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Patient Falls In Saudi Hospitals: Exploring Barriers To Prevention and Frailty Risk

Samah Alatwi, Registered Nurse, Primary investigator
Malhawitis@gmail.com

Renad Matar Alenazi, Registered Nurse,

Hanadi Hamed Alatawi , Registered Nurse

Shams Majrashi, Registered Nurse

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Abstract

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.

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 severity, 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. Mean scores of individual perceptions (perceived severity and frailty) were reported significantly higher in the No Fall of risk participants over High fall risk patients ($p < 0.05$). 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. 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.

Keywords: Individual Perception; Perceived
Severity; Fall Risk; Elderly Adult; Frailty; Saudi Arabia

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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.. 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. 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).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.

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

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groups in 2016. If the rate from falls stays the same, 43,000 elderly will have fall related deaths by 2030 (Burns & Kakara, 2018).

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). Over the past decade, evaluating patient outcomes related to elderly falls has gained increased national attention.

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. 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

Exploring how perceived severity and frailty shape fall risk in older adults in a cute care setting in a Saudi Arabian Hospital (KSFAH).

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

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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.

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

Research Questions

For patients admitted to an acute care setting in KSFAH

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

LITERATURE REVIEW

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

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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).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). Che and Woo (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). 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 (Scheffer et al., 2011).

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).

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.

METHODOLOGY

Study Design

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 (Alghnam et al , 2020).

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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 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

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

In this study there is no consensus on the approach to compute the power and sample size with logistic regression (Berezka et al., 2022), abellan Faul et al., (2009) 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

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 .Other measures are the MFS and the Fall-Related HBM .

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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.

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 studies are conducted for two main reasons. 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).

RESULTS

A very high reliability of 0.998 was reported for the overall items in the HBM Scale.

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.

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Data were entered into a statistical social package (SPSS 25). 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.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. see table 5

Table 5

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

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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

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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 6).

Table 6

Dependent Variable Characteristics (N=150)

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

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

Collinearity was tested by examining the Variance Inflation Factor (VIF). It is desired that VIF ≤ 10 in un-violated collinearity cases (Chong, 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 .

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 (Chong, 2022). This is explained further under research question #3 below.

Research Questions

For patients admitted to an acute care setting in KSFAH

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1. 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 7.

Table 7

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

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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. There was a significant model in all the cases with a negative association to fall risk (see Table 8).

Table 8

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

DISCUSSION

This study demonstrates that lower perception of fall risk and greater frailty strongly predict high fall risk among older Saudi inpatients. The negative association between HBM perception scores and fall risk suggests that patients who underestimate the severity and susceptibility of falls are less likely to adopt preventive behaviours. These findings echo international literature linking frailty and polypharmacy to falls..

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

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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, Pasa et al 2018). The findings overall are comparable with the literature, with at least similar and sometimes stronger reliability compared to previous studies. This is an important finding of the study and warrants further investigation for future use of this scale in the Saudi culture.

Implications for Practice

1. Integrate Frailty Screening: Incorporating TFI into admission assessments can identify high-risk patients beyond conventional MFS scoring.
2. Enhance Patient Education: Fall-prevention programs should address misconceptions about severity and susceptibility, using culturally and linguistically appropriate materials for patients with low literacy.
3. Medication Review: Routine multidisciplinary medication reconciliation focusing on diuretics, antihypertensives, and anticoagulants is essential.
4. Policy Development: Hospital administrators and policymakers should mandate combined HBM perception and frailty assessments in fall-prevention protocols.

Limitations

Convenience sampling from a single hospital may limit generalizability. The cross-sectional design precludes causal inference. Self-reported perceptions may be influenced by social desirability or literacy barriers, as evidenced by participants' tendency to choose extreme Likert responses.

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

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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.

References

Abellan Van Kan, G., Rolland, Y., Andrieu, S., Bauer, J., Beauchet, O., Bonnefoy, M., Cesari, M., Donini, L.M., Gillette-Guyonnet, S., Inzitari, M., Nourhashemi, F., Onder, G., Ritz, P., Salva, A., Visser, M., & Vellas, B. (2009). Gait speed at usual pace as a predictor of adverse outcomes in community-dwelling older people an International Academy on Nutrition and Aging (IANA) task force. *The Journal of Nutrition, Health & Aging*, *13*(10), 881–889. https://doi.og/10.1007/s12603-009-0246-z

Ahn, S., & Oh, J. (2018). Relationships among knowledge, self-efficacy, and health behavior of Osteoporosis and fall prevention in old aged women. *Korean Journal of*

Multi-knowledge Electronic Comprehensive Journal For
Education And Science Publications (MECSJ)
Issue No. 90 - December 2025
ISSN: 2616-9185

Women Health Nursing, *24*(2), 209–218. https://doi.org/10.4069/kjwhn.2018.24.2.209

Alex, D., Khor, H. M., Chin, A. V., Hairi, N. N., Cumming, R. G., Othman, S., Khoo, S., Kamaruzzaman, S. B., & Tan, M. P. (2020). Factors associated with falls among urban- dwellers aged 55 years and over in the Malaysian Elders Longitudinal Research

Alghnam, S.; Alsayyari, A. S.; Towhari, J. A.; Alsayer, R. M.; Almohaimeed, M. Y.; Aldebasi, M. H.; Albabtin, I. T. (2020). Epidemiological characteristics of fall injuries and their related outcome in Riyadh, Saudi Arabia: A descriptive study from a level-I trauma center. *Journal of Family and Community Medicine, 27*(2), 114–119. doi: 10.4103/jfcm.JFCM_245_19

Alqahtani, B. A., Abdelbasset, W. K., & Alenazi, A. M. (2020). Psychometric analysis of the Arabic (Saudi) Tilburg Frailty Indicator among Saudi community-dwelling older adults. *Archives of Gerontology and Geriatrics*, *90*, Article 104128. https://doi.org/10.1016/j.archger.2020.104128

Multi-knowledge Electronic Comprehensive Journal For
Education And Science Publications (MECSJ)
Issue No. 90 - December 2025
ISSN: 2616-9185

Arain, M., Campbell, M. J., Cooper, C. L., & Lancaster, G. A. (2010). What is a pilot or feasibility study? A review of current practice and editorial policy. *Boston Medical Center Medical Research Methodology*, *10*, Article 67. https://doi.org/10.1186/1471-2288-10-67

Arnold, D. M., Burns, K. E. A., Adhikari, N. K. J., Kho, M. E., Meade, M. O., Cook, D. J., & McMaster Critical Care Interest Group. (2009). The design and interpretation of pilot trials in clinical research in critical care. *Critical Care Medicine Baltimore, 37*(1), S69– S74. https://doi.org/10.1097/CCM.0b013e3181920e33

Berezka, K., Kovalchuk, O., Banakh, S., Zlyvko, S. & Hrechaniuk, R. (2022). A binary logistic regression model for support decision making in criminal justice. *Folia Oeconomica Stetinensia,22*(1) 1-17. doi: 10.2478/foli.2022-00001

Bishop, A. C., Baker, G. R., Boyle, T. A., & MacKinnon, N. J. (2015). Using the Health Belief Model to explain patient involvement in patient safety. *Health Expectations*, *18*(6), 3019– 3033. https://doi.org/10.1111/hex.12286

Bunt, S., Steverink, N., Olthof, J., van der Schans, C. P., & Hobbelen, J. S. M. (2017). Social frailty in older adults: A scoping review. *European Journal of Ageing: Social, Behavioural and Health Perspectives*, *14*(3), 323–334. https://doi.org/10.1007/s10433-017-0414-7

Multi-knowledge Electronic Comprehensive Journal For
Education And Science Publications (MECSJ)
Issue No. 90 - December 2025
ISSN: 2616-9185

Burns, E., & Kakara, R. (2018, May 11). Deaths from falls among persons aged ≥65 years United States, 2007–2016. *Morbidity and Mortality Weekly Report, 67*(18), 509–514. https://www.cdc.gov/mmwr/volumes/67/wr/mm6718a1.htm

Cawthon, P. M., Marshall, L. M., Michael, Y., Dam, T. T., Ensrud, K. E., Barrett-Connor, E., & Orwoll, E. S. (2007). Frailty in older men: Prevalence, progression, and relationship with mortality. *Journal of the American Geriatrics Society, 55*(8), 1216-1223. https://doi.org/10.1111/j.1532-5415.2007.01259.x