Individual Perceptions Related to Fall Risk
Among Older Adults in Acute Care
Setting in a Saudi Arabian Hospital

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By

Zuhar S. Altaymani

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A dissertation written by

Zuhur S. Altaymani

BSN, Prince Sultan Military College of Health Sciences, 2006

MSN, Daemen College, 2016

Ph.D., Kent State University, 2022

Approved by

________________________, Chair, Doctoral Dissertation Committee
Dana Hansen

________________________, Member, Doctoral Dissertation Committee
Amy Petrinec

________________________, Member, Doctoral Dissertation Committee
Jo Dowell

________________________, Member, Doctoral Dissertation Committee
Donna Bernet

Accepted by

________________________, Director, PhD Nursing Program, College of Nursing
Jo Dowell/Dana Hansen

________________________, Dean, College of Nursing
Versie Johnson-Mallard

ALTAYMANI, ZUHUR S., Ph.D. December 2022 College of Nursing

INDIVIDUAL PERCEPTIONS RELATED TO FALL RISK AMONG OLDER ADULTS IN AN ACUTE CARE SETTING IN A SAUDI ARABIAN HOSPITAL (126 pp.).

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Despite a plethora of research examining fall risk, including numerous fall prevention strategies, falls remain the most common adverse event among the elderly. Frail older adults are at higher risk for falls. With the increase in the geriatric population and their risk for frailty, it is imperative to address the limitations of both diagnosis and treatment of frailty, and the concurrent fall risk for older adults in Saudi Arabia by examining self-perception of fall risk. In older Saudi Arabian adults, falls are a serious health issue affecting up to 49.9% of elderly people, often resulting in fractures, traumatic brain, and limb injuries. Each year an estimated 684,000 individuals die from falls globally and of particular concern 80% of these falls occur in countries considered low to middle income. This study expands the understanding of falls in the elderly by examining the relationship among individual perceptions of fall risk.

Utilizing the Health Belief Model (HBM) as the framework, this study seeks to understand the relationships among individual perceptions related to risk for falling by examining perceived susceptibility, perceived severity, perceived benefits, perceived barriers, frailty, demographic variables, and fall risk level among older adult patients admitted in an acute care setting in King Salman Armed Forces Hospital (KSFAH) in Saudi Arabia.

A descriptive correlational, cross-sectional research design was used to examine the relationships among the variables. Measurement tools included the Health Belief Model (HBM) scale, demographic data, Part B of the Tilburg Frailty Indicator, and the Morse Fall Scale.

Mean scores of individual perceptions were reported significantly higher in the No Fall of risk participants over High fall risk patients ($p < 0.05$). The mean scores for “No Fall risk” are significantly higher than “High Fall Risk” in all four HBM domains, both individually and in the overall HBM ($p < 0.05$). Also in this study, age and frailty are positively associated with high fall risk.

The findings of the study inform the public and policymakers about the gaps in the current fall screening tools. Including individual perception and demographic data in the screening tools is of utmost importance to designing fall prevention care plans. This research adds to the scientific knowledge about falls and should be used in the foundation for fall prevention program development that improves individual awareness of fall risk.

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CHAPTER I

INTRODUCTION

Fall related injuries are a major public health problem among the older adult population. It is estimated that one in three adults aged 60 years and older fall each year (Chopik et al., 2018). The individual perception of falls among older adults or ‘elderly’ varies between cultures and generations, so no exact definition exists. Other factors that contribute to the definition of ‘elderly’ are based on social, economic, and chronological aspects, including frailty which is found in elderly men and women at 80 % and 85% respectively (Chopik et al., 2018). Globally, 60 years of age is typically considered elderly, and approximately 810 million people were elderly in 2012, with two-thirds of them residing in developing countries. This number is projected to grow to two billion by 2050. For Saudi Arabia alone, there were 1.4 million Saudis over 60 in 2012. That number is expected to reach 10 million by 2050. Falls are the leading cause of injury-related deaths and are the most common cause of non-fatal injuries and hospital admissions for trauma (Sihag et al., 2021). Patient falls is defined as any unplanned descent to the floor with or without injury to the patient. These are the most commonly reported adverse hospital events and are the second leading cause of patient injury (Huynh et al., 2020). Falls occur outside and inside the hospital setting. Participants were recruited that were aged 60 years and older and admitted to medical or surgical units. The prevalence of falls that occurred within the last three months of the participants hospital admission were examined. The following provides introductory information to the main variables of the study, which are individual perceptions, frailty, intrinsic and extrinsic factors.

Individual Perceptions

One major factor related to falls among the elderly is the individual's perception of fall risk. The Health Belief Model (HBM) provides a framework to examine individual perceptions of susceptibility, severity, barriers, and benefits. Research examining individual fall perceptions among the elderly is sparse and even less in the Saudi Arabian population.

Frailty

Frailty among the elderly is linked to reduced function, increased fall risk, higher vulnerability to adverse events, resulting in admission into assisted care (Cawthon et al., 2007; Ensrud et al., 2007; Ferrucci et al., 2004). With Saudi Arabia's increasing elderly population, it is vital that the risks related to frailty be addressed (Sihag et al., 2021). Frailty is perceived as a geriatric clinical syndrome and is defined as an excessive vulnerability to external stressors (Abellan et al., 2008; Abellan et al., 2009). A growing number of studies have indicated frailty as a major health condition for older adults and is correlated with fall frequency and fall injury (Sihag et al., 2021). In a recent systematic review studying the prevalence of frailty in low and middle-income countries, it was reported that a diagnosis of frailty was present in 4% of older adults in China, 13% of older adults in Tanzania, 51% of older adults in Cuba, and up to 72% of older adults in Brazil (Huynh et al., 2020)

Intrinsic and Extrinsic Factors

Many of the variables that increase the likelihood of falls in any setting are directly connected to risk factors present when the fall occurs (Sihag et al., 2021) and may be intrinsic or extrinsic. Some of the intrinsic factors include age, previous instances of falls, co-morbidities, the way of walking, visual, auditory, or cognitive impairment, and musculoskeletal issues. Extrinsic factors include environmental conditions, mobility issues, environment, assistive equipment in bathrooms, lighting, footwear, and medications such as opioids, benzodiazepines, and certain antidepressants (Graham, 2012; Huynh et al., 2020; Sihag et al., 2021). Other medications positively correlated to falls are heart medications, such as anti-hypertensives, analgesics, and diuretics, along with the total number of medications being taken by a patient (Fonad, 2022). Cardiac medications and analgesics have been found to be one of the main risk factors in adult falls especially in patients older than 65 because of the associated co-morbidities (Hohtari-Kivimäki et al., 2021; Fonad, 2022; Jindal et al., 2019).

Falls in the community seem, at times, likely. Hospitals are expected to provide a safe environment while delivering high quality patient care. Despite the availability of fall prevention measures, as many as 12% of patients (700,000 to 1,000,000) in the United States fall at least once during their hospitalization, (Graham, 2012; Kalisch et al., 2012; WHO, 2015). On average, falls with injury increase the length of stay in the hospital by 6.3 days and add approximately $13,000 to the total costs of the stay (WHO, 2015). By 2021, the estimated cost for hospitals to treat these injuries is expected to reach $54.9 billion (WHO, 2015). Given the large effect on patients and health systems, examining relationships among intrinsic and extrinsic factors informed the science around fall perceptions of older Saudi Arabia hospitalized patients.

Background and Significance

Between 2007 and 2016, the rate of deaths from falling increased 31% among the elderly, on average 3% each year (Sihag et al., 2021). When comparing various age groups, Guillaume et al. (2016) found 65 to 90-year-olds were most likely to fall (44.8%), followed by the middle age group of 45 to 64-year-olds at 41.9%. This provides an indication that the likelihood of falling increases with age. The death rate due to falls was higher for those 85 and above than other age groups in 2016. If the rate from falls stays the same, 43,000 elderly will have fall related deaths by 2030 (Burns & Kakara, 2018).

Fall Risk Factors

According to Sharif et al. (2018), risk of falling increases with the number of risk factors present and the prevalence of many risk factors increases with age. Multiple factors contribute to falls and can be placed into four main categories (one intrinsic and three extrinsic): biological factors such as age, sex, chronic illness, physical and cognitive decline; socio-economic factors like low income, lack of community resources, limited access to health and social services, and inadequate housing; environmental factors such as poor building design, poor lighting, slippery floors and stairs, and cracked or uneven sidewalks; and behavioral factors like multiple medication use, lack of exercise, inappropriate shoes (Huynh et al., 2020; Sharif et al., 2018). Patients have perceptions about their own risk of falling that influence intrinsic and extrinsic risk factors and the adherence to fall-prevention plans (Ahn & Oh, 2018) despite routine nursing education about fall prevention. Strategies to reduce falls have limited effectiveness on behavior change, especially if patients do not believe they are at risk (Cameron et al., 2018; Huang et al., 2015).

Lack of awareness and knowledge about their disease, poor social support, and low self-control or motivation to engage in health promotion behaviors are major factors that influence patient's individual perceptions related to fall risk (Ahn & Oh, 2018). The impact of these factors differs from one community to another. Despite the growing body of research identifying factors to increase awareness of perceived fall risk among older patients, limited studies have investigated those factors among the Saudi population.

Patient Falls in Saudi Arabia

There is one known Saudi Arabian study identifying the risk factors connected to injuries from falls among patients at the King Abdul-Aziz University Hospital (Bergen et al., 2016). The findings from 108 participants (58 who had experienced a fall, 50 who acted as a control group) showed 98% had experienced fall related hospitalizations, 85% of which were complicated by fractures, and 12% by intracranial bleeding. Patients were more likely to fall and have a fall history if they were over 60 ($p < 0.001$); self-reported as a non-smoker ($p<0.001$); and reported a fall-related hospitalization ($p < 0.001$). Those with a history of anemia were less likely to fall than those who were non-anemic [28 (48%) ($p < 0.001$)]. There is a great risk that individuals will experience multiple falls with a likelihood of complications, such as fractures. Further investigations are needed to aid in the improvement of patient outcomes while reducing the cost of treatment and the need for prolonged support.

KSAFH uses verbal education in addition to posters and handouts to inform patients about falls. All falls must be reported to the hospital’s Occurrence-Variance-Accident (OVA) system. In 2020, the hospital’s Quality Improvement and Patient Safety Department reported an increase in adult patient falls in the acute care setting, even in instances where a registered nurse provided fall prevention education. Few investigations have clarified factors that influence, predict, or shape a patient’s awareness of fall risk. Particularly missing is evidence of the role of the patient’s perception about behaviors related to safety and to fall prevention.

King Salman Armed Forces Hospital (KSFAH)

The hospital includes 25-beds in each of the following units: female medical unit, male medical unit, female general surgical unit, and male general surgical unit. More than half of the 200 patients admitted to the medical and general surgical units in 2021were over the age of 60 years old, and 88% of these patients were identified as being at high risk for falling based on the admission fall-risk assessment.

Over the past decade, evaluating patient outcomes related to elderly falls has gained increased national attention. Despite implementation of fall screening and fall prevention education, falls remain a major health concern in which more research is needed. Researchers acknowledge falls continue to be a national and global concern and posit that there is a lack of congruency among screening for fall risk, designing fall risk programs, and consistent measures for fall related patient outcomes (Bergen et al., 2016). Understanding how frailty, intrinsic, and extrinsic factors correlate with self-perception is critical to gaining an understanding of falls among the elderly in Saudi Arabia.

Problem Statement

With a sharp increase in the aging population there are significant direct and indirect effects on healthcare systems resulting from the corresponding increase in falls. With tools and other measures to quantify fall risk, and numerous strategies to help prevent falls, we still do not understand what factors lead older adults to put themselves at risk of falling.

An individual's perception is complex and multi-dimensional. It is the basis for a person's decision-making process (Glanz et al., 2002; Salovey & Steward, 2004), and the defining attributes of perception include awareness and comprehension. The current literature has looked at patient perception in connection with concepts such as patient engagement and self-efficacy, but fall risk has remained relatively unexplored (Garcia et al., 2012).

Purpose

The aim of this study was to examine the relationship among individual perceptions related to risk for falling by examining their perceived susceptibility, perceived severity, perceived benefits, perceived barriers, frailty, and fall risk level (no risk, high risk) among older adult patients admitted in an acute care setting in a Saudi Arabian Hospital (KSFAH).

Theoretical Framework

Research examining the association between individual perception of fall risk and elderly falls is sparse. Several models have been highlighted in empirical literature, including the Social Cognitive Model (SCM), the Theory of Reason Action (TRA), and the Theory of Planned Behavior (TPB). One of the theoretical frameworks that most clearly supports the investigation of fall risk is the Health Belief Model (HBM). While the HBM contains many constructs, four constructs of the model provided the framework for this study, allowing for a focused examination on the importance of perception of fall risk in the Saudi population. A lack of concordance between existing fall-risk screening instruments and the lack of ability to address all risk factors related to falls with any one instrument has contributed to inaccuracies in screening and reduced adherence to programs related to fall prevention (Timsina et al., 2017).

The HBM was first developed by social psychologists in the U.S. who were employed in the United States Public Health Service and sought to improve the use of preventative services by the public (Bandura, 1978). It included five constructs of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action (Cohen, 2009). The concept of self-efficacy was added to the original model in 1988 (Cohen, 2009). Cues to action refers to individual responses to interventions designed to change behavior, and self-efficacy reflects an individual's belief in self to create change. For this study, the constructs of perceived susceptibility, perceived severity, perceived benefits, and perceived barriers provided the framework for this study.

The HBM is a descriptive middle range theory that portrays behaviors related to health and health beliefs of individuals. This is important because individual beliefs have been found to impact and predict health behaviors (Bishop et al., 2015). The HBM postulates that individual perception has large effects on behavior.

Historical Perspectives

The foundation of the HBM is rooted in the idea that people want good health and are therefore willing to change their behaviors to achieve it. This idea can be found within several physiological and behavior theories, such as the Theory of Planned Behavior and the Social Cognitive Theory. A limitation to these theories is that a person’s health motivation, or the extent to which a person is concerned about health matters (i.e., perception), is limited, whereas the HBM includes this important construct (Arnold et al., 2009). Individual perception helps to explain why some individuals forego changing their health behaviors despite receiving cues to act regarding their health behavior and perceiving themselves as susceptible and perceiving there is a threat. The incorporation of self-efficacy into the (HBM) was added to help understand chronic illnesses because “the behavioral focus of the early model was on circumscribed preventive actions, such as accepting immunizations” (Rosenstock et al.,1988, p. 92). Self-efficacy was added to the HBM model in 1984 by Janz and Becker. According to Rosenstock, et al, (1988) as self-efficacy increases, barriers decrease when an intervention is present. This resulted in the recommendation that self-efficacy be incorporated into the HBM. Its’ relationship with other constructs in the model remain unexplained. Researchers (Scheffer et al., 2008), recommend that cues to action and self-efficacy be measured in experimental studies that include interventions congruent with their perception. For example, several studies found cues to action and self-efficacy imperative in the sustainability of fall prevention programs (Arnold et al., 2009;

Hill et al., 2013). Since there is not an intervention and there is sparse evidence on individual perceptions in the target population, self-efficacy and cues to action will not be examined. Instead, intrinsic, extrinsic variables, and frailty, which are influential to fall perception, will be evaluated.

The lack of theory-based research among the Saudi older patient community has led to limited knowledge about their individual perception to activate and promote awareness of fall risk, which in turn constrains our understanding about factors that influence a patient's ability to activate and promote awareness of fall risk.

Concepts of the Theory Related to the Study

Four concepts from the HBM will guide this study: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. Table 1 provides the definitions of the concepts. In the model, the concept of perceived susceptibility is defined as the extent to which an individual perceives the health problem to be relevant and the diagnosis to be accurate (Bishop et al., 2015). For this study, a patient's perceived susceptibility to a fall is their subjective perception of their risk and is heavily influenced by the modifying variables described below. In other words, if a patient does not feel they are susceptible to a fall, then they are at more risk for falls.

For perceived severity, even if a patient perceives themselves to be susceptible, they will only act when they believe the threat to be critical enough that they will have major physical or social complications (Bishop et al., 2015). If the consequences of a fall are not perceived as being severe, the patient is unlikely to engage in a fall prevention program. In other words, as perceived severity increases so does perceived susceptibility.

The concept of perceived benefits is defined as an individual's belief in the efficacy of a treatment to either prevent or cure an illness (Bishop et al., 2015). The individual needs to believe in the efficacy of the fall risk perception to engage in the recommended actions. As perceived benefit of an individual's perception improves, fall risk decreases.

The final concept, perceived barriers, is defined as the individuals' beliefs regarding the complexity, length, and accessibility of the treatment (Bishop et al., 2015). There are numerous barriers present and include the modifying variables previously discussed. As an individual's perception of barriers increases, their fall risk scores will likely decrease. The HBM guided the current study, by exploring patient beliefs regarding their susceptibility about the impact a fall may have, the barriers they may encounter, and which factors make them susceptible for falls.

Table 1

Theoretical and operational definition of HBM constructs

HBM Concepts	Theoretical definitions	Operational definitions
Perceived Susceptibility	A person's subjective perception of the risk of acquiring an illness or disease	Patient's perceptions and belief about the chances of experiencing fall risk or getting a condition or disease
Perceived Severity	Also known as perceived seriousness, refers to the negative consequences an individual links with an event or outcome	Patient's perceptions and belief about how serious of fall risk condition and its sequelae are
Perceived Benefits	Perceived benefits refer to an individual's assessment of the value or efficacy of engaging in a health-promoting behavior to decrease risk of disease	Patient's perceptions and belief in efficacy of the advised action to reduce risk of fall or seriousness of impact
Perceived Barriers	Perceived barriers refer to an individual's assessment of the obstacles to behavior change	Patient's perceptions and belief about the tangible and psychological costs of the advised action

The HBM was utilized by Li et al. (2019) to investigate the prevention of falls and the promotion of fall prevention in elderly populations of various demographics. The focus was on the strategies to improve health beliefs and behaviors related to fall prevention for older citizens with lower levels of education. Findings showed the scores for the HBM dimensions for the risk-reduction behaviors group were greater than the ones for the risk behavior groups. A positive correlation was found between the HBM concepts scores and the risk-reduction behaviors and risk-reduction behavior numbers for the elderly. Similar results have been found regarding HBM theory when studying other diseases (Rosenstock, et al, 1988). One interesting finding was the negative correlation between ‘perceived severity’ and risk-reduction behaviors. A higher perceived severity score usually demonstrates an individual has more awareness of the disease severity or untreated situation, which means behavior is more likely to be improved because of the feared consequences. This was not true for the study by Jones and colleagues (2010). This may be related to the fact that some fall prevention actions may be constrained in the elderly when they are worried about falls. The researchers also found that knowledge and economic and social status are represented by an individual’s level of education, with a positive correlation among education level, fall-related health beliefs, and risk-reduction activities. Higher awareness of ‘perceived severity,’ ‘perceived susceptibility,’ and ‘perceived barriers’ was also found in higher-educated elderly individuals. Perhaps this is because a person does not fear what they do not know. The HBM has a history of empirical testing in a variety of settings and provides a critical framework for this study, which addresses the gap in theory-based survey studies in the Saudi Arabian elderly population regarding falls.

Confounding Variables

Several confounding variables affect falls in the elderly. In the research context, confounding refers to the association between the independent and dependent variables being distorted due to a third variable that is independently associated with them (Ago et al., 2019). The description of a causal relationship reflects the effect of the independent variable on the dependent variables (Ago et al., 2019). According to the literature, confounding variables for falls in the elderly include intrinsic and extrinsic factors, and some researchers identify frailty as a confounding variable (Ago et al., 2019). The literature suggests several intrinsic and extrinsic factors that are connected to patient falls. This study focused on the three components that comprise the concept of frailty and include physical, social, and psychological factors. These aspects of frailty will be measured using part B of the Tilberg frailty scale (appendix A). Additional intrinsic and extrinsic variables will be measured including demographics such as, age, gender, level of education, and medication history (see Figure 1 for the study model). It is important to note that some research indicates the female gender is at greater risk for falls and other research indicates the male gender is at greater risk (Chang & Do, 2015; Saygın, et al., 2018). By measuring the existence of critical confounding variables already identified in the research, a third variable will be avoided that potentially violates the statistical results of the study.

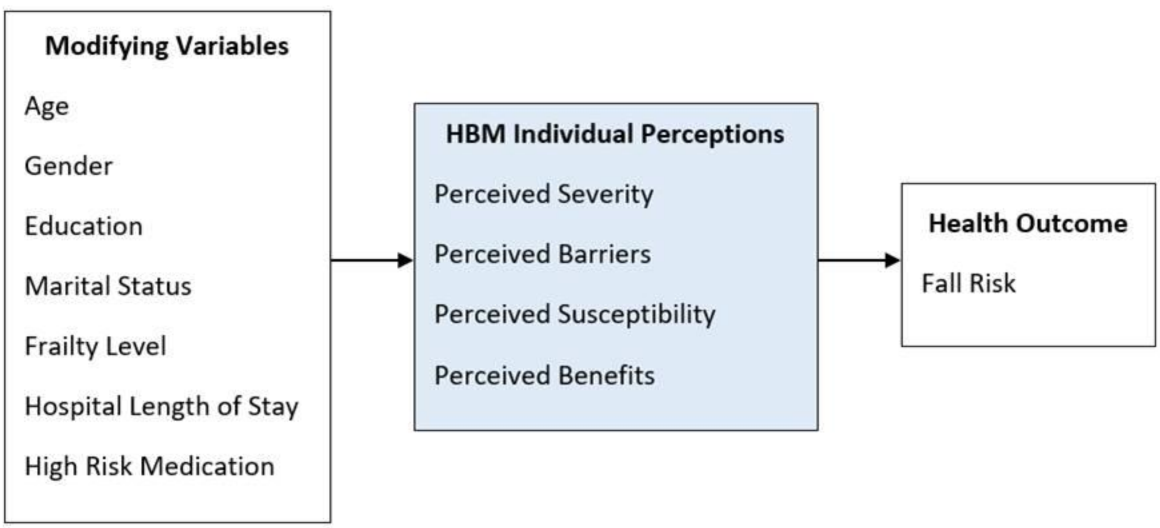
Several factors are associated with falls in existing research. As mentioned previously, some of these include age (older than 60), gender, mobility impairment, cognitive impairment, visual impairment, incontinence, fall history, certain types of medication, comorbidities, and environmental factors (Chang & Do, 2015; Morris & O’Riordan, 2017; Fabre, et al., 2010; Sun et al., 2018).

Several studies looked specifically at the relationship between certain medication classes and falls, including antidepressants, anticonvulsants, analgesics, psychotropics, sedatives, anxiolytics, diuretics, and antihypertensives (Lamis et al., 2012). Patients who were on at least three of the medications were at a higher risk of falling (Lamis et al., 2012). Titler et al. (2011)

found an increase in the odds of a fall of 6-10% for each medical treatment or nursing intervention. See Appendix A for a full list of demographic and frailty variables.

When viewed through the lens of HBM, the threat or severity of health problems faced by an individual helps them to identify their perceptions that put them at risk for falls. The model addresses how a person's belief and behavior are related. It can predict how people will behave regarding their health and their compliance with treatments (Chism, 2015). While perception can change a person's behaviors, it can also be modified and acquired through socialization. Persuasive techniques can be used to modify perceptions related to behavior, which can result in behavioral changes.

Figure 1.
Study Model



Measurement Tools

Measurement tools used in this study include demographic variables, the Health Belief Model Scale, the Tilburg Frailty Indicator, and Morse Fall Risk Scale.

Demographic Variables

The demographic variables measured in this study are age, gender, education level, marital status, hospitalization period and medications.

Health Belief Model Scale

The HBM scale, with a reported Cronbach's alpha of .91, was used to measure the concepts of fall risk perception. The questionnaire was evaluated and modified by experts in the field of epidemiology, injury prevention mapping, health education, and fall prevention professionals for its content validity and clarity (Li et al., 2019). The HBM was an appropriate theory to underpin this study investigating patient perceptions regarding falls. To accommodate this study, the HBM Questionnaire was translated into Arabic. The methodology for the translation is described in chapter 3.

Frailty

In the current study the Tilburg Frailty Indicator (TFI) part B measured intrinsic and extrinsic factors which included physical, psychological, and social components. Alqahtani et al. (2020) found that the translated Arabic TFI version is a valid and reliable instrument in assessing the frailty among Saudi community-dwelling older adults. The TFI's reliability was measured with an overall Kuder-Richardson (KR) Formula-20 of 0.70.

Fall Risk

The use of tools in assessing fall risks is important for identifying patient risk. The existing measurement tools aid healthcare workers in determining the fall risk of each patient (Heinze et al., 2009). Some of the most commonly used tools include: the Hendrich II Fall Risk Model (HFRM II; Heinze et al., 2009), the Morse Fall Scale (MFS; Morse et al.,1989), and the St. Thomas Risk Assessment Tool (STRATIFY; Oliver et al., 1997).

For this study, the Morse Fall Scale (MFS) was used to assess fall risk for patients in the KSFAH and was translated into Arabic for this study. The methodology for the translation is described in chapter 3. The reported Cronbach's alpha reliability coefficients for the MFS are α = .93 for History of falling, .90 for Secondary diagnosis, .92 for Ambulatory aid, .91 for IV/saline lock, .92 for Gait/transferring, .87 for Mental status and .94 for the whole scale (Heinze et al., 2009).

Research Questions

For patients admitted to an acute care setting in KSFAH

1. What are the individual perceptions (susceptibility, severity, benefits, barriers) and their relationship between each other?
2. What are the differences between individual perception and fall risk?
3. What are the differences among individual perceptions, demographic variables, fall risk levels, and frailty?
    a. What is the difference between individual perception and demographic variables?
    b. What is the difference between demographic variables and fall risk?
    c. What is the difference between demographic variables and frailty?
    d. What is the difference between frailty and fall risk?
4. To what extent do individual perceptions (susceptibility, severity, benefits, barriers), demographic variables, and frailty predict fall risk (no risk or high risk) for elderly patients admitted to an acute care setting in KSFAH?

Summary

Patient falls can result in injuries that lead to pain and suffering, increase hospitalization, and costs (Lima, et al., 2022; National Center for Injury Prevention and Control, n.d. Facts about

Falls). Because issues related to perception may affect fall risk in patients, this study examined the relationships among several modifying variables, individual perception based on the HBM, and fall risk. This awareness is vital as it influences the nurse's ability to create individualized care plans based on individuals' awareness of perceptions (Bolton, et al., 2019). This may also lead to the addition of individual perception items to the fall risk tools already used in the hospital. A deeper understanding of patient's perceptions about their risk of falling in a Saudi Arabian hospital advances the science with the growing number of aging patients and may assist individuals to undertake healthy fall prevention behaviors (Tovar et al., 2010). Chapter 2 addressed the literature review with a discussion of the literature that was used as evidence to support this proposed study.

CHAPTER II

LITERATURE REVIEW

This literature review provides an analysis and synthesis of the current evidence about falls among the elderly to identify gaps of scientific knowledge and an overview of knowledge regarding elderly patient perceptions of fall risks, extrinsic and intrinsic factors, such as frailty, that also effect fall risk. The research surrounding fall screening instruments and the Health Belief Model (HBM) as a framework for fall perception is evaluated and presented in this chapter.

Historical Perspectives on Falls among Older Adults

There is sparse theory-based research examining fall risk among the Saudi patient community which limits knowledge about individual perception of their fall risk.

Aging population

The world's population is ageing, with the number of people aged 65 or older expected to grow to nearly 1.5 billion in 2050 (Immonen et al., 2020). Rapidly increasing aging populations are a challenge to limited social and health care systems. A countries' aging population greatly influences its overall public health, along with its use of resources related to social services and health care. The estimated number of older adults over 65 was set to double to approximately 89 million by 2050, which means one out of every five Americans are expected to be over 65 by that time (Thenmozhi&Aruna 2016). The report showed beginning in 2011, many Americans would reach their 65th birthdays and a call to action was made for federal agencies to address the issue of healthy aging in the US so that the quality of life would improve for older people (Thenmozhi&Aruna 2016).

According to the Loonlawong et al., (2022) every second of every day, an older adult (age 65+) suffers a fall in the U.S., making falls the leading cause of injury and injury related death in this age group. One out of four older adults will fall each year in the United States, making falls a public health concern, particularly among the aging population. In 2020, the CDC reported critical information about older adult falls, 1) about 36 million falls are reported among older adults each year - resulting in more than 32,000 deaths; 2) each year, about 3 million older adults are treated in emergency departments for a fall related injury; 3) one out of every five falls causes an injury, such as broken bones or a head injury; and 4) each year at least 300,000 older people are hospitalized for hip fracture with more than 95% of hip fractures caused by falling (Loonlawong et al., 2022).

Falls in the community setting

In 2002, around 3.7 million single falls were reported in the community while 3.1 million were recurrent falls and 2.2 million were falls that resulted in injuries (Shumway-Cook et al., 2009). Boyd and Stevens (2009) reported a similar number, with about 3.5 million older adults falling at least once over a period of 3-months. These falls were from some of the following factors: acute illness (10%), hazardous activities (8%), and environmental factors (40%), with the possibility of falls increasing as individual risk factors grow in complexity (Tinetti et al.,1988). Gillespie et al. (2012) reported 30% of older adults fell each year because of balance impairment, dementia, or vision problems. Physical injuries from falls cause greater concerns due to hospitalizations and death with severe injuries (Schepens et al., 2011). Interestingly, only 48% of those who fell reported their falls to a health care provider and only 60% reported receiving fall prevention information (Schepens et al., 2011). Fall risk in the community setting tends to be related mostly to mobility status, exposure to hazardous environments, and risk-taking behaviors such as climbing ladders (Thenmozhi & Shanmugam, 2016).

Falls in hospital settings

Most falls are experienced by patients between 65 and 80 years of age (Koh et al., 2008; Tzeng & Yin, 2015). Reported incidences of falls for inpatients have been found to be from 1.9% to 2.8% but up to 52% for the geriatric population (Nyman & Victor, 2012). Inpatient fall rates were between 1.4 and 18.2 per 1,000 patient days and from 1.3% to 7% among inpatients (Dibardino et al., 2012). Previous fall prevention studies have shown the value of multidisciplinary and multifactorial interventions that focus on more activity and exercise. Most of these interventions utilized educational components that were at times tailored to individual risk factors (Schepens et al., 2011). Only a limited number of qualitative research studies have been conducted to investigate the barriers faced when implementing fall prevention programs in hospitals (Nyman & Victor, 2012). A review of these studies found varying results, research methodologies, sample sizes, use of fall risk assessment tools, reporting methods (e.g., incident reporting, nurse report system, chart reviews), and outcome measures.

Falls around the world

A fall is defined as an unexpected event due to which an individual, an elderly person, comes to rest on the ground, floor, or lower level. Falls become a significant concern because falls from a standing position to flat ground may cause serious injuries, especially for the elderly (Thenmozhi & Shanmugam, 2016). Falls involving elderly people occur for two main reasons 1) the decrease of functional reserves that are used to maintain the orthostatic position, and 2) the following vulnerabilities or pathologies caused by factors that occur simultaneously, pathological processes, and adverse pharmacological incentives (Strini et al., 2021).

Though data for all countries regarding falls is lacking, there is a clear racial difference in fatal fall rates (Gohman, 2018). Globally, falls are a major public health problem. An estimated 684, 000 fatal falls occur each year, making it the second leading cause of unintentional death due to injury, after road traffic injuries. Over 80% of fall-related fatalities occur in low and middle-income countries, with regions of the Western Pacific and South East Asia accounting for 60% of these deaths. In all regions of the world, death rates are highest among adults over the age of 60 years (WHO, 2021). Falls may be accompanied by numerous problems, including serious injuries, decreased daily activities, fear of fall, loss of self-confidence, activity intolerance, decreased quality of life and even death due to associated complications (Liu, et al., 2021). Globally, falls are responsible for over 38 million disability-adjusted life years (DALYs) lost each year and result in more years lived with disability than transport injury, drowning, burns, and poisoning combined (WHO, 2021).

Falls in Saudi Arabia

A report issued by the General Authority for Statistics in Saudi Arabia stated that the age group from 60 years and above reached 1,919,322 people in 2021, constituting 5.5% of the total population of the Kingdom. This increase from 1,878,280 people in mid-2019, was due to 40,042 people turning 60 in less than one year (Ministry of Health, 2021). The health sector is working on several programs to improve services, reduce complications resulting from chronic diseases and control in health care-associated infections, and expansion of early detection programs for cancer (Ministry of Health, 2021). In Saudi Arabia, a serious issue affecting health is falls among the elderly population. Up to 49.9% of elderly people experience falls each year, resulting in fractures and traumatic brain and limb injuries (Razik et al., 2020). Alex et al. (2020) reported that one in four adults aged 65 years and over fall at least once in 12 months.

In Saudi Arabia, the general population is dramatically increasing. Currently, there are about 30 million people living in the kingdom (Ministry of Health, 2021). If not addressed, fall related issues will become an even greater concern. Unintentional injury is the sixth leading cause of deaths and the seventh leading cause of years lived with disability in Saudi Arabia (Alghnam, et al., 2021). Unfortunately, the evidence of falls in older adults in developing countries, including Saudi Arabia, is sparse (Alghnam, et al., 2021). With the rapidly increasing proportion of the older population in Saudi Arabia, falls are becoming an issue of increasing concern in this region.

Fall Related Factors

The consequences of falls among the elderly can be vast and include physical lesions (bruises and scars), mobility limitations, and death. Understanding the factors influencing falls is critical. Researchers in Latin America reported that the increased risk of falling has been associated with female gender, increased age, high depressive symptoms, functional limitations, diabetes, arthritis, osteoporosis, and urinary incontinence (da Cruz et al., 2012; Valderrama-Hinds et al., 2018; Siqueira et al., 2011).

To prevent future falls, the factors associated with falls needs to be understood. Global studies have found that there are individual factors that contribute to the risk of falling, including having a high number of comorbidities, mental issues, cognitive decline, poor quality of sleep, female gender, getting older and taking certain medications (Huynh et al., 2020; Maaike et al., 2022). Factors related to the environment, such as poor housing conditions, insufficient lighting, or wet floors may also precipitate falls (WHO, 2008). Existing evidence is mostly from the context of high-income countries. Falls in other countries, which is about 70% of the global elderly population, are still under-researched (Huynh et al., 2020). Although falls place a significant financial burden on countries, strategies to prevent them are often not a priority for governments in low and middle-income countries (Williams, et al., 2015). For this reason, examination of the influencing factors within each culture is needed so that interventions suitable for the context are developed to reduce or eliminate fall risk in their elderly populations.

Age, Gender, Education, Length of stay and Medication

Several studies identified a wide range of factors that contribute to fall injuries. For instance, age, gender, level of education, environmental conditions, and an individual's medication history.

Age

Age is one of the strongest predictors of fall risk, with most falls occurring in the elderly. The term 'elderly' lacks a clear definition as the concept varies among countries, cultures, and generations. A person can be considered elderly from social, economic, or chronological standpoints. In general, 60 years of age is the reference point used by the United Nations (UN) to identify someone as elderly. Tasi et al. (2020) found age, history of falls, gait impairment, dizziness, hypotension, and visual impairment as the most frequently reported factors in falls. It is estimated that more than 30% of people older than 65 years of age and 50% of individuals older than 80 years old have experienced at least one fall per year (Tsai et al., 2020). There is greater risk of falling in those 85 years and older due to the deterioration of overall health status with age; among those with excellent overall health status, there was no greater risk of falling in adults 85 years and older compared to those 65-84 years of age.

Gender

Gender as a risk factor for falls is not clear in the literature. Some studies show that women have significant risk for falls, including the 2020 data from the CDC, while other studies indicate that males are at greater risk for falls. Several researchers identified specific correlations to gender with other risk factors that may provide some guidance in evaluating fall risk. Research that found men at greater risk for falls, identified correlates of stroke, nutritional risk, post-secondary school degree, eye disorder, widowed/separated/divorced marital status, and arthritis independently associated with significantly higher odds of falls (Tasi et al., 2020).

Women

In women, significant independent correlates of falls included stroke, age of 85 years or older, nutritional risk, mobility, vision impairment, consumption of at least 1 alcoholic drink per week, and the use of 5 or more medications, diseases such as arthritis, diabetes, Parkinson and osteoporosis (Ambrose et al., 2013; Sasidharan et al 2020; Sulaiman et al. 2018; Tsai et al. 2020; Vicky & Minh, 2015). In addition to these correlates, Khongboon and Kespichayawatt (2021) reported significant risk factors. These included living in a rural residence, having worked in the previous 7 days, lack of/excessive exercise, and smoking. Eleven studies conducted in Asia found fall incidence among the elderly to be 15-20% with an increased incidence of falls among females (Ngamsangiam & Suttanon, 2020). Also found to correlate with being female, was dependence in basic activities of daily living, cognitive decline, and a previous history of falling (Ambrose et al., 2013; Sasidharan, et al 2020).

Education Level

Education level represents knowledge of fall risk and socio-economic status. Education levels frequently have a positive correlation with fall-related health beliefs and behaviors that reduce risk. When there is a higher education level there is higher awareness of “perceived severity”, “perceived susceptibility”, and “perceived barriers”, there is a decrease in fall risk. It may also explain the lack of confidence in those with a low education level in implementing fall prevention measures as they may have low perception of fall risk (Lamis et al., 2012). Elderly participants who did not complete high school were associated with falls 95% more than elderly participants who did complete their diploma and bachelor's degree (Sulaiman, 2018; Lamis et al., 2012).

A fall is considered to have occurred when an individual unintentionally falls to the floor or to a lower level to their initial position (Ngamsangiam & Suttanon, 2020). For those who are in a hospital, falling is considered one of the most significant adverse events needed to be prevented by the institution (Abreu et al., 2012). According to studies, falls occur at a frequency of 1.1% to 22% among various groups of patients (Vieira et al., 2018). Falls are directly connected to patient safety and could cause the length of the hospital stay to increase while also interfering with the recovery of the patient (Tucker, 2012). There are multiple variables that can influence falls and there are often consequences for patients, such as injuries, longer hospital stays, and higher cost of care (Tucker, 2012). Pasa (2017) assessed fall risk in hospitalized adults in a cohort study design investigating 831 patients at a university hospital. The instrument used to assess fall risk was the Morse Fall Scale (MFS), with the patients with a high risk (≥45 points) considered to be more susceptible to falls. The mean MFS score was 39.4 (±19.4) points, and the score increased 4.6% from the first to the final assessment. There was a strong positive correlation between those two scores ($r = 0.810$; $p = 0.000$). The conclusion posited that patients with higher risk scores upon admission also had a higher score at the end of their time in the hospital.

Elderly patients are often on several medications and researchers have investigated the relationship between falls and certain classes of medication such as antidepressants, anticonvulsants, analgesics, psychotropics, sedatives, anxiolytics, diuretics, and antihypertensives (Lamis et al., 2012). It has been found that if a patient is on three or more of these medications, they have a higher risk of falling, with 6% to 10% increased odds of patient's falling with each additional medication in those categories (Lamis et al., 2012; Murphy, et.al, 2014; Titler et al., 2011). Side-effects of certain medications (e.g. tranquilizers, anticonvulsant, and hypertensive medications) are correlated with increased fall risk (Viera et al., 2013), and similar precipitating factors were found by Tasi et al. (2020), the most important being cardiac medications, antidepressant medications, and insulin or non-insulin medications for diabetes. For patients with a stroke, syncope, or accident, Srivastava and Muhammad (2022), found dizziness from medication side-effects as a critical risk factor.

Frailty

McMillan (2012), Vellas (2012), and their colleagues published the seminal research on frailty, which is considered a significant health risk in older people. Frailty is defined as the reduced resistance to stressors related to a decrease in physiological ability that has been connected to negative health outcomes including mortality, hospital stays, and falls (Thakkar & Srivastava, 2022.). The Tilburg Frailty Indicator (TFI) is often used to measure frailty and categorizes it into three concepts: physical, psychological, and social factors (Chong, et al., 2018). Frailty exerts a negative impact on people's daily activities and quality of life and causes a series of adverse health outcomes, such as increasing emergency visits, falls, and hospitalization (Chong, et al., 2018). Among these, falls have constituted the major cause of accidental death and injury among older patients (Thakkar & Srivastava, 2022).

As both frailty and falls are important health issues associated with negative health outcomes, many studies have investigated the relationship between frailty and fall risk (Bandeen et al., 2015; Delgado et al., 2015; Hubbard et al., 2017; Joosten et al., 2014; Tom et al., 2013;

Tsai et al., 2018). The findings of the studies were varied. For example, some studies reported that frailty is a predictor of falls, (Bandeen et al., 2015; Delgado et al., 2015; Hubbard et al., 2017), while other studies found no significant difference (Samper et al., 2011; Tom et al., 2013). The studies utilized different measurements to assess frailty, making an adequate comparison of findings difficult. Lack of consensus on the frailty measurements may make it difficult for clinical staff to evaluate frailty. Frailty was found to be significantly associated with future falls in three studies (Bandeen et al., 2015; Delgado, et al., 2015; Hubbard, et al., 2017). Frailty was also reported as a significant predictor of future falls in hospitalized patients, and frailty identification may lead to lowering fall risks (Thakkar & Srivastava, 2022).

Physiological Factors

The physical components of the TFI entail balance, physical activity, and level of dependence, in terms of physical functioning and activities of daily living (Ngamsangiam & Suttanon, 2020). As the physiological factors indicate a decline in function, individuals are at greater risk of falling. Falls in turn lead to progressive decline and increased need for assisted care over time (Lohman et al., 2022). While some decline is a natural aspect of aging, decline related to fall risk is important to address with changes related to aging often being incremental and not always noticed, which increases an individual's fall risk (Thakkar & Srivastava, 2022, Lohman et al., 2022, Chong, et al., 2018).

Conditions related to natural decline include joint stiffness, brittle bones due to decreased calcium absorption, reduced sensation in extremities, decreased mobility, and impaired vision, hearing and reflexes, all of which increase the risk of falls and related injuries such as fractures (Lohman et al., 2022, Hubbard et al., 2017). The gradual decline association with ageing results in decreased personal awareness of physical deterioration, including muscle and bone strength, which leads to increased risk of falls and decreased awareness to take precautions to prevent falls (Thakkar & Srivastava, 2022, Lohman et al., 2022, Chong, et al., 2018).

While many falls result in minor soft tissue injuries, only 5% to 10% incur major injuries such as head traumas or fractures (Chong, et al., 2018). The problem is with the “fall cycle” that seems to occur after an initial fall in the elderly population. The reoccurrence of falls that is common places individuals at risk for major injuries and hospitalization.

Psychological Factors

Psychological factors of frailty include problems with memory, recently feeling down or sad (within a few months), depressive mood, nervous or anxious, coupled with the individual’s ability (or inability) to cope with the problem well (Gobbens et al., 2010; Trevisan et al., 2021). Psychological variables such as depression, anxiety, and fear of falling are common in older adults and have been identified both as a risk factor for falls and as a potential consequence of falling (Saygın et al., 2018). Fear of falls is higher among older adults with fall experience as in “post-fall syndrome” (Saygın et al., 2018). The fear of falls could restrict older adults’ confidence in performing activities of daily living, confining the older adults to home, and causing social isolation (Hadjistavropoulos et al, 2012).

An increased risk of falls was also associated with short sleep duration, increased sleep disturbances, and increased daytime dysfunctions (Lohman et al., 2022). Other correlates of frailty were associated with drinking alcohol regularly, a greater number of comorbid conditions, and urinary incontinence independently increased the odds of sustaining fall-related injuries (Orces, 2014).

Cognitive impairment, such as dementia, is a known risk factor for falls. Even small deficits in cognitive function may increase the risk of falling, especially for those who are already at high risk of falling (Grande et al., 2019; Li & Harmer, 2020; Stark et al., 2013; Welmer et al., 2017).

Sociological Factors

The definition of social frailty is the lack of social resources and activities along with the lack of self-management skills required to fulfill basic social needs (Bunt et al., 2017). Sociological factors of frailty include environmental factors, such as living alone, missing having people around, and not receiving enough support from other people. Despite increasing awareness that social factors impact frailty, there is limited research looking at the connection between social factors and frailty. It is argued that social factors play a role in moderating the outcomes of frailty that adversely impact health incomes and are vital to the health of the elderly (Gutiérrez et al., 2012).

Elderly people living in their homes are more fearful of falling than the elderly living in nursing homes. The elderly living in nursing homes are at greater risk of falling compared to those living at home (Ngamsangiam & Suttanon, 2020). Environmental conditions contribute to sociological factors of frailty, such as poorly maintained external environments (e.g. uneven sidewalks), poorly maintained public buildings, and nonexistent street lighting (Kalula et al., 2016).

Several studies investigated individual and environmental factors and their association with falls. Statistically significant associations between the history of falls and a condition of impaired health exist and include results showing environmental hazards playing a significant role in the occurrence of falls ($p \leq 0.001$), in which 103 (81.7%) of the individuals who were exposed to environmental hazards reporting a history of falls (Sulaiman et al., 2018). Environmental associated factors of fall risk include reoccurrence, mobility, and hand foot sensation (Sulaiman et al. 2018; Ambrose et al., 2013; Henwood et al. 2020) The mean number of falls [m = 1.8 (1.2)] (M = 1.8, SD = 1.2) over a 12-month period contributed to fall recurrence (40.5%) (Henwood et.al. 2020). Other environmental factors included stairs being too high and a lack of clean, dry bathrooms and indoor bathrooms (Khongboon & Kespichayawatt, 2020; Henwood et.al. 2020).

Falls in the elderly generate social, economic, and health repercussions (WHO, 2019). Falls and the related adverse health effects impact individual costs and health care system cost (Kantow et al., 2021). Outcomes of falls include various disabilities, hospitalizations, and sometimes death (Zhou et al., 2022), resulting in economic loss, social isolation, and caregiver burden (Krug et al., 2000). The individual impact on the elderly is high with falls resulting in a fear of falling, post-fall anxiety syndrome, depression, and reduction in activities, all having a negative impact on their well-being (Ang, et al., 2020).

Burden of Falls

James, et al. (2020) estimated global, regional, and national morbidity and mortality burden of falls in the Global Burden of Disease Study has decreased. Globally, the most common injury sustained by fall victims is fracture of patella, tibia or fibula, or ankle. Globally, fall rates increase with an increase in age. The fall reoccurrence cycle also results in reduced daily functionality and performance as well as limitations in autonomy and social independence while increasing mortality risk and caregiver burden (Rubenstein et al., 2006).

Several studies, though limited, have analyzed the mortality trends from accidental falls. In older populations, the resulting fall related morbidity is moderated by comorbid conditions such as osteoporosis, osteopenia, or usage of anticoagulant or antiplatelet medications (James et al., 2020). A Spanish study (Padrón-Monedero, et al., 2017) reported mortality rates per 100,000 person-years increased from 20.6 to 30.1 for men and 13.8 to 20.8 for women between 2000 and 2015. Approximately one in four U.S. residents aged ≥ 65 years (older adults) report falling each year. In 2016, a total of 29,668 U.S. residents aged ≥ 65 years died as the result of a fall (age-adjusted rate† = 61.6 per 100,000), compared with 18,334 deaths (47.0) in 2007 (Burns & Kakara, 2018). The crude mortality rate increased from 51.6 (95% CI, 50.5-52.7) per 100,000 persons in 2000 to 122.2 (95% CI, 120.7-123.7) per 100,000 persons in 2016 (Hartholt, et al., 2018). From 2000 through 2016, an increase in the total number of deaths from falls in Dutch persons 80 years and older was seen, from 391 deaths in 2000 to 2,501 in 2016 (Hartholt et al., 2018).

An elderly person who falls and is hospitalized often incurs injuries that result in disabilities, which impacts the length of hospital stay. They often require long-term care resulting in significant costs for the health care system (Berry, et al., 2017). Additional burden to the health system from the resulting injuries is pressure on hospital capacity, and costs associated with surgery and rehabilitative services. The costs of treating falls among older adults can be very expensive. The United States (U.S.) spent 49.5 billion dollars on the management of non-fatal and fatal falls among older adults in the year 2015 (Razik et al., 2020). Estimating medical expenditures attributable to older adult falls, Florence et al. (2018) reported that in 2015, the estimated medical costs attributable to fatal and nonfatal falls was approximately $50.0 billion. For nonfatal falls, Medicare paid approximately $28.9 billion, Medicaid $8.7 billion, and private and other payers $12.0 billion. Overall medical spending for fatal falls was estimated to be $754 million. In Saudi Arabia, up to 49.9% of elderly people experience falls each year, resulting in fractures and traumatic brain and limb injuries (Razik et al., 2020).

Falls are associated with fractures, head injury, and other potentially life-threatening injuries (Alex et al., 2020). Fractures from falls place a burden on the healthcare system, caregiver and individual. Fractures are the most common serious injury resulting from falls in older persons. Specifically, fractures of the hip, wrist, humerus, and pelvis in this age group result from the combined effects of falls, osteoporosis, and other factors that increase susceptibility to injury (Komisar, et al., 2022).

Individual perception is an important component of identifying fall risk among these other correlating factors such as age, education, medication intake, environment, and frailty factors. An increase in knowledge among patients related to the perception of falls in these contexts may have a significant impact on the reduction of falls (Sharif et al., 2018).

Fall Risk Screening Instruments

An important step to fall reduction is the utilization of screening instruments. A plethora of tools exist and are typically utilized in hospitals to assess patient fall risk. There is no standard, widely used screening tool. Even the tools that have been most widely tested are inadequate and cannot fully capture the subjectivity of the healthcare professional conducting the risk assessment (Morris & O’Riordan, 2017; Sun et al., 2018, Fabre, et al., 2010). The most popular screening tools in the United States include the Morse Fall Scale (Morse et al., 1989), St. Thomas’s Risk Assessment Tool in Falling Elderly Patients (STRATIFY) scale (Oliver et al., 1997), the Hendrich II Fall Risk Model (Hendrich et al., 1995), the Johns Hopkins Fall Assessment (Klinkenberg & Potter, 2017; Poe et al., 2018), and the Stopping Elderly Accidents, Deaths and Injuries (STEADI; Stevens & Phelan, 2013). Scores on these fall risk assessment tools are derived from the clinical assessment of nurses. In order to reach a fall risk score, patients are assessed by designated parameters and given point values according to the nurse’s judgement of the patient's status for that parameter. Table 2 provides a summary of the assessment parameters and scoring for each of the most frequently used instruments.

Table 2

Comparisons of Current Fall Risk Instruments

	Morse Fall Scale	STRATIFY Model	Hendrick II Fall Risk Model	John Hopkins Assessment	STEADI
History of Falls	X	X		X	X
Secondary Diagnosis	X				
Ambulatory Assistive Devices	X			X	X
Intravenous Device	X			X	
Impaired Mobility	X	X	X	X	X
Impaired Mental Status	X	X	X	X	X
Age >60	> 14 years	Pediatric & Adult	X	X	X
Impaired Hearing/Vision		X		X	X
Medication Usage			X	X	
Impaired Elimination		X	X	X	X
Easy to Use	X	X		X	
Number of Items	7	7	12	9	12
Correlation of Coefficient > 0.70	N/A	N/A	N/A	0.66	N/A
Interrater Reliability > 0.70	0.96	N/A	1.00	1.00	N/A

Note: N/A = Not Applicable; STEADI = Stopping Elderly Accidents, Deaths, and Injuries; STRATIFY = St. Thomas Risk Assessment Tool in Falling Elderly Patients.

In general, fall risk instruments include factors such as history of falls, medication history, use of equipment, the environment, mobility, and cognition (Aranda et al., 2013). None of the fall risk instruments include elements of an individual's perception as formulated in the Health Belief Model. Many of the current instruments have high validity and reliability, but research has found that perception is a key factor that decreases a patient's fall risk.

All five instruments reported are widely used by nurses in clinical practice. The Morse Fall Scale has been reported to have a high inter-rater reliability (r = 0.96), and the Hendrich II fall risk model has an even higher inter-rater reliability (r=1.00; Morse, 1997). Both scores are acceptable according to Cho et al. (2020), who claim an "r" value ≥ 0.90 is acceptable, as it indicates 90% reliability and 10% random error. Regarding the STRATIFY and STEADI instruments, no studies reported the inter-rater reliability. For validation measures, all five instruments have been validated for different populations of patients. The Morse Fall Scale was validated in several care settings, such as general surgery and medicine units, a gastrointestinal and endocrinology unit, an ophthalmology unit, a long-term care organization, and a number of units in a rehabilitation hospital (Morse et al., 1989). On the other hand, specific types of units or populations have not been reported for the STRATIFY and HIIFRM instruments. STRATIFY has been tested on patients older than 65 in inpatient settings in acute care facilities (Oliver et al., 1997), and HIIFRM was also tested in an acute care inpatient setting (Gohman, 2018).

Perception is a key component in identifying an individual's risk for falling. The Health Belief Model clearly demonstrates perception is associated with one's ability to perform a desired action such as fall prevention. The following section will discuss the model and the concepts of the model.

Health Belief Model (HBM): Implication for Perception of Fall Risk

The HBM is a framework, used by researchers to explain and predict a variety of health-related behaviors (Gohman, 2018). In 1988, the HBM was expanded to include cues to action and self-efficacy (Hayden, 2017). This will focus on the patient perception by examining their perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. The

HBM provides a theoretical foundation to explain anticipated relationships between concepts and gave rise to this study's hypotheses.

Perceived Susceptibility

Perceived susceptibility is defined as individual perception of the relevance of a health problem and accuracy of a diagnosis (Bishop et al., 2015). For this study the perceived susceptibility is an individual's perception of susceptibility to falling, as perceived susceptibility of falling increases, their fall risk decreases.

Perceived Severity

Perceived severity is defined as individual perception of the seriousness of developing a disease or leaving the disease untreated (Bishop et al., 2015). In the proposed study, if an individual does not perceive a fall as having severe consequences or as life-threatening, then their perceived severity decreases, which increases their fall risk.

Perceived Benefit

Perceived benefit is individual perception of that a given treatment will prevent or cure an illness (Bishop et al., 2015). In this study, as individual perceived benefit of fall risk reduction activities increases, fall risk will decrease.

Perceived Barrier

Perceived barrier is individual perception of treatment complexity, duration, and accessibility (Bishop et al., 2015). Many barriers exist that prevent individuals from fall risk awareness. Some of the identified barriers include slow responsiveness of staff, the desire to not inconvenience others, loss of independence, lack of awareness, and lack of understanding. As individual perceived barriers increase, fall risk increases.

A meta-analytic review of 18 studies conducted by Carpenter (2019) assessed the ability of the HBM to predict behavior longitudinally. Effect size estimates ranged from ($r = 0.90$) for susceptibility and severity to ($r = 0.80$) for benefits and barriers. Similar to other studies, susceptibility and severity were consistently the strongest predictors of fall risk (Sulat et al., 2018). Although the four main perception variables of The HBM does predict behavior, the overall outcomes are varied and have not demonstrated conclusive evidence during the last ten years. Increasing patient awareness of factors that increase fall risk and the consequences of falls is imperative to fall prevention programs. A person's belief in personal risk and susceptibility must be present to prevent patient's fall (Cohen, 2009). In the study by Li et al. (2019), the researchers explained the HBM's dimensions related to falls. The researchers state that the negative correlation between perceived severity and behavior reduces the risk of falls. As one's perception of severity increases, and realization of possible negative outcomes consequently increases, there may be a behavior change to manage the risks and create a reduction in falls.

Using the HBM as a framework for targeting determinants of dietary behavior, Keshani et al., (2019) aimed to assess the impact of an educational intervention, based on the HBM that included collaborative learning techniques on diet quality in adolescents. In this field trial study, 311 students aged 13-15 years old were included, 163 and 148 were allocated to the experimental and comparison groups, respectively. They were selected through a stratified random sampling strategy from sixteen urban, secondary schools in 4 educational districts of Shiraz, the largest city in southern Iran. The revised children diet quality index was used to assess their diet quality. Constructs of the HBM and diet quality were measured before and after the intervention. All HBM constructs significantly improved in the experimental group and mean differences were increased after the intervention. Diet quality improved in the experimental group ($p < 0.001$), which was significantly different from the comparison group (p = 0.001). The findings support the integration of appropriate models/theories into examining behavioral determinants.

Summary

In conclusion, the HBM was developed to address problem behaviors that evoke health concerns. It postulates that an individual's likelihood of engaging in a health related behavior is determined by their perception of the following variables: Perceived susceptibility (perceived risk for contracting the health condition of concern); Perceived severity (perception of the consequence of contracting the health condition of concern); Perceived benefit (perception of the good things that could happen from undertaking specific behaviors); Perceived barrier (perception of the difficulties and cost of performing behaviors). This study addresses a gap in the Saudi literature through examining the relationships among individual perceptions related to risk for falling and frailty among older adults' patients admitted in an acute care setting in a Saudi Arabian Hospital (KSFAH). This study adds to the body of knowledge of falls by addressing fall risk using the HBM. By using this framework and conducting this study, the researcher will be well positioned to understand the issues of fall risk in the elderly population and initiation critical fall prevention programs in KSFAH.

CHAPTER III

METHODOLOGY

A description of the research methodology for this study consisting of the study design, rationale, sampling, and measurements are presented in this chapter. Additional discussion is presented about the methodology regarding the use of Qualtrics software to administer the questionnaires. The protection of human subjects, plan for data collection, and data analysis are also explained.

The purpose of the study was to examine the relationship among individual perceptions related to the risk for falling by examining perceived susceptibility, perceived severity, perceived benefits, perceived barriers, frailty, and fall risk level (no risk, high risk) among older adult patients admitted to an acute care setting in a Saudi Arabian Hospital (KSFAH).

The research questions for this investigation include the following:

1. What are the individual perceptions (susceptibility, severity, benefits, barriers) and their relationship between each other?
2. What are the differences between individual perception and fall risk?
3. What are the differences among individual perceptions, demographic variables, fall risk levels, and frailty?
    a. What is the difference between individual perception and demographic variables?
    b. What is the difference between demographic variables and fall risk?
    c. What is the difference between demographic variables and frailty?
    d. What is the difference between frailty and fall risk?

4. To what extent do individual perceptions (susceptibility, severity, benefits, barriers), demographic variables, and frailty predict fall risk (no risk or high risk) for elderly patients admitted to an acute care setting in KSFAH?

Study Design and Rational

A descriptive correlational, cross-sectional research design was used in this study to allow the researcher to collect data on the variables of the study at one point in time and to examine the relationships among the variables (Aggarwal & Ranganathan, 2019). One of the categories of non-experimental design is correlational research that is conducted to "look for and describe relationships that may exist among naturally occurring phenomena, without trying in any way to alter these phenomena" (Tavakol & Pinner, 2019 p.135). In this study, no conditions were manipulated or changed. A non-experimental, descriptive correlational, cross-sectional design was appropriate.

Sampling Methods

The study participants were recruited utilizing a convenience, nonprobability sample that included all adult patients who were admitted to the King Salman Armed Forces Hospital (KSAFH) in an acute care unit and meet the inclusion/exclusion criteria.

Situated in Tabuk City in the northwestern region, KSFAH is among the largest hospital in Saudi Arabia and admits for a variety of medical specialties and subspecialties making KSAFH a metacenter for all hospitals in the region. There are nurse receptionists in each acute care unit (female medical unit, female surgical units, male medical unit, and male surgical units) who were responsible for identifying participants who were eligible for the study. There are 20 to 25 beds in each unit and the patients are native-Arabic speaking male and female residents of the northwestern region. Medical and surgical units were chosen because these units contain patients admitted directly from the ER or transferred from a unit within the hospital. The majority of the patients in these units are usually alert and oriented. The medical-surgical unit in KSFAH is defined as either telemetry, orthopedic, neurology, medical surgical, or oncology. Patients in those units are diagnosed with a variety of chronic and serious illnesses such as heart failure, diabetes, peripheral vascular disease, hypertension, chronic pulmonary disease, neurologic disorders, renal disease, anemia, cancer, and/or depression.

Inclusion/Exclusion

The inclusion criteria are 1) hospitalized patients admitted to acute care units aged 60 and older; 2) speak Arabic; and are 4) without cognitive impairment; that is, they are cognitively alert and oriented. Exclusion criteria are patients diagnosed with dementia or delirium, or other psychiatric disorders.

Determination of Sample Size

Calculation of sample size is an important step in any type of scientific study. A valid research conclusion is based on various factors such as suitable choice of study design, determination of adequate sample size, selection of representative sample, accuracy of the collected data, appropriate application of statistical methods and correct interpretation of results (Faul et al., 2009). Generally, sample size is detected by three determinants: power; alpha level; and effect size (ES; Campelo & Takahashi, 2018).

In this study there is no consensus on the approach to compute the power and sample size with logistic regression (Berezka et al., 2022), although Faul et al., (2006) suggests 10 cases for each independent variable is appropriate. In a binary logistic regression model, a statistical rule of thumb for sample size is 10-20 cases per independent variable (Faul et al., 2009). The full model of this study will include 13 predictor variables, requiring a sample size of 130 to 260 cases for the binary logistic regression. For this study, only data with complete records for 130 participants will be used. If the number of complete records is insufficient to provide adequate study power for the logistic regression model, multiple imputations of the data set to replace missing values prior to analysis may be used.

Measures

Measurements in the study demographic data included modifying variables that measured part B of Tilburg Frailty Indicator (TFI) and characteristics such as age, gender, and educational level (Appendix A). Other measures are the MFS (Appendix B), and the Fall-Related HBM (Appendix C).

Morse Fall Scale

J. M. Morse developed the MFS in 1989 as an assessment method used to identify patients at risk of falling (Morse et al., 1989). The MFS screening instrument has been widely validated, with predictive validity found to be highly sensitive, and is identified as highly reliable (Klinkenberg & Potter, 2017). When first introduced, the MFS reported high scores in clinical validity and reliability, scoring 0.96 in reliability, 0.78 in sensitivity and 0.83 in specificity. The study hospital uses the MFS (Appendix B) on all patients who are 14 years and older and admitted to the hospital. In the current study the MFS was completed for elderly people age 60 years and older.

The Morse Fall Scale (MFS) is a rapid and simple method of assessing a patient's fall risk. A large majority of nurses (82.9%) rate the scale as "quick and easy to use," and 54% estimated that it took less than 3 minutes to rate a patient (Kiyoshi-Teo et al., 2017). The MFS is used widely in acute care settings and long-term care inpatient settings.

The study hospital eliminated the moderate risk indictor identifying patients only as either a no risk or high fall risk. An MFS score of 0-50 equals no risk and a score ≥ 51 equals high risk, this scoring method is supported in the literature (Kiyoshi-Teo et al., 2017).

Fall-Related HBM Scale

To assess the individual's perception scale among Saudi patients, the Principal Investigator (PI) adopted the Fall-Related HBM Scale (Li et al., 2019). The questionnaire in the original version was composed of 7 dimensions with 26 items according to the HBM (Appendix C). A 5-point Likert scale was used to rate the items with 1-5 marked as 'strongly disagree', 'disagree', 'neutral', 'agree', and 'strongly agree'. The five items of perceived barriers were reverse coded so that the effect was in the direction hypothesized by the HBM theory. The questionnaire has been further evaluated and modified by experts in the field of epidemiology, injury prevention mapping, health education, and fall prevention professionals for its content validity and clarity (Li et al., 2019).

Item analysis, item-scale correlation, and correlation matrix were performed. These include a frequency table of responses for each of the 26 items, uncorrected item-scale correlations, and the correlation matrix among the 26 items. For the 26 items, 68% (88 out of 130) of the responses fell in the range of 5%–95%. The uncorrected item-scale correlations ranged from 0.57–0.86 (Li et al., 2019).

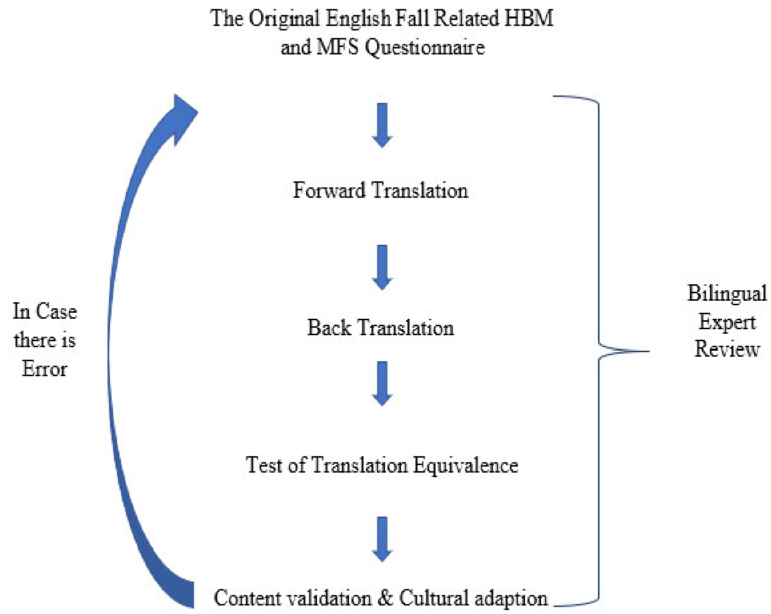
Psychometric Evaluation of Measures

The researcher gained permission to translate the survey into Arabic via an e-mail sent to the questionnaire's developer. Then the researcher translated the Fall-Related HBM and MFS questionnaire into Arabic as this is the predominant language in Saudi Arabia. Brislin's (1970) model was the basis for the translation and back-translation, as it is a well-known method to prepare valid and reliable tools to be used in cross cultural research (Jones et al., 2001).

A number of procedures were used to ensure the psychometric properties of the translated Arabic version of the instrument, such as forward translation, back translation, the test of translation equivalence, content validation, cultural adaptation, and psychometric evaluation (Brislin, 1970). See Figure 2.

Figure 2.

Procedures of Establishing Psychometric Properties



Two independent translators performed the translation and back-translation process. The English version of the survey was e-mailed to a bilingual expert for translation into Arabic. After that, the version that was translated into Arabic was provided to another bilingual expert who was not given access to the English version. The second bilingual expert carried out a back-translation into the English language. If there were any discrepancies between the original English version and the back-translated version, a retranslation of the term in question took place before it was back-translated an additional time by another expert. The process repeated until no errors in meaning were detected. The results of the translation procedures are reported in chapter 4.

Content Validity and Content Equivalence

Content validity is the estimation of the representativeness of the items included on the instrument to the content or phenomena the instrument has been designed to measure (Newman et al., 2013). The evaluation of the content validity of the translated questionnaire should take place after the initial translation (Kristjansson et al., 2003). The term content equivalence relates to the relevance of each item to the cultural group or population that is being studied (Kristjansson et al., 2003). The content validation of the final version was carried out by three bicultural and bilingual experts (who are different experts from the two independent translators) with a background in medicine or nursing and had experience with research using the MFS survey were selected from Tabuk University, KSFAH and Kent State University, and through input from the researcher's dissertation chair. They were invited via email to participate on this panel to evaluate the content validity and the content equivalence of the questionnaire.

The HBM (26 items) and MFS (6 items) questionnaires were assessed using the Item-Content Validity Index (I-CVI) (Almanasreh et al., 2019), which is utilized to estimate the usefulness of items on a questionnaire in relation to the relevance, representativeness, clarity, readability and comprehensiveness of the translated Arabic version. To calculate the I-CVI, a 4-point Likert scale assessed the translation equivalence of the questionnaire. In accordance to a formula described by Lynn (1986), each item was evaluated on the following 4-point Likert scale: 1 (totally different), 2 (major revision needed to be equivalent), 3 (minor revision needed to be equivalent), and 4 (equivalent). The content validity and content equivalence results are reported in chapter 4.

Reliability Coefficient of Internal Consistency of HBM Scale

In the analysis for internal consistency in the reliability study of the scale, Li and colleagues (2019) found a Cronbach's alpha reliability coefficients α = .86 for perceived severity subscale, α = .87 for perceived susceptibility, α = .85 for perceived benefits, α = .86 for perceived barriers, and α = .94 (see Table 3).

Table 3

Reliability of the HBM Scale (Li. et al., 2019)

Dimensions	Item #	Items	Cronbach
Perceived severity (belief about how serious a condition and its sequelae are)	1	Falls in the elderly is a very serious problem	0.86
	2	Falls in the elderly can cause fractures, disability, and even death	
	3	Falls in the elderly can change psychology and cause fear of fall	
	4	Falls in the elderly can increase the burden on the family	
Perceived susceptibility (belief about the chances of experiencing a risk or getting a condition or disease)	5	The elderly people are prone to fall	0.87
	6	Insecurities in the home and community can easily lead to falls, such as slippery floors, aisle debris, etc.	
	7	Some bad habits can cause falls, including unsuitable dressing and shoes, not using handrails, etc.	
	8	Unhealthy mental states can cause falls, such as depression	
	9	Many chronic disease and organ hypofunction can cause falls	
Perceived benefits (belief in efficacy of the advised action to reduce risk or seriousness of impact)	10	Falls of elderly is preventable with right methods	0.85
	11	It will decrease the risk of falls if I can change the insecurities in the home environment	
	12	It will decrease the risk of falls if I can change my bad habits	
Perceived barriers (belief about the tangible and psychological costs of the advised action)	13	I know some habits are bad, but it's hard for me to make changes	0.86
	14	It's hard for me to change some of the insecurities in my home environment	
	15		

	16	It's hard for me to determine the risk factor of falls
	17	It is difficult for me to adhere to the treatment of chronic diseases that affect falls, such as hypertension
		It is expensive to prevent falls, such as installing handrails

Cronbach's Alpha Reliability Coefficients of MFS

High internal consistency in the reliability of the MFS scale was established in the original research (Morse et al., 1989) and other studies (Tang et al., 2014). Cronbach's alpha reliability coefficients were determined as α = .93 for History of falling, α = .90 for Secondary diagnosis, α = .92 for Ambulatory aid, α = .91 for IV/saline lock, α = .92 for Gait/transferring, α = .87 for Mental status and α = .94 for the whole scale (Tang et al., 2014). Supporting the translatability of the scale, a study completed in 2013, included a translated version of the MFS scale in Portuguese, and this version had good reliability with a Kappa Coefficient of .80 (De et al, 2013).

Reliability of part B of Tilburg Frailty Indicator (TFI)

Alqahtani et al (2020) translated the TFI to Arabic and used Kuder-Richardson Formula 20 (KR-20) to measure reliability because of the binary variables in the Frailty indicator. The overall internal consistency of the TFI was KR-20 = 0.70. Similar to other reliability scores a range from 0-1 is utilized with scores closer to 1 being more reliable. In the Alqahtani study, domain scores were as follows; KR-20 = 0.68 for physical, 0.57 for psychological, and 0.42 for social. The KR-20 after deletion of each item correlations ranged from 0.66 to 0.72, see Tables 4 thru 6 for the test-retest reliability with one-week interval, the ICC was 0.86 (95 % CI = 0.67–0.94) indicating very good reliability (Almanasreh rt al., 2019).

Table 4
Modifying Variables

Modifying Variables	Definition	Measurement Tool
Age (continuous)	60 and older measured in years	Demographic Survey
Sex (categorical)	Self-identification of Male, Female, or other	Demographic Survey
Education (categorical)	Less than high school, high school diploma, some college, associate degree, bachelor's degree, or graduate degree	Demographic Survey
Marital Status (categorical)	Self-reported as either single, married, divorced or widow	Demographic Survey
High risk medications (categorical)	High fall risk medications defined as cerebral neurovascular agents, diuretics, antihypertensive, and anticoagulant agent	Demographic Survey
Length of stay (LOS), (categorical)	Counting number of days hospitalized	Demographic Survey
Frailty – Physical components (continuous)	The physical components on the frailty scale entail balance, physical activity, and level of dependence in terms of physical functioning and activities of daily living (Gobbens et al., 2010; Ma et al., 2018). See appendix A for items list	Part B – TFI listed in the Demographic Survey
Frailty – Psychological components (continuous)	Psychological factors of frailty include problem with memory, recently (within a few months) feeling down or sad, depressive mood, nervous, or anxious, coupled with the individual's ability (or inability) to cope with the problem well (Gobbens et al., 2010; Trevisan et al., 2021). See appendix A for items list	Part B – TFI listed in the Demographic Survey
Frailty – Social components (continuous)	The definition of social frailty (SF) is the lack of social resources and activities along with the ability to self-manage required to fulfill basic social needs (Bunt et al., 2017; Ding et al., 2017). See appendix A for items list	Part B – TFI listed in the Demographic Survey

Table 5

Independent Variables

Modifying Variables	Definition	Measurement Tool
Perceived susceptibility	Belief about the chances of experiencing a risk or getting a condition or disease (Li et al., 2019).	Fall-Related HBM Scale. 5 Likert scale items scored from 1 (strongly disagree) to 5 (strongly agree)
Perceived severity	Belief about how serious the condition and its sequelae are for the individual (Li et al., 2019).	Fall-Related HBM Scale. 5 Likert scale items scored from 1 (strongly disagree) to 5 (strongly agree)
Perceived benefits	Belief in the efficacy of the advised action to reduce risk or seriousness of impact (Li et al., 2019).	Fall-Related HBM Scale. 5 Likert scale items scored from 1 (strongly disagree) to 5 (strongly agree)
Perceived barriers	Belief about the tangible and psychological costs of the advised action. (Li et al., 2019).	Fall-Related HBM Scale. 5 Likert scale items scored from 1 (strongly disagree) to 5 (strongly agree)

Table 6

Dependent Variable: Fall Risk

Dependent Variables	Definition	Measurement Tool
No Risk	The unlikely occurrence of a fall occurring is based on the absence of: History of falling, Secondary diagnosis, Ambulatory aids, Intravenous therapy: Gait and Mental status.	The Morse Fall Scale (See Appendix B) fall risk assessment tool (Morse et al., 1989). The total score indicating high fall risk is greater than 51.
High Risk	The likely occurrence for a fall or repeat fall is based on: History of falling, Secondary diagnosis, Ambulatory aids, Intravenous therapy: Gait and Mental status.	The Morse Fall Scale (See Appendix B) fall risk assessment tool (Morse et al., 1989). The total score indicating high fall risk is greater than 51.

Institutional Review Board and Ethical Considerations

Institutional review board (IRB) approval to conduct research on human subjects was obtained from the IRB at King Salman Forces Armed Hospital, in Tabuk, Kingdom of Saudi

Arabia as well as the IRB at Kent State University. To initiate the study, the director of the nursing departments and acute care setting administrator in KSFAH by sending an official letter via email to obtain permission to take part in this study.

Rights and privacy

Ethical considerations are important in research, and this is especially the case when working with human beings, including nursing research, because it is through ethics that values, relationships, and rights, are established. These considerations build both professionalism and accountability. There are several ways in which this study respects participants' rights and privacy 1) the researcher was available in the hospital to answer questions about the study and the consent form; 2) the participants signed the informed consent prior to the study on the first page of the Qualtrics survey; and 3) the participants had the opportunity to withdraw from the study at any time without harm or repercussions.

There are four main ethical principles in nursing research: beneficence, respect, justice, and informed consent (Obeidat & Al-Delaimy, 2022). In both phases of this study these principles were upheld. There were minimal risks because no intervention was performed, and the study only required the participants to answer questions on a survey. The human dignity of all participants was respected, and the researcher assured the subjects that their participation, or non-participation, would not affect the type of care they received while hospitalized.

Maintaining Confidentiality and Anonymity

Each participant's anonymity and confidentiality were strictly protected via the following methods: 1) the electronic tablet that was used to collect the study data was encrypted, and only the researcher had the password; 2) the tablet was stored inside a locked cabinet in a locked office at Tabuk University of Science and Technology; 3) the researcher was the only one with access to the Qualtrics account; 4) all data were collected in patients' private rooms or at a private office in the acute care unit; 5) all surveys were completed as an anonymous response, so no identifying information such as patient's name or patient's room number were collected; and 6) the data from this study are presented in the aggregate without identification of personal attributes.

Pilot testing

Pilot studies are conducted for two main reasons. The first reason is to determine feasibility and is typically conducted on a small scale or trial, done in preparation for a major study (Almanasreh et al., 2019). The second reason is to test a research instrument or procedure (Almanasreh et al., 2019). The main aim of a pilot study generally is to focus on testing methods and feasibility along with descriptive results that justify conducting a larger, full-scale study (Arain et al., 2010; Arnold et al., 2009).

As a result, the initial 30 surveys were used as a pilot study, allowing for useful feedback on how participants were interpreting the questionnaire and the amount of time they needed to complete it. It is recommended that between 10 and 30 participants be used for a pilot study (Isaac & Michael,1995, Spano et al., 2022). The results of the pilot study ensured the viability of recruitment, participant understanding of the survey questions, and feasibility related to Qualtrics. Data collection then proceeded until the estimated sample size was reached. Technical issues or problems were not found during data collection in the pilot study for this dissertation research.

Recruitment

An official letter was sent to the Director of Nursing, Amal Saleh, at KSAFH, stating that study approval was obtained from KSU IRB and KSAFH ethical committee. The Primary

Investigator (PI) conducted a training session for the three nurse receptionists who were responsible for identifying and recruiting eligible participants. This training session included the study purpose and ways to ensure the anonymity, privacy, and confidentiality of the participants in the context of the current study. They were also instructed not to include any patient identifiers to the PI to minimize bias during the data collection. None of the acute care nurses collected data. The inclusion and exclusion criteria were also highlighted during the training session to help them identify appropriate participants for this study.

Data Collection

Online Survey Platform

After the translated Fall-Related HBM and MFS questionnaire gained approval, the PI uploaded the consent form, the Demographic Survey, part B of the TFI, the Fall-Related HBM and MFS, respectively, into the Qualtrics software. Qualtrics is a computer software used for collecting and analyzing data for surveys (Konrad, 2018). The Qualtrics survey was uploaded to the tablet used to collect surveys from all participants. The tablet was given to each participant to review the consent form, and if they agreed to participate the Qualtrics survey was initiated. Once they were done, they clicked on submit.

The nurse receptionists notified the PI when a potential new participant was admitted to their unit. Each eligible participant was informed about the study and asked if they were interested in participating. For those interested in participating in the study, the PI reviewed the purpose of the study and the consent form with the potential participant and explained their right to withdraw from the study any time. After this point the eligible participants had the opportunity to read the consent form (or if needed the PI read the form to them) and ask questions (Appendix D). The tablet with the Qualtrics survey was then handed to the participant. The first page of the survey was the consent form and the participants clicked on “I agree” if they wanted to proceed and if they did not wish to procedure as a study participant they clicked on “I do not agree.”

Data Collection Procedure

The first portion of the survey consisted of demographic questions and Part B of the TFI Scale. Once those were answered, the participants were taken to the MFS and HBM fall-related questionnaire by the software. When a participant left a question unanswered, the software informed them they left a question unanswered before proceeding to the next page without forcing them to answer the question. The participants had a choice to answer or skip any question before proceeding to the next page. Once the survey was completed, each participant was asked to submit their survey responses through the Qualtrics platform.

Data Management and Analysis

Data Entry

Prior to data collection, the researcher developed a codebook for all the demographic data and the other variables. Data was entered into the Statistical Package for the Social Sciences IBM SPSS Statistics Base 25 for Windows in two files. Double data entry occurred, necessitating the creation of two data files and comparisons made for inconsistencies to protect the validity of this study as well as to decrease the potential for random and systematic errors.

Data Management

The analysis plan included preliminary data screening to assess the data for missing values and outliers. Missing values were assessed using frequency distribution, as recommended by Tabachnick and Fidell (2013). Box plots, Mahalanobis distance, and Cook’s distance were used to identify univariate and multivariate outliers, respectively. By removing both types of outliers, the probability of Type I and Type II errors can be decreased, and the accuracy of estimates improved (Carlin et al., 2022).

Testing Statistical Assumptions

Normality of the independent variables (continuous) including the individual perceptions of the HBM scale with overall scale and frailty scale were determined by Shapiro-Wilk test of normality. Binary logistic regression was used to predict fall risk; therefore, normality of distribution will not be examined because of the binary dependent variable (Ainiyah, et al., 2016). Cook's D was used to identify any outliers in the predictor variables, and all the values were reported less than 1.0 (0.001- 0.636), indicating there were no influential cases on the prediction line. Collinearity was examined by the Variance Inflation Factor (VIF). It is desired that VIF ≤ 10 in un-violated collinearity cases (Cheng, 2022). The VIF results for this study are explained further in chapter 4.

Statistical Analysis Plan

Data analysis included descriptive and inferential statistics. Descriptive statistics (mean, mode, median, and standard deviation) were computed for continuous demographic data, such as age and item responses for the HBM, MFS, and the TFI. Frequency counts and percentages were computed for categorical demographic data such as sex, marital status, and level of education.

Inferential statistical analyses were performed to answer the study questions.

In the first research question, Spearman's rho correlation was determined as the data of all domains of the individual perceptions are not normally distributed and the data of these variables are collected on an ordinal scale.

In the second research question, As the data for the individual perception did not meet the assumption of normal distribution, a Mann Whitney U test was used to compare means among fall risk levels and individual perceptions of the HBM scale.

In the third research question part ‘a’, to examine the relationships among individual perceptions with demographic variables, Mann Whitney U test was used for gender and marital status. Kruskal-Wallis H test was used for the variables with more than 2 categories i.e., age, education, and hospitalization duration. In the third research question part ‘b’, Chi-Square test was used to find any association between demographic variable and MFS Risk level. In the third research question part ‘c’, to find differences between demographic variables and frailty, Mann Whitney U test was used for gender and marital status. Kruskal-Wallis H test was used for the variables with more than 2 categories i.e., age, education, and hospitalization duration, In the third research question part ‘d’, to find any relationship between the TFI scores and Fall Risk (No Risk and High Risk), non-parametric Mann Whitney U test was used.

In the third research question, a binary logistic regression analyzed the fall risk level as a binary dependent variable and demographic variables, HBM and frailty scores as independent (predictor) variables. Further discussion of the results and implications of this study appear in the next chapter.

Summary

In summary, the purpose of this study was to investigate the relationship among individual perceptions related to risk for falling by examining individual perceptions of susceptibility, severity, benefits, barriers, frailty, and fall risk level (no risk, high risk) among older adults’ patients admitted to an acute care setting in a Saudi Arabian Hospital (KSFAH). This chapter detailed the study design and rational, sampling methods, determination of sample size, recruitment procedure, measures employed, data collection procedure, pilot testing, institutional review board and ethical considerations, and finally, data plan, management and analysis.

CHAPTER IV

RESULTS

The purpose of this cross-sectional study was to examine the relationship among individual perceptions related to fall risk by examining perceived susceptibility, perceived severity, perceived benefits, perceived barriers, frailty, and fall risk level (no risk, high risk) among older adult patients admitted in an acute care setting in a Saudi Arabian Hospital (KSFAH). This study also measured individual perceptions related to risk for falling by using an instrument based on the theory Health Believe Model (HBM). This instrument was translated into Arabic for this study, the frailty measure was previously translated into Arabic. The Morse Fall Scale (MFS) was also translated into Arabic for this study. All analyses were performed using the SPSS, version 25, statistical software package.

This study was accomplished in three parts. The first part includes instrument translation and adaptation: (a) producing an accurate translation of the HBM and MFS questionnaire, written in Arabic; and (b) validating the translated Arabic version of the HBM and MFS questionnaire. The second part was a pilot studying addressing the feasibility of the translated instruments and the study procedures related to recruitment. In the third part, the study research questions were addressed using descriptive statistics of demographic factors of the study sample, preliminary data analysis, tests of statistical assumptions, and analysis of research questions.

Instrument Translation and Adaptation

Questionnaire Translation

The translation of the HBM and MFS questionnaire was based on Brislin’s model (1970). The HBM questionnaire includes the four types of individual perception; perceived severity includes four questions, perceived susceptibility includes five questions, perceived benefits include three questions, and perceived barriers includes five questions. There are a total 17 questions on the HBM questionnaire (see Appendix C) and the MFS questionnaire includes six questions to assess patient fall risk (see Appendix B).

Content Validity of the Questionnaire

Validity assesses if participants who answer the survey understood what the items examined in a manner that was reasonably when compared to the original questionnaire (Beauford et al., 2009). Content validity of the translated questionnaire was conducted after the translation process. A panel of three experts was created to make quantitative judgments on the questionnaire items. The panel members were asked to judge the content validity index. Three bilingual panel experts validated the final Arabic version to check for consistency of the meaning of the language. The qualifications of bilingual experts matched the following criteria: (a) fluent in reading, speaking, and writing in both English and Arabic; (b) experience with Saudi culture; and (c) hold a minimum of a bachelor's in nursing science. A cover letter describing the purpose of the study, the scoring method, the theoretical definition for constructs, in addition to the questionnaire, were sent via e-mail to each expert.

The 17-item HBM questionnaire and 6-item MFS questionnaire were assessed by the Item-Content Validity Index (ICVI) and the Scale Level Content Validity Index (S-CVI). This assessment occurred by responding on a 4-point Likert scale, where 1 (totally different), 2 (the item needs major revision to be equivalent), 3 (the item needs minor revision to be equivalent), and 4 (equivalent) were used, as suggested by Kovacic (2018). The panel experts were asked to use the original English version of the HBM Scale as the gold standard to evaluate the equivalence of the translated variables. Each item was scored based on the understandability of the Arabic translated version.

In order to compute the I-CVI, the proportion of agreement of the HBM 17 items and 6 items of MFS among the three panel members was calculated. The results indicated that 13 items of HBM and 6 items of MFS were rated "4" ′out of "4" by all reviewers. Only 4 of the 17 items of HBM were rated on score "3" out of "4" by one reviewer, which are items 7, 10, 12,13 and this reviewer suggested adding a question mark at the end of these items. Those items were rated "4" out of "4" by the other two reviewers and a question mark was not added.

To obtain the content validity index for each item (I-CVI), the number of those judging the item as relevant was divided by the number of panel experts (N = 3). In the current study, the I-CVIs of 19 of the 23 items were 1.0. The other 4 items had an I-CVI of 0.91. The scale-level index of an instrument (S-CVI) was then calculated by dividing the sum of I-CVIs on the number of items (Kovacic, 2018; Patra & Guha, 2018; Yusoff, 2019). In the current study, S-CVI was 0.97. The results indicated that the 23-items translated Arabic version had excellent content validity. Researchers recommend that a scale with excellent content validity should be composed of I-CVIs of 0.78 or higher and S-CVI of 0.8 or higher (Kovacic, 2018). The instrument possesses a high content validity after translation.

Pilot Testing of the Questionnaire

The Arabic-translated questionnaire was initially piloted to assess the comprehension and relevance of the questionnaire content. A sample of 30 Saudi elderly patients at King Salman Armed Forces Hospital (KSFAH) took part in this pilot study. The majority of the pilot sample were males (70%) and 96.7% married. Regarding the age of the patients, 90% of the participants were in the range of 60-80 years old of which 10% were more than 80 years old. To check the internal consistency of the items in the overall and different domains of the Health Belief Model (HBM), Cronbach's alpha reliability coefficients was determined. A very high reliability of

0.998 was reported for the overall items in the HBM Scale. Cronbach's alpha values for the individual domains of HBM are presented in the following (table 7)

Table 7

Health Belief Model Cronbach's Alpha - Pilot Study

Health Belief Model	Cronbach's Alpha
Overall	0.99
Severity	0.98
Susceptibility	0.99
Benefits	0.99
Barriers	0.99

Cronbach's alpha reliability coefficient for overall 15 items of the Frailty Scale reported as 0.654. Reliability coefficient Cronbach's alpha for the overall items of the Morse Fall Scale was registered as 0.948. Regarding the MFS scale, 63.3% of our pilot study sample were at a High-Risk level.

The average completion time of the questionnaire was 15 to 20 minutes, and no concern were reported about engaging in the study or regarding the content of the questionnaire. In the pilot study, it was noted that participants were answering either strongly agree or strongly disagree on the HBM's Likert scales. The researcher and dissertation chair spoke about this and reviewed the translation process again to ensure a step was not missed. The researcher identified that the participants have low levels of education, some being illiterate, which may be influencing their decision to choose an answer. It was decided to leave the scale as it was and make the necessary statistical accommodations if needed. There was no other reported difficulty encountered during survey data collection. The results of the pilot study supported the continuation of the study. The final sample size was 150 participants, which includes the 30 participants used in the pilot study. This is justified because no problems were identified and therefore no changes to the instruments or procedures were needed (Leon et al., 2011). The following information pertains to the full study.

Data Management

Data Entry and Coding

Data were entered into a statistical social package (SPSS 25). In this study, the HBM was originally coded as a 5-point Likert scale and during analysis, it was decided to change the response to dichotomous (strongly agree/strongly disagree) based on participant responses to the Likert scale. Frailty was coded as a rank scale of yes/no and sometimes and the MFS was entered as a dichotomous scale of no risk or high risk.

Data Screening

All data entry was screened by frequency tables to check for any possible errors including the coding process, missing values, and scale for all variables by the researcher. No data entry errors were identified for any of the variables in this study.

Outliers

In the context of outlier identification, regression modeling uses Cook's D values and cases with a cook's distance of more than or equal to 1 as an outlier (Tabachnick & Fidell, 2013). In this study, all the values were reported less than 1.0 (.001 to .636), indicating no influential cases on the prediction line.

Demographic Characteristics

As no missing data was reported during data screening, all 150 subjects were included as overall sample of the study. Ages of subjects ranged from 60 to 89 years. The majority of subjects were male, n = 65, (43.3%) and married = 141 (94%). The participants had different educational degrees, 52% of participants had a high school degree, 32.7% had completed a diploma degree. 14.7% completed a bachelor's degree and 0.7% completed a master's degree. For most participants the hospital length of stay was less than 1 week (58.7%), compared to 26.7% admitted for 1 week and 14.7% more than a week. The participants have different high-risk medication, 16.7% were on cerebral neurovascular agents, 53.3% were on the diuretics, 80.7% were on analgesic, 70.0% were on antihypertensive, 37.7% anticoagulant agent and 90.7% were on antidepressants medication. Table 8 provides the sample characteristics.

Table 8
Sample Characteristics

Demographic Variables		Frequency	Percentage
Gender	Male	65	43.3
	Female	85	56.7
Age	60-69	77	51.3
	70-79	66	44.0
	80-89	7	4.7
Marital Status	Married	141	94.0
	Divorced	9	6.0
Education	High School	78	52.0
	Diploma degree	49	32.7
	Bachelor's degree	22	14.7
	Master's degree	1	0.7
Length of Hospitalization	Less than 1 week	88	58.7
	1 week	40	53.3
	More than 1 week	22	46.7
High Risk Medications			
Cerebral Neurovascular agents	Yes	25	16.7
	No	125	83.3
Diuretics	Yes	80	53.3
	No	70	46.7
Analgesic	Yes	121	80.7
	No	29	19.3
Antihypertensive	Yes	105	70.0
	No	45	30.0
Anticoagulant agents	Yes	56	37.3
	No	94	62.7
Antidepressants	Yes	14	9.3
	No	136	90.7

Study Variables

Independent Variables

Descriptive statistics were used to describe frailty in terms of range, mean and standard deviation. The HBM variables were described using the same method. The descriptive statistics of the independent variables appear in Table 9.

Table 9
Independent Variable Characteristics (N=150)

			Participant Range		
		N	Minimum	Maximum	Mean ± SD
Frailty Indicator		150	1.00	13.00	6.2 ± 3.70
Health Benefit Model (HBM)	Severity	150	4.00	20.00	8.8 ± 7.0
	Susceptibility	150	5.00	25.00	11 ± 8.8
	Benefits	150	3.00	15.00	6.5 ± 5.4
	Barriers	150	5.00	25.00	10.9 ± 8.9
	Overall HBM Score	150	17.00	85.00	37.2 ± 29.9

Dependent Variable

The dependent variable for this study was fall risk, which was measured as a dichotomous variable of No Fall Risk or High Fall Risk (see Table 10).

Table 10
Dependent Variable Characteristics (N=150)

Morse Fall Scale	Number	Percentage
No Risk	43	29
High Risk	107	71
Total	150	100

Statistical Assumptions

The Shapiro Wilk test results indicate the individual perceptions of the HBM were not normally distributed (see Table 11), so a nonparametric test was utilized.

Table 11

Testing Assumption of Normality

Test of Normality		
	Shapiro-Wilk	
Variables	Statistic	*p* - value
Severity	0.62	0.001
Susceptibility	0.62	0.001
Benefits	0.60	0.001
Barriers	0.62	0.001
Overall HBM Score	0.61	0.001
Frailty	0.89	0.001

Logistic regression was used to predict fall risk; therefore, normality of distribution was not examined because of the binary dependent variable (Cheng, 2022).

Collinearity was tested by examining the Variance Inflation Factor (VIF). It is desired that VIF ≤ 10 in un-violated collinearity cases (Cheng, 2022). VIF values of all demographic variables, high risk medication and the TFI scale were reported within the accepted range. But all individual perception scales in the HBM questionnaire were reported as high collinearity (see table 12).

Table 12

Testing Assumption of Collinearity

Coefficients [a]

Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistic	
	B	std. error	Beta	t	Significance	Tolerance	VIF
(Constant)	1.824	.296		6.159	.000		
Gender	.003	.019	.003	.159	.889	.889	1.125
Age	-.027	.019	-.035	-1.440	.152	.700	1.428
Marital Status	.041	.041	.022	1.019	.310	.883	1.133
Education	-.006	.005	-.025	-1.192	.235	.890	1.124
Hospital Duration	.002	.015	.002	.112	.911	.868	1.152
Cerebral Neurovascular agent	-.153	.032	-.126	-4.724	.000	.566	1.766

Diuretics	-.015	.025	-.016	-.581	.562	.511	1.955
Analgesic	-.036	.028	-.032	-1.301	.196	.674	1.483
Anti-hypertensive	.099	.025	-.100	-3.917	.000	.618	1.617
Anticoagulant agents	-.036	.025	-.038	-1.403	.163	.544	1.837
Anti-depressants	-.028	.037	-.018	-.753	.453	.701	1.426
No high-risk medication	-.030	.115	-.005	-.260	.796	.936	1.069
Frailty	.001	.003	.004	.148	.882	.498	2.007
Severity	.051	.024	.782	2.095	.038	.003	345.833
Susceptibility	.064	.024	1.237	2.622	.010	.002	552.313
Benefits	.001	.030	.008	.023	.982	.003	302.062
Barriers	-.037	.014	-2.729	-2.729	.007	.001	155.247
Overall HBM Score	-.044	.014	-3.274	-3.274	.001	.001	1988.507

a. Dependent Variable: Risk Level

Assumption of the linear relationship between continuous independent variables and the logit transformation of the dependent variable was verified by Box-Tidwell Test and all the interaction terms having $p > 0.05$, (non-significant) indicating a linear relationship between continuous independent variables and the logit transformation of the dependent variable.

Due to high collinearity among the four individual perception variables, the decision was made to conduct the logistic regression by loading each perception variable separately (Cheng, 2022). This is explained further under research question #3 below.

Inferential Statistics

Psychometric Properties (Reliability)

Cronbach's alpha was calculated to determine the reliability of the four subscales of the HBM variables (perceived severity, susceptibility, benefits, and barriers). Internal consistency measures the relationships between items in a specific instrument (Carlin et al., 2022). A very high reliability of .999 was reported for the overall items in the HBM Scale. Cronbach's alpha reliability coefficient for the 15-item TFI Scale was 0.809. Reliability coefficient Cronbach's alpha for the overall items of the Morse Fall Scale was 0.776. All the findings are comparable with the literature. Detailed values of Cronbach's alpha for the individual domains of HBM, and overall Cronbach's for the Frailty Scale and the MFS are presented in the following (Table 13).

Table 13

Psychometric Properties of the HBM, Frailty Scale, and MFS

Study Instruments	
Health Belief Model (HBM)	Cronbach's Alpha
Overall	0.999
Severity	0.994
Susceptibility	0.995
Benefits	0.996
Barriers	0.997
Frailty Scale	0.809
Morse Fall Scale	0.776

Research Questions

For patients admitted to an acute care setting in KSFAH

1. What are the individual perceptions (susceptibility, severity, benefits, barriers) and their relationship between each other?

Descriptive statistics of the individual perceptions are already discussed in Table 9. To find the correlation between individual perception scales, Spearman's rho correlation was determined as the data of all domains of the individual perceptions are not normally distributed and the data of these variables are collected on a ordinal scale. A strong positive correlation was reported between all individual perception scales. Association among the four individual perception scales was statistically significant ($p < 0.05$). Please see table 14 for the correlations among the individual perceptions.

Table 14

Correlations between individual Perception Scales

	Severity	Susceptibility	Benefits	Barriers
Severity	1			
Susceptibility	*p*=0.889	1		
Benefits	*p*=0.818	*p*=0.850	1	
Barriers	*p*=0.825	*p*=0.877	*p*=0.840	1

2. What are the differences between individual perception and fall risk?

As the data for the individual perception did not meet the assumption of normal distribution, a Mann Whitney U test was used to compare means among fall risk levels and individual perceptions of the HBM scale. The mean scores for the perception of “No Fall risk” with participants are significantly higher than “High Fall Risk” in all four HBM domains individually and in the overall HBM ($p < 0.05$). Mann Whitney U test dealt with ranking of the mean to handle the non-normality of the data. See Table 15.

Table 15

Comparison of scores of the individual perceptions among Fall of Risk levels

	No Risk			High Risk			U test Statistics (Z)	*p*-value
	N	Median	Mean Rank	N	Median	Mean Rank		
Severity	43	20.0	126.8	107	4.0	54.9	-10.02	0.001
Susceptibility	43	25.0	126.8	107	5.0	54.9	-9.82	0.001
Benefits	43	15.0	127.1	107	3.0	54.8	-10.55	0.001
Barriers	43	25.0	127.4	107	5.0	54.6	-10.14	0.001
Overall	43	85.0	127.05	107	17.0	54.79	-9.553	0.001

3. What are the differences among individual perceptions, demographic variables, fall risk levels, and frailty?
    a) What is the difference between individual perception and demographic variables?
    b) What is the difference between demographic variables and fall risk?
    c) What is the difference between demographic variables and frailty?

d) What is the difference between frailty and fall risk?

Question 3a

To examine the relationships among individual perceptions with demographic variables, Mann Whitney U test was used for gender and marital status. Kruskal-Wallis H test was used for the variables with more than 2 categories i.e., age, education, and hospitalization duration. Statistically significant mean differences were determined between age groups and all individual perception variables. Individual perception scores were found lower in the old age groups. In the variable of hospitalization duration, individual perceptions regarding sensitivity, susceptibility, and benefits (but not barriers) shows difference in their respective scores in different hospitalization categories. Individual perception scores were mostly found significantly higher in non-users of risk medications except analgesics and antidepressant medications. Detailed findings of Mann Whitney U test (for gender and marital status) and Kruskal-Wallis H test (for age, education, hospitalization) are presented in the Table 16.

Table 16

Comparison between Demographic Variables and Individual Perceptions

Demographic Variables		HBM INDIVIDUAL PERCEPTIONS: Sensitivity			Susceptibility			Benefits			Barriers		
		Mean Rank	U test & H test †	*p*	Mean Rank	U test & H test †	*p*	Mean Rank	U test & H test †	*p*	Mean Rank	U test & H test †	*p*
Gender	Male Female	78.45 73.24	2570.5	0.43	76.85 74.47	2675.0	0.72	74.43 76.32	2693.0	0.76	76.18 74.98	2718.0	0.85
Marital Status	Married Divorced	75.07 82.22	574.0	0.60	75.55 74.72	627.5	0.95	74.84 85.78	542.0	0.40	75.06 82.44	572.0	0.59
Age	60-69 70-79 80-89	86.7 63.9 61.64	12.6	0.00	89.48 61.58 53	19.2	0.00	87.34 64.02 53.57	16.0	0.00	89.61 60.45 62.14	20.0	0.00
Education	High school Diploma Bachelor Master	67.46 82.01 91.11 40	8.7	0.03	66.99 81.61 93.77 37.5	10.0	0.02	65.56 80.9 100.1 46	16.3	0.00	67.37 80.93 93.86 40	9.7	0.02
Hospitalization Duration	> week 1 week < week	76.32 86.06 53.02	9.9	0.01	75.18 89.4 51.52	12.5	0.00	75.3 85.88 57.45	8.0	0.02	76.9 82.26 57.61	5.7	0.06
Cerebral Neurovascular agents	Yes No	55.84 79.43	1071.0	0.01	63.76 77.85	1269.0	0.11	62.4 78.12	1235.0	0.06	68.36 76.93	1384.0	0.33
Diuretics	Yes No	64.48 88.09	1918.5	0.00	62.68 90.15	1774.5	0.00	64.58 87.99	1926.0	0.00	66.59 85.69	2087.0	0.00
Analgesic	Yes No	77.11 68.79	1560.0	0.31	76.72 70.41	1607.0	0.45	77.28 68.07	1539.0	0.24	76.67 70.6	1612.5	0.46
Anti-hypertensive	Yes No	70.68 86.76	1856.0	0.02	68.86 90.99	1665.5	0.00	70.84 86.38	1873.0	0.02	69.05 90.54	1685.5	0.00
Anticoagulant agents	Yes No	65.04 81.73	2046.5	0.01	66.7 80.74	2139.0	0.04	66.27 81	2115.0	0.02	65.97 81.18	2098.5	0.02
Anti-depressants	Yes No	57.46 77.36	699.5	0.08	59.86 77.11	733.0	0.13	63.36 76.75	782.0	0.21	61.89 76.9	761.5	0.18

* p = .05

** p = .001

† U statistics for gender, marital status, risk medication and H Statistics for age, education, and hospitalization

Question 3b

Chi-Square test was used to find any association between demographic variable and MFS Risk level. A strong association was found between age and fall risk level ($p<0.05$). The percentage of high risk was significantly increased with an increase in age. A significant difference was reported in the number of high and no risk among the different education categories of the participants. Chi Square test findings of all the demographic variables and MFS Risk level are presented in the table 17.

Table 17

Comparison between Morse Fall Scale (MFS) Risk Level and Demographics

Demographic Variables		Morse Fall Scale (MFS) Risk Level					
		No Risk		High Risk		Chi-Square	*p*-value
		N	%	N	%		
Gender	Male	18	27.7	47	72.3	0.05	0.817
	Female	25	29.4	60	70.6		
Marital Status	Married	40	28.4	101	71.6	0.10	0.749
	Divorced	3	33.3	6	66.7		
Age	60-69	34	44.2	43	55.8	19.14	**
	70-79	9	13.6	57	86.4		
	80-89	0	0.0	7	100.0		
Education	High School	14	17.9	64	82.1	11.24	.05
	Diploma degree	18	36.7	31	63.3		
	Bachelor's degree	11	50.0	11	50.0		
	Master's degree	0	0.0	1	100.0		
Duration of hospitalization	Less than 1 week	24	27.3	64	72.7	5.03	0.08
	1 week	16	40.0	24	60.0		
	More than 1 week	3	13.6	19	86.4		1
High Risk: Cerebral Neurovascular agents	Yes	0	0.0	25	100.0	12.06	**
	No	43	34	82	65.6		
High Risk: Diuretics	Yes	12	15.0	68	85.0	15.66	.001
	No	31	44.3	39	55.7		
High Risk: Analgesic	Yes	38	31.4	83	68.6	2.30	0.17

	No	5	17.2	24	82.8		1
Antihypertensive	Yes No	22 21	21.0 46.7	83 24	79.0 53.3	10.19	*
Anticoagulant agents	Yes No	9 34	16.1 36.2	47 60	83.9 63.8	6.93	*
Antidepressants	Yes No	1 42	7.1 30.9	13 94	92.9 69.1	3.50	0.06 9

Note Q.3b

As fall risk is our main outcome variable, and as per past references, only individual risk medication is not enough to show the impact of risk medication on the fall risk. High risk medication is classified in two categories as three or more medications and less than three medications.

There is a significant association between four high risk medications, i.e. cerebral neurovascular agents, diuretics, antihypertensive and anticoagulant agents. Fall risk was found significantly higher among participants using these high-risk medications (p<0.05).

With regards to participants taking multiple medications, fall of risk was found significantly higher among the Participants who were using three of more medications. Findings of Chi-Square test are presented in table 18.

Table 18 *Comparison of Fall of Risk level among High Risk Medications*

High Risk Medication	Morse Fall Scale (MFS) Risk Level					
	No Risk		High Risk		Chi-Square	*p*-value
	N	%	N	%		
Less than 3 medications	36	70.6	15	29.4	66.41	0.001
3 or more medications	7	7.1	92	92.9		
Total	43	28.1	107	71.3		

Question 3c

To find differences between demographic variables and frailty, Mann Whitney U test was used for gender and marital status. Kruskal-Wallis H test was used for the variables with more than 2 categories, i.e. age, education, and hospitalization duration. Frailty scores were found statistically higher in the old ages 70-79 years old. Educational categories were also reported significantly different in their scores of individual perceptions and frailty scores. With regard to the risk medications, the frailty scores of the patients using Cerebral Neurovascular and Diuretic medications were found significantly higher than the non-users of these medications (table 19).

Table 19
Comparison of Demographic Variables and Frailty

Demographic		Frailty		
Variables		Mean Rank	U test & H test Statistics†	*P*
Gender	Male Female	71.59 78.49	2508.5	0.332
Marital Status	Married Divorced	76.51 59.61	491.5	0.255
Age	60-69 70-79 80-89	60.45 88.8 115.64	21.654	0.001
Education	High School Diploma Bachelor's Master's	84.78 70.21 53.36 97.5	10.379	0.016
Hospitalization Duration	Less than 1 week 1 week More than 1 week	77.75 63.66 88.02	5.095	0.078
Cerebral Neurovascular agents	Yes No	113.02 68	624.5	0.001
Diuretics	Yes No	87.26 62.06	1859	0.001
Analgesic	Yes No	74.02 81.67	1575.5	0.391
Antihypertensive	Yes	75.39	2350.5	0.961

	No	75.77		
Anticoagulant agents	Yes No	78.46 73.74	2466.5	0.518
Antidepressants	Yes No	95.46 73.44	672.5	0.069

† U statistic for gender, marital status, risk medication, & H statistics for age, education, and hospitalization.

Question 3d

To find any relationship between the TFI scores and Fall Risk (No and High Risk), non-parametric Mann Whitney U test was used, and mean rank scores of High-Risk categories was found significantly higher than No Risk Category (*p* = .001). Please see table 20.

Table 20

Comparison between scores of Tilburg Frailty Indicator (TFI) and Fall Risk level

Risk Level	N	Mean	Median	Mean Rank	Sum of Ranks	Mann-Whitney U	*Z*	*p*-value
No Risk	43	3.0	3.0	36.43	1566.50	620.500	-7.02	0.001
High Risk	107	7.5	7.0	91.20	9758.50			

4. To what extent do individual perceptions (susceptibility, severity, benefits, barriers), demographic variables, and frailty predict fall risk (no risk or high risk) for elderly patients admitted to an acute care setting in KSFAH?

Prediction of Fall Risk with Respect to Demographic Variables, Individual Perception Scale, and Frailty Scale

With regards to the prediction of fall risk, we conducted a binary logistic regression analysis by taking fall risk level as a binary dependent variable and demographic variables and frailty scores as independent (predictor) variables.

Gender, marital status, antidepressant, and analgesics are insignificant in Block 0. (Beginning Block) so we reduced these from the model and proceeded with age, education, hospitalization duration, cerebral nervous agent medication, diuretics, antihypertensive, anticoagulant agent and frailty scale. There is a statistically significant model with chi-square = 69.9, *p* = 0.00. The model explained 53.4% (Nagelkerke R2) of the variance in fall risk and correctly classified 82.7% of the cases (See Table 19). Age, cerebral nervous agent medication, diuretics, antihypertensive, anticoagulant agent and frailty are positively associated with high fall risk. One-unit increase in age when all other independent variables are kept constant, yielded an increase of 2.8 times in fall risk. Similarly, one-unit increase in frailty scores, when all other independent variables are kept constant, yielded an increase of 2.7 times in fall risk. Regarding to the usage of risk medications, diuretic, antihypertensive and anticoagulant agents were having a positively association with fall of risk. It means with the increased usage of these medications, fall of risk will also be increased. See Table 21.

Table 21
Binary Logistic Regression Model for Fall Risk

Variables in Equation						
	B	S. E.	Wald	df	Sig.	Exp(B)
Age	1.061	.504	4.437	1	.035	2.888
Education	.140	.189	.546	1	.460	.870
Hospitalization duration	.119	.570	.044	1	.835	.888
Cerebral Neurovascular agent	20.540	5686.312	.000	1	.997	.000
Diuretics	3.644	.983	13.748	1	.000	.026
Antihypertensive	4.484	1.161	14.907	1	.000	.011
Anticoagulant agents	3.490	.940	13.790	1	.000	.030
Frailty	.980	.274	12.771	1	.000	2.664

A binary logistic regression model was constructed for fall risk by using a stepwise approach. First, we included all variables in the complete model with demographic and frailty. Due to high collinearity, they were excluded from the model. At that point, each individual perception as an independent variable separately, was loaded to the model. There was a significant model due to the high correlation among the variables. We applied only the binary regression between all individual perceptions separately. There was a significant model in all the cases with a negative association to fall risk (see Table 22).

Table 22

Binary Logistic Regression Model for Fall Risk

	Dependent Variable	Independent Variable	B	Wald	Exp(B)	Chi-Square	*p*-value	Nagel-kerke R^2	Predicted % (corrected)
Model 1	Fall Risk	Severity	-0.55	34.86	0.58	157.9	0.00	0.93	98.70
Model 2	Fall Risk	Susceptibility	-0.43	34.96	0.65	158.0	0.00	0.93	98.70
Model 3	Fall Risk	Benefits	-0.71	34.72	0.49	158.4	0.00	0.93	98.70
Model 4	Fall Risk	Barriers	-0.44	33.02	0.64	159..9	0.00	0.94	98.70
Model 5	Fall Risk	Overall HBM Scale	-0.13	34.60	0.88	158.7	0.00	0.94	98.70

Summary

The results of this chapter were obtained from participants' responses to the demographic, HBM, TFI, and MFS questionnaires. The target population consisted of Saudi Arabian patients at KSFAH. Descriptive statistics described the sample characteristics such as age, gender, length of hospitalization, level of education, and marital status. Cronbach's alpha was calculated to determine the reliability of HBM scale, TFI and MFS indicating acceptable values of reliability.

In the first research question, a Mann Whitney U test was used to compare means among fall risk levels and individual perceptions of the HBM scale. Mean rank scores of Individual perceptions were reported significantly higher in the No fall of risk participants than High fall risk patients ($p < 0.05$). The mean rank scores for "No Fall risk" are significantly higher than "High Fall Risk" in all four HBM domains individually and in the overall HBM ($p < 0.05$).

In the second research question a Mann Whitney U test was used (for gender and marital status) and Kruskal-Wallis H test was used (for age, education, hospitalization) to examine the relationships among individual perceptions and demographic variables, age, education, and length of hospitalization report significant difference between them.

In the Third research question, Chi-Square test was used to find any association between demographic variables and the MFS Risk levels. A strong association between age, education and fall of risk level ($p<0.05$) was found. In the second research question, in the third part, to find any difference between frailty scores and fall risk (No and High Risk), a non-parametric Mann Whitney U test was used, and mean rank scores of High-Risk categories was found significantly higher than the No Risk Category ($p = .001$).

In the Fourth research question, we conducted a binary logistic regression analysis by taking fall risk level as a binary dependent variable and demographic variables and frailty scores as independent (predictor) variables. The result showed that Age and frailty are positively associated with high fall risk. Then we conducted the binary regression model for fall risk by taking each individual perception as an independent variable separately, due to the high collinearity. There was a significant model in all the cases with a negative association to fall risk. Further discussion of the results and implications of this study appear in the next chapter.

CHAPTER V

DISCUSSION

This chapter includes the discussion of this study's findings in comparison with the current literature and addresses the strengths, limitations, implications, and recommendations for future studies. A dissemination plan is presented, and a conclusion is offered. This chapter will begin with a discussion about the instruments and then a discussion about each research question will follow.

Psychometric Properties of the Instrument

The instruments used in this study were the Fall Related Health Belief scale (HBM scale), The Tilburg Frailty Indicator (TFI) and the Morse Fall Scale (MFS). Two instruments, the HBM scale and the MFS, were translated into Arabic for the purposes of this study. The psychometric findings in this study yielded strong reliability with alpha coefficients of 0.999 for the overall items in the HBM Scale, in each item reliability of severity was 0.98 and in susceptibility, benefits and barriers reported was 0.99. The results found in this dissertation are supported in the literature (Cite authors for the HBM).

The Cronbach's alpha reliability coefficient for the 15-item TFI was also strong at 0.809 in this study, compared to the literature which ranged from 0.66 to 0.72 (Klinkenberg & Potter, 2017). The reliability coefficient Cronbach's alpha for the overall 6-items of the Morse Fall Scale in this study was 0. 776. Although this is a strong reliability, it is lower compared to the literature of an MFS reliability of 0.96 (Klinkenberg & Potter, 2017). The findings overall are comparable with the literature, with at least similar and sometimes stronger reliability compared to previous studies.

One interesting finding related to instrumentation was an issue of multicollinearity of the HBM scale. For the HBM scale the assumption for normal distribution was not met in further examination the cause of this issue was due to how the participants interpreted the Likert scale format. During data collection several participants voiced confusion on how to answer on the Likert scale and made comments about how it is either strongly agree or strongly disagree. The researcher hypothesizes that this is related to the literacy and education levels of the participants. It was noted that when this scale was translated into mandarin there were not issues in understanding the Likert scale, but also the participants of that study had higher education levels (e.g., many had master's degrees; Li et al., 2019). They also found that participants who were older, less educated, and living in rural areas generally had lower scores in the four HBM dimensions, and also had lower proportions of fall risk-reduction behaviors. Participants who had higher levels of education were more likely to participate in exercise and training, and they were more likely to assess their home environment and participate in exercise and training ($p < 0.001$). This is an important finding of the study and warrants further investigation for future use of this scale in the Saudi culture.

Study Summary

For patients admitted to an acute care setting in KSFAH

1. What are the individual perceptions (susceptibility, severity, benefits, barriers) and their relationship between each other?

There was a strong positive correlation was reported between all individual perception scales. Association among the four individual perception scales was statistically significant ($p < 0.05$).

2. What are the differences between individual perception and fall risk?

The majority of the participants were in high fall risk with low mean scores of individual perception, For instance, The mean scores for the individual perception of “no fall risk” are significantly higher than “high Fall Risk” in all four HBM domains individually and in the overall HBM ($p < 0.05$), there were 107 of high-risk patients with overall mean of individual perception 19.0 while there were 43 participants of no risk with higher mean score of their individual perception of 82.6 indicating that the patient has high fall risk when their individual perception (susceptibility, severity, benefits and barriers) of fall risk is low while the other patients has low risk of fall because their perception (susceptibility, severity, benefits and barriers) of fall risk is high meaning they aware about the fall risk items included in the HBM scale. Given the frail nature and elderly stature of the participants this finding was not surprising.

3. What are the differences among individual perceptions, demographic variables, fall risk levels, and frailty?
   a) What is the difference between individual perception and demographic variables?
   b) What is the difference between demographic variables and fall risk?
   c) What is the difference between demographic variables and frailty?
   d) What is the difference between frailty and fall risk?

In the context of age, there was a significant difference between the mean of different age groups and individual perceptions. Individual perception scores were found lower in older age groups. Meaning the older participants in this study had less perception of fall risk and their number greater in high fall risk. Frailty scores were statistically higher in the older age groups. This is congruent with previous research. Age is one of the strongest predictors of fall risk, with the majority of falls occurring in the elderly (Sasidharan, 2020). This is a concern for the elderly in Saudi Arabia because most of the elderly patients have low educational level, so they need different methods to increase awareness in fall prevention programs.

In the context of gender, the majority of participants identified as female (n = 85) compared to male (n = 65), and there were no significant differences noted for fall risk based on gender, individual perceptions, or frailty in this study ($p = 0.817$). The influence of gender on fall risk has been unclear in the literature thus far. Several studies (Ambrose, et al., 2013; Sasidharan, et al., 2020; Sulaiman et al. 2018; Tsai, et al. 2020; Vicky & Minh, 2015) found that women are at greater risk for falls, including the 2020 data from the CDC. The research states this is more related to the frail nature of elderly woman because they are more likely to live alone. Other studies indicate that males are at greater risk for falls (Tsai et al., 2020;), and in these studies this association was more strongly associated with co-morbidities such as stroke.

It is not surprising that there is not an association for the participants in this study due to the Saudi Arabian culture. The elderly population do not live alone, which is often attributed to the majority of the population staying married (divorce rates are very low). If the elderly were divorced or widowed, they would live with other family members. Risk based on gender or marital status is unlikely in this culture.

Educational levels were significantly correlated with individual perceptions ($p = 0.001$) and frailty scores ($p = 0.016$). In other research, education levels had a positive correlation with fall-related individual perceptions (Sulaiman, 2018), indicating where there is a higher education level there is higher awareness of “perceived severity”, “perceived susceptibility”, “perceived benefits”, and “perceived barriers”, that resulted in lower fall risk. In this study, lower education levels may explain the lack of confidence in implementing fall prevention measures (Lamis et al., 2012). Elderly participants who did not complete high school were associated with falls 95%

more than elderly participants who did complete their diploma and bachelor's degree (Sulaiman, 2018; Lamis et al., 2012). This is an important finding of the study, and as mentioned earlier, identifies the need to develop tailored fall prevention programs that are accessible for the needs of the Saudi population, because the level of education that a patient has likely plays into their ability to adapt the education.

Medication side-effects have a large influence on fall risk. Research has identified categories of medications that are most problematic to fall risk and those include antidepressants, anticonvulsants, analgesics, psychotropics, sedatives, anxiolytics, diuretics, and antihypertensives. In terms of high-risk medication usage, 81% of the participants took analgesic medication (opioid and non-opioid analgesic), followed by 70% taking antihypertensive and 53% taking diuretics. There was a significant association ($p<0.05$) between four of the high-risk medications at the individual level, i.e., cerebral neurovascular agents, diuretics, antihypertensive, and anticoagulant agents to fall risk.

While over 80% of the participants in this study took the high-risk medication classified as analgesic, of those participants ($n = 121$), 33% were taking less than 3 medications daily, only 19 participants who reported taking analgesics were taking more than 3 medications daily. Twenty-nine participants were taking analgesics such as acetaminophen or ibuprofen, which have a lesser side-effect profile effecting falls compared to opioids. Despite the high percentage taking analgesics the reality of the medications taken and the combination of medications resulted in insignificant to the effect on fall risk.

For participants taking multiple medications, which is defined as taking three or more high-risk medications, fall of risk was found significantly higher in patients who are using three or more drugs. This is similar to other research studies that found taking three or more high-risk medications have a higher risk with a 6% to 10% increased odds of falling with each additional medication in those categories (Lamis et al., 2012; Titler et al., 2011).

Hospital length of stay was positively correlated with individual perceptions in severity, susceptibility, and benefits. There was no significant correlation between frailty and the hospital length of stay. According to other research studies, falls occur at a frequency of 1.1% - 22% among various groups of patients (Vieira et al., 2013), and are directly connected to patient safety. The length of the hospital stay may increase when there is a fall that occurs in the hospital, especially if it is a fall with injury because it interferes with the recovery of the patient (Tucker, 2012). Pasa (2017) assessed fall risk in hospitalized adults and confirmed there are incidences in the hospital environment and concluded that patients with higher risk scores upon admission also had a higher score at the end of their time in the hospital. The participants in this dissertation study who were hospitalized longer may have reflected on the need for more individual perception regarding their health and safety. This may be an important sub-population to target with fall prevention education that could directly influence their perceptions about fall risk.

There is a significant correlation between frailty and fall risk (p = .001). Other research also has found frailty as a significant health risk in older people. Among the frail elderly, falls have constituted the major cause of accidental death and injury (Siviero et al., 2022). As both frailty and falls are important health issues associated with negative health outcomes, many studies have investigated the relationship between frailty and fall risk (Bandeen et al., 2015; Delgado et al., 2015; Hubbard et al., 2017; Joosten et al., 2014; Samper et al., 2011; Tom et al., 2013; Tsai et al., 2020). The findings of the studies were controversial. For example, some studies reported that frailty is a predictor of falls, (Bandeen et al., 2015; Delgado et al., 2015;

Hubbard et al., 2017) and other studies found no significant difference (Lin et al., 2018; Samper et al., 2011; Tom et al., 2013; Tsai et al., 2018). For research question 2, frailty and high fall risk has a significant relationship among elderly Saudi population which indicate the importance of included a frailty scale in any fall risk prevention program or even in fall risk screening tool. A discussion about frailty as a predictor of fall risk in this study is below.

4. To what extent do individual perceptions (susceptibility, severity, benefits, barriers), demographic variables, and frailty predict fall risk (no risk or high risk) for elderly patients admitted to an acute care setting in KSFAH?

A binary logistic regression analysis was used to answer research question 3 by taking fall risk level as a binary dependent variable and demographic variables and frailty scores as independent (predictor) variables.

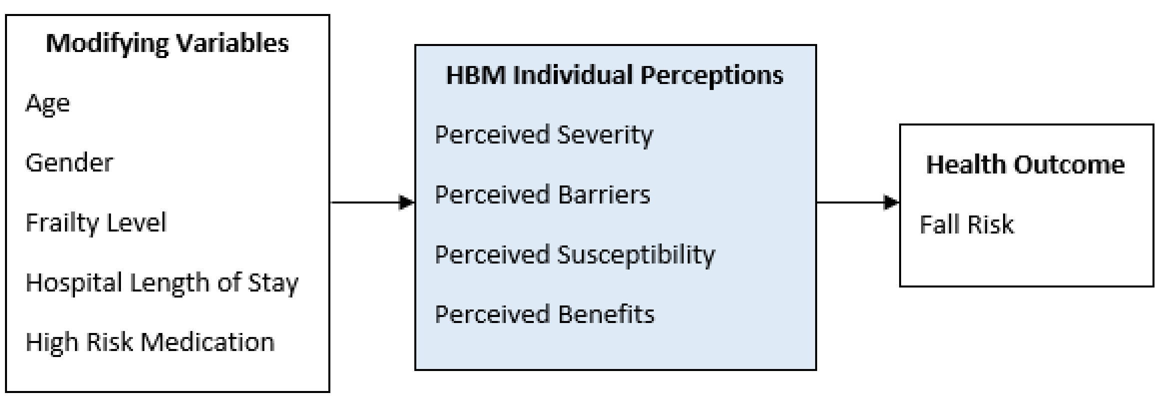
Gender, marital status, education and length of hospital stay were insignificant predictors of fall risk. Age and frailty are positively associated with high fall risk. One-unit increase in age when all other independent variables are kept constant, resulted in an increase of 2.8 times in fall risk. Its mean that aging is a bigger factor in the risk of fall in the patients and every unit increase in age will enhance the chances of fall risk by approximately 3%.

Frailty component scores which were calculated by assessing the physical functionality and mental health, balance and level of dependence were also reported an increased effect on the fall risk. An increase in the frailty score which is due to the negative physical or mental health conditions, will doubled (2 times) the chances of the fall of risk. These conclusions are similar to the research findings of Siviero et al., (2022) that found increased age and frailty was found to be significantly associated with future falls among $P < 0.000$. Identifying frailty in the community or hospital setting may lead to lowering fall occurrence when coupled with an intervention program to address individual perceptions (Siviero et al., 2022).

All the binary regression models of individual perception (susceptibility, severity, benefits, barriers) by taking fall risk as a dependent variable were statistically significant with a negative association with fall of risk. It predicted that by increasing the individual perceptions there is a significant decrease in fall risk. Individual perception is an important component of identifying fall risk amongst other correlating factors, such as, age, education, medication intake, and frailty factors. An increase in knowledge among patients related to the perception of falls in these contexts may have a significant impact on the reduction of falls (Sharif et al., 2018). In this study the hypothesized study model was close to the final model (see Figure 3). It can be concluded that by examining modifying variables, such as age, gender, frailty level, hospital length of stay and high-risk medication there is a significant influence on individual perceptions that may lead to predict patient fall risk.

Figure 3

Updated Study Model



Strengths and Limitations

Strengths and Opportunities

This research study had several strengths that future studies should replicate. The first one is the use of a valid and reliable instrument to collect data. The HBM, MFS and frailty questionnaire have established and strong reliability and validity. The formatting of it makes it simple for the participants to complete, and the participants directly engaged in providing their responses. The use of Cronbach's alpha coefficient to establish internal consistency reliability in this study showed excellent values (>.97). Along with a reliable instrument, the use of HBM as a guiding framework allowed this research to be positioned from the perspective of participants and the social, cultural, and physical environments they are in. The model also provided a means to assess perceptions related to falls and we now have an idea of how modifying variables among the population along with perceptions predict fall risk which can fit into a larger framework for future studies. One final strength is that this was the first Saudi study that investigated elderly patients' perception of fall risk using a combination of the HBM, MFS and frailty scale in one study. Because of this, the study provides foundational knowledge of the investigated population. The results could help inform Saudi policymakers as they formulate future fall risk intervention programs.

One opportunity emerging from this study is in regard to the 5-point Likert scale, which was difficult for the elderly Saudi patients in the current study to use. Therefore, it is suggested that further examination into this occurrence is needed. It is important to examine why the participants could only understand that response as either strongly agree or strongly disagree. One method is to conduct a cognitive interview with the translated HBM scale among a similar population.

Limitations

Although the current study provides solid insights into factors that explain individual's perceptions of fall risk in the elderly Saudi population based on the proposed theory, there are still some limitations. To begin, the results are based on self-report responses, which could introduce respondent bias. For example, there could be an occurrence of social desirability bias if stated behaviors were adjusted to suit what the participants believed the researchers expected. Self-report data can also result in either under or over-reporting because of inaccuracies in recalling information. Because all participants came from the same public hospital in Tabuk City, King Salman Forces Armed Hospital (KSFAH), there was no random sampling, so results are not generalizable. The final limitation of this study was the use of a cross-sectional design. This design, by nature, does not establish a cause-and-effect relationship, which limits the study's ability to prove causation among the variables of the study. Despite these limitations, the study provides evidence for the improvement of fall prevention strategies because of individual's perception based on HBM of patients having a high risk of falling.

Importance to Advancement of Knowledge and Research

Relationships among individual perceptions, including severity, susceptibility, benefits and barriers, frailty, modifying variables, and fall risk were described in the current study. Because there have been a limited number of studies conducted worldwide on perception and fall risk, and none were previously conducted in the Saudi context, this study adds to the existing body of scientific knowledge related to the way perception could be related to fall risks and influence future behavior change interventions. These findings could be used to improve health care providers' awareness of the impact of perceptions and frailty on fall prevention, improve fall risk programs, and inform future fall risk interventions

Importance to Nursing Practice, Education and Policy

While this study does not directly lead to changes in nursing practice, education or policies, various aspects of it could lead to improvements in these aspects of the profession. There are indications that determine perception is an important variable in predicting which patients are at risk from falls, new screening instruments for fall assessment will need to be developed and tested. After that, if perception and frailty become a part of a screening instrument, nursing practice and education will need to be adjusted.

The insight gleaned from this study could contribute to policy initiatives in the future. There are currently a limited number of policies in Saudi Arabia that attempt to broaden initiatives to prevent falls, especially in relation to the involvement of pharmacists in providing medication related fall risk information to patients who may be at risk and community initiatives that seek to improve education, awareness, and home environments. Further policy changes that are required to decrease patient falls are the use of a standardized screening tool, make all healthcare professionals accountable for patient falls, implement collaborative frameworks and models to help hospitals with the fall prevention programs and initiatives, and eliminate patient falls as a sensitive indicator for nurses. Through collaboration, a culture of shared responsibility will be promoted, which will allow various inter-professional disciplines to feel ownership for patient care, safety, and outcomes.

In the future nurses need to apply the systematic assessment of the risk of a patient falling during hospitalization. a systematic assessment processes is an effective intervention to reduce the incidence of falls. The researcher can apply in the future the theoretical framework which based on the systematized assessment of Virginia Henderson’s model of care. This model is considered an axiom for nursing care. Based on the dimension of the problem, as well as the consequences of falls (pain, injuries, complications, costs, and increase in hospital stay.

The study showed that (Montejano-Lozoya et al., 2020) patients admitted to units whose nurses have been trained in the systematic assessment of the risk of falls will fall less than those in units in which nurses have not received specific training.

Dissemination

The study results will be disseminated via poster presentation and oral presentations at The 2nd annual international conference of the Saudi nurse associate nursing conference.
The plan initially consists of making a poster presentation on (December 21-22, 2022). The manuscript will be prepared for publication in a scholarly nursing journal, such as the Western Journal of Research, Saudi Medical and Health Journals, or Gerontological Advanced Practice Nurses Association Journal.

Conclusion

The Health Belief Model (Rosenstock et al., 1988), provided the framework for this study, its importance as the overall conceptual model is clear as it underpins the impact of individual perceptions influence on fall risk. If health care provides can instill the importance of abiding by fall prevention strategies, they also need to understand the thought process of patients and their perceptions regarding their risk of falling in the hospital. The next step is to conduct a cognitive interview study to examine the meanings and processes used by respondents in answering questions on the HBM scale, which will enhance an understanding of question validity and response error. Another study will be conducted testing the mediating relationship of education and social support between individual perceptions, frailty, and fall risk. This will lead to important changes that include the development of fall risk screening instruments that includes questions related to perceptions and frailty. It is clear further studies are needed that investigate fall risk and perceptions as they could direct the shift in how patients are screened for fall risk and how programs and interventions to mitigate fall risks are developed in the future. Health care professionals should include perception and frailty as a factor for consideration in patient fall risk. Patients' lives continue to be jeopardized by falls even though there have been several decades of research, it is important to begin intervention research using fall prevention programs in this area of study.

APPENDICES

APPENDIX A

DEMOGRAPHIC DATA

Appendix A

Demographic Data

Part B of Tilburg Frailty Index

Permission to use the Arabic translation of the Tilburg Frailty Indication received from Gobbens.

Physical Component	Answer Options	Coding
1-Do you feel physically healthy? هل تشعر بصحة جيدة؟	Yes No	Yes = 0 No = 1
2-Have you lost a lot of weight recently without wishing *('a lot' is: 6 kg or more during the last six months, or 3 kg or more during the last month)* هل فقدت وزنا كبيرا في الآونة الأخيرة دون الرغبة في القيام بذلك؟	Yes No	Yes =1 No = 0
3-Do you experience problems in your daily life due to: difficulty in walking? هل تواجه مشاكل في حياتك اليومية بسبب صعوبة في المشي؟	Yes No	Yes = 1 No = 0
4- Do you experience problems in your daily life due to difficulty maintaining your balance? هل تواجه مشاكل في حياتك اليومية بسبب صعوبة الحفاظ على توازنك؟	Yes No	Yes =1 No = 0
5- Do you experience problems in your daily life due to poor hearing? هل تواجه مشاكل في حياتك اليومية بسبب ضعف السمع؟	Yes No	Yes =1 No = 0
6- Do you experience problems in your daily life due to poor vision? هل تواجه مشاكل في حياتك اليومية بسبب ضعف النظر؟	Yes No	Yes =1 No = 0

7- Do you experience problems in your daily life due to lack of strength in your hands? هل تواجه مشاكل في حياتك اليومية بسبب نقص القوة في يديك؟	Yes No	Yes =1 No = 0
8- Do you experience problems in your daily life due to physical tiredness? هل تواجه مشاكل في حياتك اليومية بسبب التعب البدني؟	Yes No	Yes =1 No = 0

Psychological components	Answer Options	Coding
9-Do you have problems with your memory? هل لديك مشاكل في الذاكرة؟	Yes Sometimes No	Yes =1 Sometimes = 0 No = 0
10-Have you felt down during the last month? هل شعرت بالإحباط خلال الشهر الماضي؟	No Yes Sometimes	No = 0 Yes = 1 Sometimes = 1
11-Have you felt nervous or anxious during the last month? هل شعرت بالتوتر أو القلق خلال الشهر الماضي؟	No Yes Sometimes	No = 0 Yes = 1 Sometimes = 1
12-Are you able to cope with problems well? هل أنت قادر على مواجهة المشاكل بشكل جيد؟	Yes No	Yes = 0 No = 1
Social components	**Answer Options**	**Coding**
13-Do you live alone? هل تعيش بمفردك؟	No Yes	No = 0 Yes = 1
14-Do you sometimes miss having people around you? هل تفتقد وجود اشخاص من حولك أحياناً؟	No Yes Sometimes	No = 0 Yes =1 Sometimes = 1
15-Do you receive enough support from other people? هل تتلقى دعماً كافياً من اشخاص آخرين؟	Yes No	Yes=0 No=1

Scoring Part B Components of frailty (range: 0 – 15)

Question 1: yes = 0, no = 1
Question 2 – 8: no = 0, yes = 1
Question 9: no and sometimes = 0, yes = 1
Question 10 and 11: no = 0, yes and sometimes = 1
Question 12: yes = 0, no = 1
Question 13: no = 0, yes = 1
Question 14: no = 0, yes and sometimes = 1
Question 15: yes = 0, no = 1

Demographic Data

Question	**Options**	**Coding**
1. What is your gender?	Male Female	Male = 0 Female = 1
2-How old are you?	60-65 65-70 70 and older	60-65 = 0 65-70 = 1 70 and older = 2
3-What is your marital status?	Single Married Divorced Widowed	Single = 0 Married = 1 Divorced = 2 Widowed = 3
4-What is your highest level of education?	High school Bachelor's degree Master's degree Doctoral degree	High school = 0 Bachelor's degree = 1 Master's degree = 2 Doctoral degree = 3
5-How long - have you been hospitalized?	1 week Less than week More than week	1 week = 1 Less than 1 week = 2 More than 1 week = 3
6-Medications: High risk medication categories	Cerebral Neurovascular Agents Diuretics Analgesic Antihypertensive Anticoagulants Antidepressants	Cerebral Neurovascular agents Yes=1, no=2 Diuretics Yes=1, no=2 Analgesic Yes=1, no=2 Antihypertensive Yes=1, no=2 anticoagulant agents Yes=1, no=2 No high-risk medication Yes=1, no=2

APPENDIX B

MORSE FALL SCALE FOR FALL RISK

Appendix B

Morse Fall Scale for Fall Risk

Adapted with permission, SAGE Publications

Item		**Scale**	**Scoring**
1. History of falling; immediate or within 3 months	No	0	
	Yes	25	_________
2. Secondary diagnosis	No	0	
	Yes	15	_________
3. Ambulatory aid			
Bed rest/nurse assist		0	
Crutches/cane/walker		15	
Furniture		30	_________
4. IV/Heparin Lock	No	0	
	Yes	20	_________
5. Gait/Transferring			
Normal/bedrest/immobile		0	
Weak		10	
Impaired		20	_________
6. Mental Status			
Oriented to own ability		0	
Forgets limitations		15	_________

The items in the scale are scored as follows:

History of falling: This is scored as 25 if the patient has fallen during the present hospital admission or if there was an immediate history of physiological falls, such as from seizures or an impaired gait prior to admission. If the patient has not fallen, this is scored 0. Note: If a patient falls for the first time, then his or her score immediately increases by 25.

Secondary diagnosis: This is scored as 15 if more than one medical diagnosis is listed on the patient's chart; if not, score 0.

Ambulatory aids: This is scored as 0 if the patient walks without a walking aid (even if assisted by a nurse), uses a wheelchair, or is on a bed rest and does not get out of bed at all. If the patient uses crutches, a cane, or a walker, this item scores 15; if the patient ambulates clutching onto the furniture for support, score this item 30.

Intravenous therapy: This is scored as 20 if the patient has an intravenous apparatus or a heparin lock inserted; if not, score 0.

Gait: A *normal gait* is characterized by the patient walking with head erect, arms swinging freely at the side, and striding without hesitant. This gait scores 0. With a *weak gait* (score as 10), the patient is stooped but is able to lift the head while walking without losing balance. Steps are short and the patient may shuffle. With an impaired gait (score 20), the patient may have difficulty rising from the chair, attempting to get up by pushing on the arms of the chair/or by bouncing (i.e., by using several attempts to rise). The patient's head is down, and he or she watches the ground. Because the patient's balance is poor, the patient grasps onto the furniture, a support person, or a walking aid for support and cannot walk without this assistance.

Mental status: When using this Scale, mental status is measured by checking the patient's own self- assessment of his or her own ability to ambulate. Ask the patient, "Are you able to go the bathroom alone or do you need assistance?" If the patient's reply judging his or her own ability is consistent with the ambulatory order on the Kardex®, the patient is rated as "normal" and scored 0. If the patient's response is not consistent with the nursing orders or if the patient's response is unrealistic, then the patient is considered to overestimate his or her own abilities and to be forgetful of limitations and scored as 15.

Fall Risk Level in this study

Risk Level	**MFS Score**
No Risk	0 - 50
High Risk	≥ 51

APPENDIX C

THE FALL RELATED HEALTH BELIEF MODEL

Appendix C

The Fall Related Health Belief Model

Dimensions	Items	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Perceived severity	Fall in the elderly is a very serious problem.					
	Fall in the elderly can cause fractures, disability, and even death.					
	Fall in the elderly can change psychology and cause fear of fall.					
	Fall in the elderly can increase the burden on the family					

Perceived susceptibility	The elderly people are prone to fall.					
	Insecurities in the home and community can easily lead to falls such as slippery floors, aisle debris and etc.					
	Some bad habits can cause falls, including unsuitable dressing and shoes, not using handrails and etc.					
	Unhealthy mental states can cause falls such as depression.					
	Many chronic disease and organ hypofunction can cause fall.					

Perceived benefits	Falls of elderly is preventable with right methods.					
	It will decrease the risk of falls if I can change the insecurities in the home environment.					
	It will decrease the risk of falls if I can change my bad habits.					

Perceived barriers	I know some habits are bad, but it’s hard for me to make changes.					
	It’s hard for me to change some of the insecurities in my home environment.					
	It’s hard for me to determine the risk factor of falls					

	It is difficult for me to adhere to the treatment of chronic diseases that affect falls such as hypertension.					
	It is expensive to prevent falls such as installing handrails.					

APPENDIX D

CONSENT FORM

Appendix D

Consent Form

Title of Research Project: The Individual Perceptions Related to Risk for Falling and Fall Risk Levels Among Older Adults' in an Acute Care Setting
Researcher: **Zuhur Altaymani; PhD candidacy student in Nursing Science, Kent State University:** zuhuraltaymani@gmail.com, 347-268-6892
Faculty Advisor and PI: **Dr. Dana M. Hansen, Ph.D., APRN, ACHPN, Associate professor and Co-Director PhD program at Kent State University, dhansen1@kent.edu**
Description of the Research Project:

The researcher is a graduate student in the Doctor philosophy of Science in Nursing program at Kent State University. She is conducting a research study on the Individual Perceptions Related to Risk for Falling and Fall Risk Levels Among Older Adults' in an Acute Care Setting in Saudi Arabian Hospital (KSFAH).The goal of the study is to gain insight into the individual's perception of Saudi elderly patients of fall risk through examining their perception ;perceived susceptibility, severity, benefits and barriers Saudi Arabian hospitals in a cute care settings ,which may be used to enhance the fall risk screening tool for all patients , to improve patients 'outcomes and to increase patients' satisfaction by decreasing or preventing patient's fall during hospitalization.

Description of Participants' Role:

If you agree to participate in this study, the researcher will ask you questions about your perception of fall risk. Since your thoughts are important, you will be asked to answer the questions that will be asked by the researcher or assistant researcher, you may choose not to answer any of the questions asked, and you can choose to stop the interview at any point. You will also be asked if you would be willing to be contacted by phone to review the findings of the study and to see if these findings fit your experience. This phone call would take approximately 20 minutes and would not be audio taped. You do not need to agree to the follow up phone call to participate in the study.

Confidentiality:

After the interview, your answered will documented without any identifying information, meaning there will be no way to link you with the study. The identities of the participants will not be shared with anyone Kent state university. Kent state university is not involved in the study other than to grant recruiting permission. Kent State University will only receive a summary of the study with no identifying information included. Any publications, presentations or reporting of the study data in any way will be done with no identifying information so that there will be no way to link participants with the study. After 3 years, all study documents will be destroyed.

Benefits:

You will not directly benefit from participation in this research.

Risks:

There are no anticipated risks to you as a result of taking part in this study.

Withdrawal of Participation:

Your participation in this study is strictly voluntary and your consent to participate may be withdrawn at any time.

Request for More Information:

Further information about the study may be provided by contacting the researcher or Dr. Dana Hansen Contact information is provided at the top of the first page of this form.

Consent to Participate:

By signing below, I understand the following:

1. If I have any questions about this research study, I can contact Zuhur Altaymani at or her faculty advisor, **Dr. Dana Hansen, Ph.D., APRN,ACHPN, Associate professor , dhansen1@kent.edu,** Kent State University College of Nursing,113 Henderson Hall, P. O. Box 5190 Kent, OH 44242 330-672-8779 (office)
2. I can choose to be part of this study or not. Even if I choose to be a part of this study I can withdraw at any time without penalty.
3. I know I can ask questions about this research at any time.
4. I know I will not receive any money for being in this research study.
5. I have been told what will happen in the study and what I am supposed to do, including any possible risks and/or benefits.
6. All of my questions about the study to this point have been answered.
7. I give my consent freely and take part in this research study based upon the facts given to me as noted in this consent.
8. I have read the entire consent, or someone has read it to me.
9. I am over 60 years of age.
10. Signing this form means that I will be given a signed copy of the consent.

____

Participant's SignatureDate

____

Researcher's Signature and Date

Do you agree to be contacted by phone to discuss your impressions of the findings of this study?

___YES ___NO

If you checked yes, please provide a phone number: _______________________

____

Participant's Signature for
Follow up phone call Date

Do you agree to be contacted by phone to discuss potential participation in future research? By marking yes, you are not obligated to participate in any future research.

___YES ___NO

If you checked yes, please provide a phone number: _______________________

____

Participant's Signature for potential future research and Date

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