Physical assessment of individuals in the LTCF is one of the important roles of nurses in the assessment of the risk of fall. A study done by Phelan et al. (2015, 281-293) presented the key elements necessary for fall- focused physical examination. These key elements include neurological examination such as assessment of muscle bulk, tone, strength, reflexes, and range of motion; cognitive screen, for example Mini-Cog; and examination of orthostatic vital signs; the distal visual acuity; cardiac examinations such as heart rate, rhythms and murmurs, gait, and balance evaluation as well as musculoskeletal examination of back and lower extremities (Phelan 2015).

Nurses are responsible for day-to-day care of elderly living in long-term facilities. Through systematic method of history taking, medical examination of the patient and continuous interaction with patient, nurses can easily identify the elderly at risk of falling and can act accordingly to prevent fall in elderly. Some of this examination may involve physical examination by the conduction of certain test on patient who has been identified to be at risk. Such examinations may include: The time up-and GO (TUG) test, The 30-second chair test, the 4-stage Balance Test, Orthostatic Blood pressure test, Allen Cognitive Screen test (Cains 2021).

In gait and balance evaluation for instance, Timed Up-and Go (TUG), 30-Second Chair Stand and 4-Stage Balance tests can be done to evaluate the risk of fall. TUG is a functional mobility test involves timing an individual from standing up from the chair with armrests or assistive device if in use, then walking 3 m at their usual pace, turning, and returning to chair and sitting down. When the time covered for the exercise equals to or exceeds 12 second, this indicates a high risk of fall. The 30-Second Chair Stand checks for lower extremity strength and balance. This can be tested from the individual's ability to stand up from a chair of knee height (Cain 2021.)

2.7 Fall prevention

Fall prevention in LTCF is important due to the; increased incidence of fall within this population, the long-term effects it has on the individual as well as the burden it creates on the health care system (Florence 2018). Fall prevention entails the necessary actions taken by the nurse to help reduce the incidence of accidental falls. According to the WHO (2021), fall prevention interventions should focus on gait, balance and functional training, Tai Chi, environmental modifications, medication assessment, Vitamin D supplements for those with deficiencies and multifactorial interventions which is based on individual's risk assessment followed by focused interventions.

2.7.1 Exercise programs

A study presented by Li et. al. (Li 2016) showed that exercise intervention helped to reduce the incidence of fall by 22% (Lord SR 2003) to 47.5% (Wolf 1996) among the elderly living within the facilities and residential care. The type of exercise intervention used by the nurse depends on the individual assessment of the elderly. Evaluation of gait, strength and balance can help determine the elderly who will benefit from exercise which incorporates gait balance and functional training as a fall intervention program.

2.7.2 Vitamin D supplementation

Vitamin D is a key nutrient that help in bone development and its deficiency is one of the risk factors for falls in older adult (Bischoff-Ferrari 2018) The effectiveness of vitamin D supplement in fall prevention in the elderly living in the LTCF has been controversial and nonconclusive in some studies as they fail to show the effect or its insignificance in decrease in falls and fracture (Annweiler 2010; Chua & Wong 2011, 93-99 ; Pfortmueller 2014, 279-280). However, in the study by Chua and Wong (2011), their result showed that a daily standard dosage (800-1000 IU) of vitamin D significantly increased reduction of fall by 16%, but, reduction in the number of fallers remained statistically insignificant even when the dosage is taken into account.

2.7.3 Management of polypharmacy

The use of four or more drugs is regarded as polypharmacy and this phenomenon is a common thing among the elderly living in the LTCF (Le 2021). A study done

in England (Dhalwani 2017) on association between polypharmacy and falls in older adults showed that there is an increase rate of 21% in patients with polypharmacy compared with those without polyparmacy. The drugs that increase the risk of falls are regarded as Fall-risk increasing drugs (FRIDs). These includes drugs for cardiovascular diseases, benzodiazepines, antidepressants, antiepileptics, antipsychotics, antiparkinsonian drugs, opioids and urological spasmolytics (Huang 2012, 359). The use of these drugs have been shown to cause difficulty in mobility, slow gait, difficulting in rising (Huang 2012)

The management of medications is an important part in the provision of high quality care and patient safety in a LTCF. Nurses play crucial roles in the in the prevention of falls arising from the use of FRIDs. Their roles includes implementation of other strategies including non-pharmacologic options in the management of conditions to reduce the risk of fall; planing and optimization of medications and monitoring for side effects in the implementation of effective fall prevention strategies. The optimization of the medication in use can be done either by reducing the dosage of medications, withdrawing some medications such as psychtropic medications or switching of the medications. In a study by Huang (2012, 365), it was reported that complete withdrawal or reduction of atleast a dose of the FRIDs proves to be an effective intervention for fall prevention. This withdrawal or reduction of medication is called deprescribing. According to Sternberg (2021, 671-672) the depriscribing of FRIDs can be safely done by the use of tools such as screening tool of older people's prescriptions (STOPP)/ screening tool to alert to right treatment (START) (O' Mahony 2015), Fit fOR The Aged (FORTA) (Pazan & Wehling 2017), and Beers (American Geriatrics Society Panel 2015).

3 PURPOSE OBJECTIVES AND STUDY QUESTIONS

The purpose of this thesis is to conduct a descriptive literature review on the roles of a nurse in fall injury prevention in a long-term care facility.

The objective of this study is to educate nurses on the assessment of risk of fall and fall injury prevention strategies in the long-term care facility.

The study questions for this thesis are:

1. What are the risks of falls nurses must assess in a long-term care facility?
2. What are the ways that nurses can prevent falls in LTCFs?

4 METHODOLOGY

4.1 Definition of descriptive literature review

The method used for this thesis is a descriptive literature review which can also be called a narrative literature review (Kangasniemi et al. 2013). Descriptive literature review is a type of literature that is content driven which aims at describing certain phenomenon of interest based on the theoretical point of view.

This literature review is focused, structured, and complies with research ethics during all the stages of the review (Kangasniemi et al. 2013, 292). According to two different studies, the descriptive review follows a systematic and transparent procedure which includes formulating research question(s), searching for literature, screening of searched literatures for inclusion, assessing the quality of the primary studies, extracting, and analysing the data (Paré 2015, Paré & Kitsiou 2017). These stepwise procedures were put to use this thesis and shown in the figure 1 below. The justification for the use of these method was based on the knowledge that a decriptive literature review will give the authors and readers a comprehensive background and current knowledge of the thesis topic as well as answer the question of what is known about the topic (Kangasniemi et al. 2013).

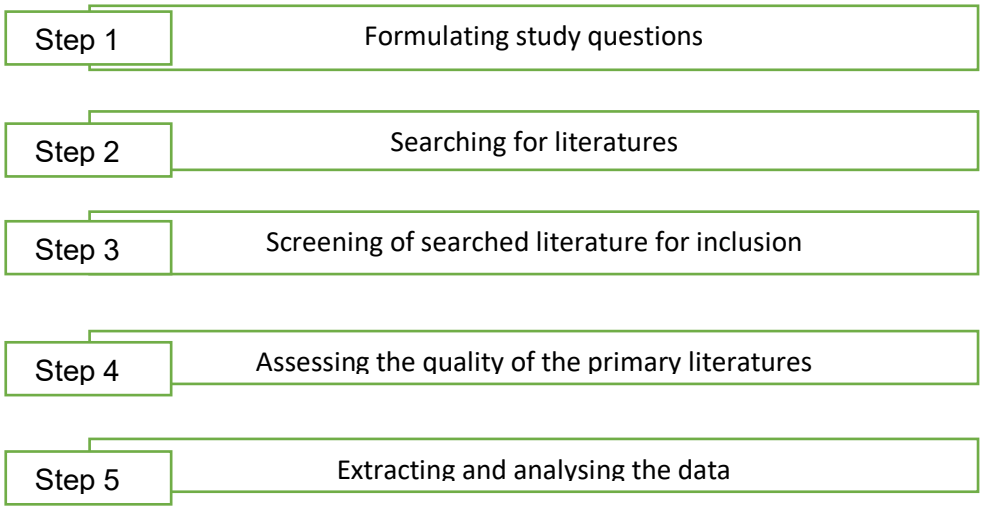

Figure 1. Process of descriptive literature review.

4.2 Formulating study questions

Identification of research problem is the key to formulating proper study questions for this thesis study. The research problem was identified by conducting an initial electronic literature search on falls in long-term care facilities and their preventions. From here, we were able to identify and formulate study questions to make a descriptive review of this topic.

4.3 Searching for literatures

Prior to the search for literatures, study questions had been formed for this thesis study. Literatures were searched in CINAHL, MEDLINE and PubMed electronic databases. These databases were chosen due to their suitability for the nursing field of study and option of wide range of literatures.

CINAHL is known as Cumulative Index of Nursing and Allied Health Literature. It is referred to as the largest and in-depth information source for nursing research (Wright, Golder & Lewis-Light 2015). It was assessed through the institutional library interphase (Tampere University Library n.d.). CINAHL has a basic search interphase for simple quick search and an advanced search interphase for more refined search. The advanced search was however used for literature search in this thesis.

MEDLINE is known to have a wide subject scope especially in biomedicine and health which encompass areas in life sciences and behavioural sciences, however MEDLINE is regarded as the primary component of PubMed, a literature database developed and maintained by NCBI (National Library of Medicine 2021). It can be assessed through NCBI, PubMed as well as through institutional interphase.

PubMed is a free database that contains 32 million citations and abstracts of biomedical and life science literatures. These literatures can be retrieved for global and personal benefit for the intent of health improvement (National Library

of Medicine n.d.). The searches done through this database was by advanced searches.

The literature search through these databases was based on the search terms that were developed based on the theoretical starting point of this thesis. They form a core concept which serves as a guidance towards answering of the thesis questions for this thesis topic. The search terms included “fall”, "long-term care", "nursing home", “nurse”, “prevention” and assessment. These search terms were obtained by using the Population or Problem, phenomenon of Interest and Context (PICo) structured database search tool for qualitative studies (Stern, Jordan & McArthur 2014, 54). The obtained search terms were then merged by Boolean operators, such as “AND” and “OR”. Similarly, truncation “*” (asterisk) after a word, for example nurs* was used, this gave searches with all words as nurse, nurses and nursing. Phrase searching with quotation sign (“”) which searched for a combination of words, for example “nursing home” was also used in the three different electronic databases. The database searches were documented in the database search table 2 below, while the PICo table can be found in table 1.

Combinations of two separate searches were done in each database. In one combination, “prevention” was used, while the other combination used “assessment”, these are shown in table 1 below

Table 1: Structured data search (PICo)

PICo	Key term	Alternative term
P: Population or problem	“long-term care”	“nursing home”
I: Interest; phenomenon of interest	“fall” or “fall injury” “nurses’ roles”	
Co: Context	“Prevention” “Assessment”	

4.3.1 Selection Criteria

The authors thoughtfully took into consideration selection criteria before the electronic database search. The goal of using a selection criterion is to determine which articles will be selected (Stern, Jordan & McArthur 2014, 55) or excluded from a study. In this thesis study, sorting for most current, relevant, and generalized reviewed research and information about the research questions from the selected databases was put into consideration.

4.3.2 Inclusion and exclusion criteria

Inclusion criteria can be used to determine which articles will be selected while the exclusion criteria determine those articles that are not selected. The criteria help the readers to understand what the study is basically focused on and the limitations used in article selection. According to Stern and his co-researchers, precision of the criteria such as the type of study, the intervention, the outcome, the population reviewed with reference to age, the publication language and publication period, which was chosen, needs to be considered when choosing the inclusion criteria for a study (Stern, Jordan & McArthur 2014, 55). In this thesis study, we explicitly highlighted in table 2 below the inclusion and exclusion criteria used in literatures selected.

Table 2: Inclusion and Exclusion criteria

Selection criteria	**Inclusion criteria**	**Exclusion criteria**	**Justification for its use**
Publication type	Peer-reviewed articles published in academic journals	Articles that are not Peer-reviewed	Peer reviewed articles have been subjected to scrutiny and are of high academic standard (Kelly, Sadeghieh & Adeli, 2014) which increases

			the reliability and trustworthiness of this thesis
Population reviewed	Elderly of age 65+	Age below the specified age in the inclusion criteria were excluded from the study.	Falls are one of the most common health concerns and prevalent thing among elderly people over the age of 65 in different type of health care facilities (Berry & Miller 2008, 149 ; WHO 2021).
Language used for article publication	English only	Other languages were excluded	English is a universal language and all authors speak, write and understand English language. This has helped to enhance clarity in this study.
Publication period	Published articles with 5-year time frame from 2016 to this current year (2016-2021)	Papers published outside this time frame	Based on the method of this study, current sources of information are more appropriate to use.
Full text	Articles available as full text were used	Articles which have no full text were excluded	Full text articles gave full information on the topic.

Relevancy	Relevant to nursing practice	Exclusion of articles not relevant to nursing practice. Also, articles which do not focus on our research questions were excluded.	The choice of the relevancy of the article to nursing field helped to support our thesis study questions.

4.4 Screening of searched literatures for inclusion

The articles retrieved from CINAHL and MEDLINE searches were screened and duplicates were removed, the initial articles from both databases based on search focused on “prevention” of falls were 58 and 38 respectively and those focused on “assessment” of falls were 48 and 35. After duplicates were removed, there were only 45 and 44 articles were left in each group. No duplicates of the nine articles were found for articles obtained from PubMed. The screening for duplicates reduced the number of articles to be further extracted to a total number of 98 articles.

Table 3: Database search information

Database	PICo	CINAHL	MEDLINE	PUBMED
Search terms and results obtained from each database	fall* OR “fall injury” AND "long-term care" OR "nursing home" AND nurs* AND prevention	58	38	5
	fall* OR “fall injury” AND "long-term care" OR "nursing home" AND nurs* AND prevention assessment	48	35	4
Search results		106	73	9
Total number of articles found in all databases were 188				

Furthermore, the 98 articles were screened by going through the topic, abstract and then reading through their methods and findings to have a clear understanding of their research and deduce if they are suitable for our objective and thesis study questions. From the extraction process 23 articles were found to be useful for this thesis.

The 23 articles were read through, and we further discovered that some of these articles did not focus on LTCF but rather on community living, which was outside the scope of this thesis. A total number of 10 articles were able to fulfil our criteria, these included 5 articles focused on prevention of falls and the other five articles focused on fall risk assessment.

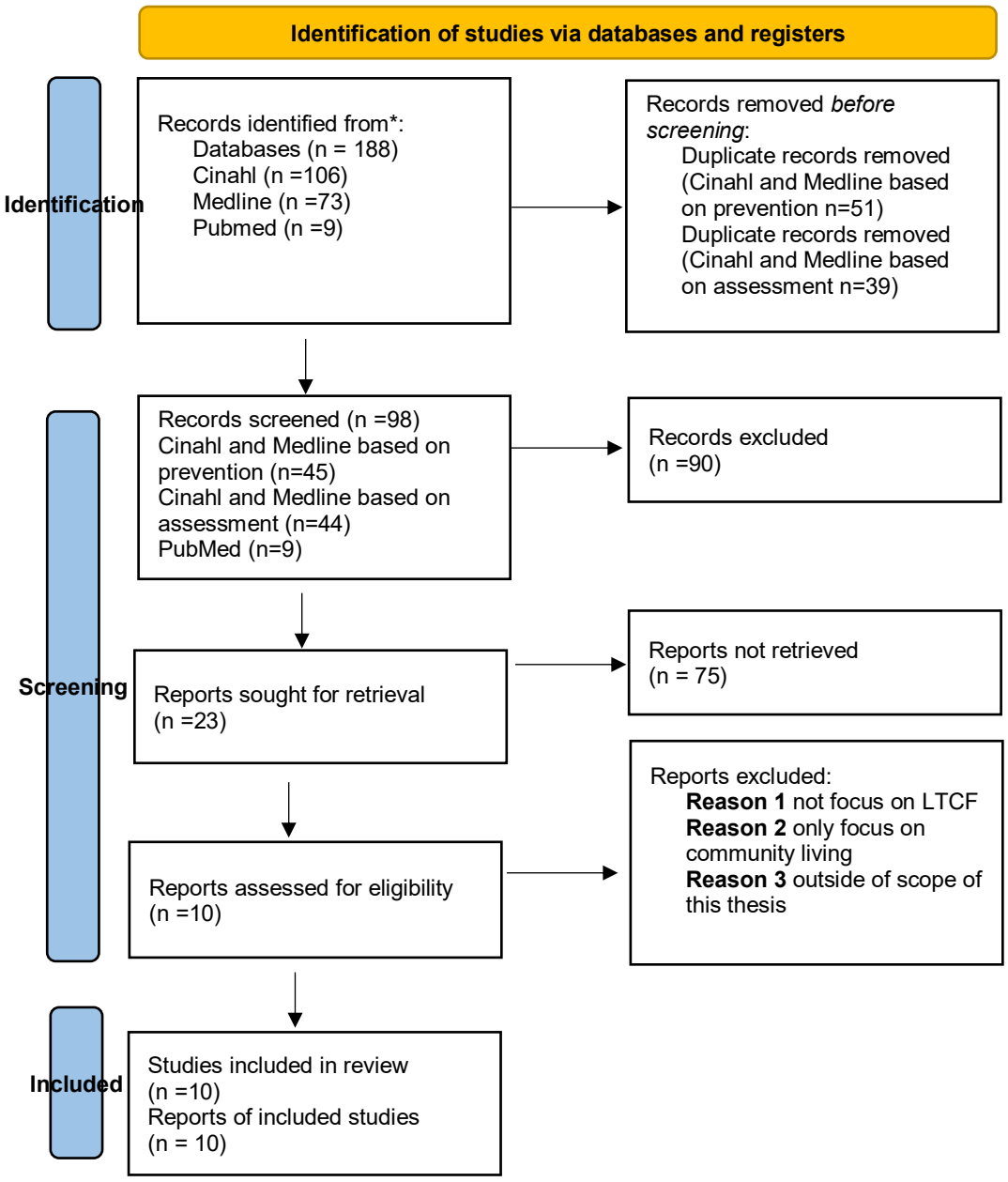

Figure 2: Prisma flow chart of database results

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372: n71. doi: 10.1136/bmj.n71

4.5 Assessment of the quality of articles

The quality of the 10 articles was done by using defined quality-appraisal criteria tool based on Kangasniemi et al. (2015). The use of y = yes, P = Poor, nr = not reported, scales showed how aims, objectives, study design, research methods, explicit theoretical framework, limitations, and implications were clearly and adequately described, presented and discussed. This process was done by two of the authors independently and the resolution of differences were done by all three authors. The table below shows the summary of quality appraisal for the 10 articles used in this thesis.

Table 4. Summary of quality appraisal of 10 chosen articles for study

Author(s) (year)	**Quality appraisal criteria (Scale y= yes, nr = not reported p= poor)**					
	Aims and objectives clearly stated	Study design adequately described	Research methods appropriate	Explicit theoretical framework	Limitations presented	Implications discussed
Song, Intrator, Lee & Boockvar, (2018)	Y	y	y	Y	y	Y
Baran and Gunes (2018)	Y	y	y	Y	y	Y

Lachance et al. (2018)	Y	y	y	Y	p	Y
Vieira de Sousa et al. (2016)	Y	y	y	Y	y	Y
Herculano de Araújo Neto et al. (2017)	Y	y	y	Y	y	Y
Yeşilyaprak et al. (2016)	Y	y	y	Y	y	Y
Zubkoff et al. (2019)	Y	y	y	Y	y	Y
Lee & Kim (2017)	Y	y	y	Y	p	Y
Huang et al. (2016)	Y	y	y	Y	y	Y
Cantalice Alves et al. (2016)	Y	y	y	Y	nr	Y

4.6 Extracting and analysing the data

The selected articles were read and methodological table was formed based on the following information: aim, objectives and purpose, methods, risk assessment risk prevention and the main findings of the articles. These information gave a brief overview of the articles and this can be found in the appendix 1 below.

Articles were extracted using deductive content analysis, which entails preparation, organizing and reporting of findings (Elo 2014).

5 FINDINGS

5.1 Fall's risk identification and assessments

In our findings, the following themes emerged, and they are: fall identification and risk assessment, and fall prevention.

Fall's risk identification and assessments: - Several risk factors of falls emerged from the analyzed data, and they classified into the following categories: age, gender, previous Illnesses/ chronic disease, medications/ polypharmacy, adverse events including number of previous falls, fear of fall, types of mobility, balance disorder and risk assessment tools.

On the other hand, fall prevention's theme were further classified into four categories which are: exercise, compliant flooring, deintensification of antihypertensive drugs and virtual coaching virtual reality-based balance exercises.

5.1.1 Age and Gender

Age was identified as an important risk factor in fall assessment according to Vieira de Sousa et al. (2016) and Herculano de Araújo Neto et al. (2017). The study conducted by Vieira de Sousa et al. (2016) with the population of age range of 61-91 and average age of 73.45 shows that there is a significant association between the risk of falls and the age of residents in the institutionalized home. Similarly, study of Cantalice Alves et al. (2016), with the mean age of 79.6+/- 7.1 shows that old age has a strong association with the risk of fall. (They attributed this to structural and functional changes due to biological aging). The age distribution of the study population in Herculano de Araújo Neto et al. (2017), were 79.8+/- 9.4 and their study show that there was not statistically significant of fall using t-test, however, when Berg Scale was used, the age range of older

adults of 80-89 directly influenced their result because there was limitation in performing requested activities.

The study by Vieira de Sousa et al. (2016) further shows gender plays a vital role in the risk of fall where significant association exist between female gender and increased risk of fall. (explained that this can be because of decrease in muscle mass in aging women). Similarly, study by Cantalice Alves et al. (2016) show that higher rate of falls was seen in women compared to their male counterpart with explanation similar to Vieira de Sousa et al. (2016)

5.1.2 Previous illnesses/chronic diseases

Previous illnesses as well as chronic diseases have been described as risk factors of fall. The findings of Cantalice Alves et al. (2016) show that 80% of the elderly in their study who had previously experience one or more falls have hypertension and 53% have diabetes. Herculano de Araújo Neto et al. (2017), in their research studied relationship between falls and multiple diseases which includes: Diabetes mellitus, hypertension, acute myocardial infarction, osteoporosis, arthritis, arthrosis and labyrinthitis. Herculano de Araújo Neto et al. (2017), findings show that previous diseases influenced the occurrence of fall while hypertension stands out.

5.1.3 Medication/ polypharmacy

The results of this research show that polypharmacy is a risk factor of fall Vieira de Sousa et al. (2016) Cantalice Alves et al. (2016), Herculano de Araújo Neto et al. (2017), in their study, investigated simultaneous use of 0 to 10 drugs among institutionalized elderly and their findings show that most of the seniors who are at the risk of fall made use of polypharmacy while those that have low risk of fall were using one to four drugs. Their analysis also shows strong statistical association between polypharmacy and risk of fall. In contrast, the research of Herculano de Araújo Neto et al. (2017) which studied risk of falls related to use

of 24 different drugs failed to show that there is a statistical difference in the mean amount of medication between elderly using 0 to 4 medication and those with polypharmacy.

5.1.4 Adverse events including numbers of previous falls

The findings of Vieira de Sousa et al. (2016), show that adverse events such as wounds and bruises, sudden illnesses as well as infections or surgical procedure are risk factors of fall. Their results suggest that occurrence of adverse events shows very strong statistical association with the risk of fall in elderly. In addition, Cantalice Alves et al. (2016) research indicate that those that had two or more previous fall were at the high risk of having new episodes of accidental fall.

5.1.5 Fear of Fall (FOF)

Research have shown that association exist between the fear of fall and risk of fall. Huang et al. (2016), conducted extensive research on combined cognitive behaviours and exercise intervention to manage FOF among elderly in residence home in Taiwan.

Table 5**:** fall's risk identification and assessments (X=present in article)

	Themes/ Authors	**Vieira de Sousa et al. (2016)**	**Cantalice Alves et al. (2016)**	**Huang et al. (2016)**	**Herculano de Araújo Neto et al. (2017)**	**Baran and Gunes (2018)**
Risk identification	Age	X	X		X	
	Gender	X	X			

	Previous Illnesses/ Chronic disease		X		X	
	Medications/ polypharmacy	X			X	
	Adverse events including number of previous falls	X	X			
	Fear of fall			X/ NO		
	Types of mobility	X	X			
	Balance disorder		X			
Assessments/ Assessment tools	Tools					X

5.1.6 Types of mobility and Balance disorder

Mobility of the elderly has been attributed to the risk of fall. Vieira de Sousa et al. (2016), described how unsafe walking (with or without help) especially in an unfamiliar terrain increases the risk of fall. They further explained their findings in which balance disorders are regarded as favouring factor for fall in elderly where previous fall are associated with poor walking parameters when compared to elderly without previous fall. They explained further how gait, an intrinsic factor contributed to about 46.7% of fall among their study population. Balance disorder

was also found as an intrinsic factor which includes conditions such as vertigo, dizziness, and syncope in this context.

5.1.7 Risk assessment tools

Fall assessment tools has been used to assess the risk of fall as well as preventing fall. Baran and Gunes (2018) conducted extensive research on some of the tools available for identification and prevention of fall. These tools include Fall Risk Assessment (FRA) Morse fall scale (MFS), Hendrich Fall Risk Model-II (HFRM-II). These three tools were used to assess data from 159 nursing homes. Their findings show assessment using FRA tool gave most satisfactory results. They also showed that MFS could also be of use in nursing home for assessment of risk of fall while HFRM-II is not appropriate for use in nursing home in assessing the risk of fall.

5.2 Fall prevention methods

5.2.1 Exercise

Exercise has been described as an important and effective ways mitigating against the risk of fall and more importantly, help in fall prevention among the elderly people living in long-term care facilities by Yeşilyaprak et al. (2016) and Lee & Kim (2017). The findings of Lee & Kim (2017) in their meta-analysis research which involve exercise intervention in fall prevention show that: ‘‘exercise had preventive effects on the rate of falls as well as the number of fallers.’’. Their results also show that when balanced training (such as gait, balance and functional training: or balance and strength) is included in exercise, fall rate significantly reduced even among the recurrent fallers (Lee & Kim 2017).

The findings of Yeşilyaprak et al. (2016) also show that exercise has a preventive measure and reduction in numbers of fall, and it is an effective ways of fall prevention and intervention among elderly.

5.2.2 Compliant flooring

Compliant flooring which involve covering of floors with shock absorbency for fall prevention has been attributed to an effective way of fall prevention by the staffs working in long-term facility according to research conducted by Lachance et al. (2018) on the perceptions about compliant flooring from senior managers in long -term care (Lee & Kim (2017)) and further stated that despite the high cost of installing compliant flooring facilities in care homes, it's cost effectiveness pays off in the long run.

5.2.3 Deintensification of antihypertensive drugs

Many of the results show that medications including antihypertensive drugs are one of the identified risk factors of fall. Song, Intrator, Lee & Boockvar, et al, (2018) compared the distribution of covariates among veterans who experienced antihypertensive deintensification within 7 days to those who did not experience antihypertensive deintensification. Their findings show that antihypertensive deintensification is associated with reduction in number of falls among the veterans.

5.2.4 Virtual coaching and virtual reality-based balance exercises

Virtual coaching according to Zubkoff et al. (2019), involving coaching of veterans in nursing homes on fall prevention other than face to face. There

findings show that there was significant improvement in overall injury rate including minor injury rate among the veterans, however, there was no improvement in total fall rate or major injury rate among these veterans living in nursing homes. Yeşilyaprak et al. (2016), explore the effect of virtual reality-based exercise on fall risk prevention and compare it to conventional exercise among the older adults living in nursing home in Turkey. Their findings made them conclude that VR based exercise is as effective as conventional exercise in fall prevention. They are of the opinion that people who don't want to involve in conventional exercise can participate in VR based exercise for fall prevention.

Table 6: Fall prevention matrix (X= present in article)

Themes/ Authors	**Yeşilyaprak et al. (2016)**	**Lee & Kim (2017)**	**Zubkoff et al. (2019)**	**Lachance et al. (2018)**	**Song, Intrator, Lee & Boockvar, (2018)**
Exercise	X	X			
Compliant flooring				X	
Deintensification of antihypertensive drugs					X
Virtual coaching and virtual reality-based balance exercises			X		

6 DISCUSSION

Fall is a combination of several complex phenomenon (Al-Aama T. 2011), and the nurse's role in the understanding of the mechanisms involved in fall is essential for the prevention of falls in the LTCF. The understanding of the risk factors associated with falls, and the use of risk assessment tools in identification of elderly at the risk of fall will go a long way in the prevention of falls in the LTCF. For instance, normal gait pattern could be disrupted due to ageing. As age progresses, there are possibilities of increased medical problems, thus the increase in the need of more medications which could then result into an increased risk of falls. The risk factors of falls have been widely studied. Some of the risks of fall that are needed to be assessed by nurses caring for elderly people in LTCFs are: age, gender, previous illnesses or chronic disease, medications and polypharmacy, adverse events including numbers of previous falls, fear of fall, types of mobility and balance disorder. The use of risk assessment tools by nurses to identify these risks have been thoroughly researched by Baran and Gunes (2018).

Findings from this study showed a strong association between age and the risk of fall (Cantalice Alves et al. 2016, Vieira de Sousa et al. 2016 ; Herculano de Araújo Neto et al. 2017). Vieira de Sousa et al. (2016) had shown in their study that an average age of 73.45 shows significant association between risk of falls and age in an institutionalized setting, while a similar study by Cantalice Alves et.al (2016) had shown that the average age of 79.6+/- 7.1 years shows strong association with risk of fall. However, reports from previous and recent studies showed that people aged 60 and above are already at a higher risk of falling and at increased risk of sustaining serious injury from the fall (Berg & Cassells 1992 ; WHO 2021). Age is a well known non-modifiable risk factor of fall, and despite the age discrepancies reported above, strong association with risk of fall still exists. Nurses should give special attention when caring for elderly patients above 60 years to assess the risks and put up measures for fall prevention.

Our findings have shown that female gender is at increased risk of falling when compared to their male counterpart (Cantalice Alves et al. 2016, Vieira de Sousa et al. 2016). There has been profund evidences from various studies that support

this findings (Chang and Do 2015; Gale, Cooper & Sayer 2016). These findings could be attributed to the increased variability in gait parameters such as length, stride length, step width**,** stance time, stride velocity and single support time in women when compared with the men in a study (Johansson, Nordström & Nordström 2016, 535). One of the reasons why female gender is prone to risk of fall more than male gender is the increase in fear of fall in women which also hinders their participation in social or physical exercise, thus make them more debilitated and prone to increased fall risk (üchele G 2014). Exercise is a good intervention to reduce fear of fall in elderly (Zijstra et al. 2007, 603-615). Nurses have role to play in assisting these elderly to cope by reassuring them that exercise is a proven method of fall prevention.

Previous illnesses and chronic diseases were found as risk factors of falls. Long-term care is a major criteria for living in the LTCF, thus diseases such as hypertention, postural hypotention, myocardial infarction, arthritis, osteoporosis and many other chronic diseases that requires LTC are risk factors of fall (Herculano de Araújo Neto et al. 2017). Our findings support recent study which reported that recurrent falls occurred mostly among those with higher number of chronic diseases (Immonen 2020). An individual may have various comorbidities which require treatments. In the treatment of these diseases, polypharmacy is inevitable, thus increases the risk of fall. Based on our findings (Vieira de Sousa et al. 2016; Cantalice Alves et al. 2016), polypharmacy has a strong relationship with the risk of fall. However, the study of Herculano de Araújo Neto et al. (2017), failed to show any statistical difference in the mean amount of medication between elderly using 0-4 medications compared to those with polypharmacy when they experimented the use of 24 different drugs. Polypharmacy in the LTCFs has been an ongoing concerns in past decades and it has been assocated with decline in functionality in the elderly, thus increases fall risk (Maher 2014). Similarly, comorbidities usually requires polypharmacy as more drugs are likely to be pescribed to elderly with many diseases. Throughout this reseach, polypharmacy have been documented as a well known risk factor of fall. Some of the drugs of concern are antihypertensive medications. Deintensification of antihypertensive medications have been described as way of preventing falls in elderly in LTCFs in this study. The findings have shown that there is a lower risk of recurrent fall when deintensification of antihypertensive drug is done, however,

there is an increase risk of death among residents with high systolic blood pressure, which could be a concern and an option that requires clinical judgment of the nurses in decision making. Although some studies showed that deprescribing of drugs are effective in risk of fall prevention (Huang 2012), it is also important that the use of appropriate tools such as Beers (American Geriatrics Society Panel 2015), STOPP (screening tool of older peoples's prescriptions), START (Screening tool to alert to right treatment) (O'Mahony D 2015) criteria and the Medication Appropriateness Index (Halli-Tierney 2019) are put to use to ensure safety in deprescribing of drugs and effective fall prevention.

Additionally, adverse events such as sudden illnesses, surgical procedures and infection are predisposing factors to the risk of fall. Findings from this study (Vieira de Sousa et al.2016) showed that there is an association between these events and the risk of fall. Similarly, report on previous episodes of two or more falls were also shown to cause increases in the risk of having repeated episode(s) of fall (Cantalice Alves et al. 2016). Proper assessment and suggestion of right intervention will ensure prevention of falls. It is of our opinion that nurses and other caregivers should be given appropriate training in fall prevention in elderly living in LTCFs.

Findings from this study showed that assessment of fall risk tools such as fall risk assessment (FRA), Morse fall scale (MFS) and Hendrich Fall Risk Model-II (HFRM-II) were effective in fall risk assessment, although HFRM-II was found non-effective for fall risk assessment in the LTCFs (Baran and Gunes 2018). This was also supported by a study done by Park (2018) where HFRM-II and some other tools were found to have low predictive validity for differentiating high and low fall risk. However, it was recommended that the use of two assessment tool at same time will give a better evaluation of the characteristics of falls that can occur when considering multiple factors and maximizing the advantages of each tool for predicting the occurrence of falls (Park 2018).

Our findings also showed that exercise, (Yeşilyaprak et al. 2016; Lee & Kim 2017) compliant flooring, virtual coaching, and virtual reality-based balance exercises (Zubkoff et al. 2019), are effective approaches that nurses can use to prevent falls in the LTCFs. Exercise is commonly used in fall prevention and intervention and reports on its effectiveness has supported our findings (Wolf SL 1996; Lord

SR 2003; Li 2016). Nurses have roles in the identification of the right exercises for elderly based on their functional capacity. It is a common phenomenon among elderly not to want to participate in physical exercise which may be due to fear of fall. However, these group of people can still benefit from the use of virtual coaching and virtual reality based exercise. The use of these devices has been proven to be as effective as exercise in our findings. Nurses should learn to use this technology and encourage the elderly who otherwise might refuse or be reluctant to paticipate in exercise to prevent fall risk.

In addition to exercise, compliant flooring with shock absorbing feature have been found to reduce the risk of fall in older people in a study done on a quasi-experimental evaluation of compliant flooring in the residential care setting (Gustavsson 2018). Although, the cost effectiveness of this is questionable in short term, it has been proven that the benefits in the long-run in preventing fall is cost effective (Lee & Kim 2017).

It is of our opinion that the roles of nurses in fall risk assessments and prevention cannot be overephasized as nurses need to work hand-in-hand with other caregivers to promote and improve the health of elderly living in LTCFs. We strongly recommend that nursing students as well as qualified nurses should be trained adequately in risk assessment and prevention to mitigate against this meneance of fall epidemiology in LTCFS in Finland.

6.1 Ethical consideration, reliability, and limitations of the study

Writing of this thesis has taken into consideration the guidelines issued by the National Advisory Board of Research and Ethics (2012). This thesis was conducted based on the prerequisite for ethical acceptability and reliability in accordance with good scientific practice. Trustworthiness of a study should describe in good details how an analysis is carried out in a sufficiently detailed manner (Elo 2014). In this thesis, we have striven to achieve trustworthiness by making careful selection, screening, analysis and proper documentation of the articles used to give clarity and ensure readers understanding in a stepwise manner.

According to Polit and Beck (2012, 106), reliability can be referred to as the accuracy and consistency of information obtained in a study. The selection of the articles used a systematic process which involved the use of PICo, a structured database search tool for qualitative analysis. This tool has helped in the simplification and identification of database search key words which also added to the reliability of this thesis. Also, the selected articles were chosen from reliable scientific electronic databases with selection of recent articles which were with 5 years publication to the time of the writing of this thesis. Articles used were of primary sources which enables us to get original information about the thesis topic, which also helped to improve on the reliability of this thesis work.

Screening and analysis of the articles involved what we called a check, read, re-read phases by all authors to ensure credibility. Credibility involves the set of procedure undertaken in analysis of the data which ensures that no relevant data are left out (Bengtsson, 2016) The checking phase involved basically all three authors going through the topics and abstract to see if they were relevant to the thesis questions. The methods and findings in each article were also read through during the read phase. The re-read was also done to ascertain the relevance of selected articles. Similarly, quality appraisal of the articles was done by two authors independently and then concluded by the three authors together.

Plagiarism was described by Ashworth, Bannister and Thorne (1997, 200-201) as a form of intellectual theft which cannot occur by accident. During the

documentation of the thesis work, the referencing of other authors achievement was done properly according to the TAMK referencing guidelines, this also ensured that proper referencing was done to prevent plagiarism.

There are several limitations to this thesis. One of them is the use of descriptive literature review as our methodolgy. While careful choice was made, it is not without an itch as there were limited articles on this research methodolgy. We could not find many materials which described ethical consideration on the use of descriptive literature review, however, reading through several publications on research ethics in qualitative and quantitative study as well as ethical consideration in systematic review, it gave us a broad knowledge of research ethics to be considered in our research process.

Also, our topic focused on long-term care facilities. While people accomodated in LTCFs consist of different age groups, the facts that we have focused on only elderly is a clear limitation to this study. This is to avoid ambiguity in our literature and data analysis. Moreover, this thesis is authoured by three students, sometimes, opinion varied during the analysis of the data as what are important and considered not important especialy during article selection. When these challenges arosed, we referred back to the literatures and addressed these issues together before proceeding. This was time consuming but it was a necessary challenge.

7 CONCLUSION

In conclusion, there are various risk factors that are associated with elderly living in LTCF and these are: age and gender, previous illnesses/chronic diseases, medication/polypharmacy, previous fall, fear of fall, mobility, and balance disorder. Fall prevention can be attained by use of: risk assessment tools to identify elderly at the risk of fall, exercise intervention, compliant flooring, deintensification of antihypertensive drugs virtual coaching and virtual reality-based balance exercise. It is important to have an idea of these risk factors and prevention methods of fall to ensure good quality of life for the elderly living in the LTCF. Based on our recommendation on emphasis for training needs of nursing student as well as qualified nurses in risk assessment and prevention to mitigate against the meneance of fall epidemiology in LTCFS in Finland. We would suggest that one of the ways to achieve this is to develop standardized national tools for fall risk assessment which are more thorough than the present one recommended by THL, although more studies will be needed to achieve this. Also, future studies should focus more on national studies in fall risk assessment and prevention in the LTCFs in Finland and to evaluate the efficiency of intervention put in place in several LTCFs; this can be explored using both qualitative and quantitative research methods.

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APPENDICES

Appendix 1. Methodological Matrix

	TOPIC	AIMS, OBJECTIVES & PURPOSE	METHODS	RISK ASSESSMENT	RISK PREVENTION	MAIN FINDINGS
Vieira de Sousa et al. (2016)		To identify the factors associated with the risk of falls in institutionalized elderly.	Quantitative analysis using SPSS to analyze frequency, chi-square, regression model analysis and Test	Age previous fall medication adverse events (wound, bruises, sudden illness, infection, or surgical procedure) Types of walking Gender		female gender occurrence of adverse events, high drug consumptions are associated with high risk of fall
Cantalice Alves et al. (2016)		To investigate prevalence, causes and consequences of falls in an of long permanence in the city of Jaoa Pessopb	Used of instrument with demographic questions. Descriptive study with qualitative approach.	use of medicine Chronic diseases (Hypertension, diabetes, Hypertension, and diabetes hand in hand) Numbers of falls weakness/balance or gait, syncope, dazedness, vertigo		prevalence of fall among elderly is 3 and above due to weakness/balance disorders, concomitant reduced vision, and syncope/dizziness/ vertigo

Yeşilyaprak et al. (2016)		To investigate effects of Virtual reality (VR) balanced exercises on balance and fall risk in comparism to conventional balance exercise.	Quantitative analysis where 18 subject aged 65-82 with fall history were randomly assigned to either VR group or conventional exercise group		Exercise can prevent fall risk	Improvements in balance training and fall risk are similar with VR-based balanced training and conventional balance training. Thus, older adults that are reluctant to attend monotonous exercise can benefit from VR
Lee & Kim (2017)		To evaluate effectiveness of exercise interventions on the rate of fall prevention in care facilities	Meta-analysis of RCT published up to December 2014		Exercise	Exercise intervention such as balance training has resulted in reduced fall rate and reduced number of recurrent fallers Exercise combined with other interventions has strongly reduced rate of fall
Huang et al. (2016)		To examine the effectiveness of cognitive-behavior strategies either with or without exercise in reducing fear of falling among elderly residing in nursing home	Prospective randomized control trial. Data analysis is done by SPSS	Fear of fall		Exercise intervention is effective for reducing free of fall among older adults

Zubkoff et al. (2019)		To reduce preventable falls and fall related injuries in state veterans' home	Virtual breakthrough series to help state veterans' homes for fall prevention		Coaching on VBTS to prevent fall	Fall related injuries reduced but fall rate did not reduce
Herculano de Araújo Neto et al. (2017)		To analyze he occurrence of falls in institutionalize elderly addressing the risks, consequences and antecedents	Statistical analysis using descriptive, independent t-test, Anova (Tukey), chi-test, Mann whitney.	Age, Hypertension Antihypertensive causing postural hypertension Previous diseases Medication		Number of drugs use does not have significant relationship on number of falls
Baran and Gunes (2018)		To determine the psychometric properties of the fall risk assessment, Morse, Hendrich Fall, Risk model II in NH residents	Prospective observational method of data collection using FRA, MFS and HFRM-II. Data was analyzed using SPSS			MFS has low sensitivity MFS has an acceptable specificity value71.30%HFRM-II has low specificity
Lachance et al. (2018)		To explore barriers and facilitators to adoption of compliant flooring as a fall injury prevention strategy in long-term care.	Qualitative research using thematic analysis		Compliant flooring	Compliant flooring was viewed positively for long-term care.

Song, Intrator, Lee & Boockvar, (2018)		To examine the association between antihypertensive deintensification and subsequent falls	Quantitative research using logistic regression analysis		Deintensification of antihypertensive drugs	Deintensification of antihypertensive drugs led to substantial reduction in number of falls