

Prevalence and Risk Factors of Recurrent Falls in Older People Post–Hip Fracture Surgery After Discharge: A Cross–Sectional Study

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Abstract: Recurrent falls and fall-related injuries are common in older adults after a hip fracture. This cross-sectional study aimed to investigate the prevalence and risk factors associated with recurrent falls in older people following hip fracture surgery after their discharge from the hospital. With purposive sampling, the participants were 180 older adults who underwent hip fracture surgery six months prior and visited orthopedic outpatient services at three tertiary care hospitals in Bangkok from July 2023 to May 2024. Data collection utilized standard assessments, including the Personal Health Information Questionnaire, the 6-Item Cognitive Impairment Test, the Hip Dysfunction and Osteoarthritis Outcome Score for Joint Replacement, the Falls Efficacy Scale International, the Activities-specific Balance Confidence Scale, and the St Thomas’s Risk Assessment Tool in Falling Elderly Inpatients. Data analysis was performed using descriptive statistics and multiple logistic regression, with a significant level set at 0.05.

The results indicated that the prevalence of recurrent falls among older people who underwent hip fracture surgery was 27.8% within the first six months after being discharged from the hospital. Participants identified as high risk for falls had a risk of recurrent falls that was 4.74 times greater than those classified as low risk. Additionally, participants taking medications related to falls had a 2.71 times higher risk of experiencing recurrent falls compared to those who were not on such medications. Findings from this study suggest that health professionals, particularly gerontological nurse practitioners, should emphasize the importance of assessing fall risks and the potential side effects of medications that could lead to falls before discharging patients from the hospital.

Keywords: Fall risk factors, Hip fracture surgery, Older adults, Recurrent falls

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Introduction

As the global population ages, falls have become a significant health problem profoundly affecting people aged 60 or over worldwide. Falls and recurrent falls in older individuals result in serious consequences and even mortality.¹ Among these consequences, fall-related hip fractures are most common, often leading to developing other illnesses, prolonged hospitalization, difficulties with care home discharge, physical or mental disabilities, and even death, particularly in the older population.^{2,3}

Despite advancements in hip fracture surgery, many older adults may be less likely to regain their physical function post-surgery fully. As a result, post-hip fracture surgery requires complex care to prevent disability and restore quality of life. Moreover, the reoperation rate in hip fractures is notably high. In 2019, statistics indicated that older people with hip fractures who underwent hip surgery had a 14.3% chance of re-operating, and of these, 34.2% experienced reoperation within one month and 72.9% within one year.⁴ In addition, over a decade of monitoring revealed that older people receiving reoperation faced a significantly higher mortality risk, with a high mortality rate of 62.9%, compared to just 20.0% of those who do not undergo reoperation.^{3,4} Hence, exploring the factors influencing fall-related hip fractures and recurrent falls is essential to prevent adverse health consequences in older adults. Ensuring adequate attention from healthcare professionals is imperative for effectively preventing recurrent falls and subsequent bone fractures.

Literature Review

Falls and fall-related injuries are prevalent among older adults. A fall is defined as “an unintentional change in position that results in coming to rest at a lower level or on the ground.”^{5(p 39)} With the aging population globally, the incidence of falls and

fall-related injuries requiring hospitalization has intensified.⁶ Hip fracture—a common fall-related injury in older people—significantly contributes to the need for treatment and hospitalization.^{7,8} Extensive inquiry has demonstrated that a fall-related hip fracture results in adverse health outcomes such as functional deterioration in daily activities, a need for complex care, depressive symptoms, and a reduced quality of life.^{9,10} Additionally, experiencing a fall-related hip fracture was found to increase the likelihood of experiencing subsequent or recurrent falls. For example, a study conducted in the United States reported that 26.1 % of individuals aged 65 years and above experienced recurrent falls within one year after the initial fall-related injuries; half of this cohort experienced recurrent falls within the first 90 days after discharge from the hospital.¹¹ Another study conducted in Australia emphasized that approximately 43% of older people aged 60 and over experienced recurrent falls within six months after being discharged from the hospitals, and 49.7 % of this population reported severe injuries resulting from falls.¹² Additionally, a study by Jo, Park, and Ryu¹³ found that 59.2% of older people experienced at least one fall within a year, and 48.1% experienced recurrent falls that required medical treatment. Notably, falls that occur after discharge or a second hip fracture are crucial factors associated with a higher likelihood of subsequent fractures, rehospitalization, and increased mortality,^{14,15} which often necessitates hospitalization. As mentioned earlier, an initial fall in older people frequently leads to recurrent falls after hospital discharge, which requires comprehensive care, resulting in a healthcare burden for this population.

Besides initial falls being linked to recurrent falls, the evidence demonstrated other risk factors associated with recurrent falls. For example, complex health conditions increase the risk of recurrent falls within 12 months; specifically, for each additional chronic disease, the odds of experiencing recurrent falls increase by 1.18 times.¹⁶ Additionally, a meta-analysis

exploring 22 studies identified key factors leading to recurrent falls in older adults, including balance and mobility, polypharmacy (especially psychoactive drugs and analgesics), psychological sensory, and neuromuscular changes.¹ Furthermore, previous studies have also highlighted that age, the presence of comorbidities, the number of initial falls, fear of falling, balance and gait problems, and overall quality of life are all linked to recurrent or future falls,^{3,17} while the linkage between gender and recurrent falls has produced inconclusive results.^{11,18} Hence, understanding risk factors is essential for health personnel in identifying older adults at risk of recurrent falls to prevent any negative consequences in this population.

Although much of the research up to now has explored factors related to recurrent falls and their impact on older adults over six months to one year, there is still very little scientific evidence on factors—particularly gender, age, comorbidities, type of medications, functional ability, gait balance confidence, fear of falls, and risk of falls—linked to recurrent falls among older people after hip fracture surgery, particularly at a period of six months after discharge, which is practical time for recovery from hip surgery in performing daily activities. The findings of this study could be beneficial not only for identifying essential information on risk factors that may help prevent recurrent falls but also for enhancing better care aimed at reducing disability in older individuals who have undergone hip fracture surgery.

Study Aim

To investigate the prevalence and risk factors associated with recurrent falls in older adults who have undergone hip fracture surgery within the first six months after hospital discharge.

Methods

Design: A cross-sectional study design was employed. This study follows the strengthening of

the reporting of observation studies in epidemiology: STROBE Checklist.¹⁹

Sample and Setting: The sample included older adults, both males and females, who had surgical intervention due to fall-related hip fractures at three tertiary care hospitals in Bangkok, Thailand. Participants were recruited in the study if they met the following criteria: aged 60 years and above, discharged from the hospital for at least six months until one year after hip surgery, cognitively intact,²⁰ had well-controlled comorbidities indicated in the medical record, could communicate in Thai, and were willing to participate in the study. Prospective participants who were bedridden and diagnosed with pathologic fractures were excluded. Based on the recommendations of Burmeister and Aitken²¹ for logistic regression analysis—20 participants for each variable—180 participants were required for the final analysis (eight independent variables, including gender, age, comorbidities, type of medications, functional ability, gait balance confidence, fear of falls, risk of falls, and one dependent variable of recurrent falls).

Ethical Considerations: Before beginning the data collection process, the Institutional Review Boards in Mahidol University Multi-Faculty Cooperative IRB Review approved the study protocol for two settings (COA.MURA2023/404). The researchers adhered to the International Guidelines for Human Research Protection, such as the Declaration of Helsinki. Participants were informed regarding the study details and their rights, including the right to participate or withdraw from the study at any moment without providing a reason. They also were ensured that choosing not to participate or withdrawing from the study would not cause any negative consequences. All information collected would be kept anonymous and treated confidentially. Participants signed an informed consent form before beginning data collection.

Instruments: The instruments consisted of those for screening and data collection, and all copyright instruments obtained permission to use from developers or copyright holders.

The 6-Item Cognitive Impairment Test-Thai version (6CIT) is a short assessment tool designed for screening cognitive impairment or dementia in older people. The 6CIT was developed by Brooke and Bullock²² and was translated into Thai by Aree-Ue and Youngcharoen.²⁰ The 6CIT covers six items, with total scores ranging from 0 to 28. A score between 0 and 7 indicates no cognitive impairment, while a score of 8 or more suggests suspected cognitive impairment that necessitates a more complex diagnosis. The 6CIT demonstrated high sensitivity and specificity with 78.57% and 100%, respectively.²² Additionally, for the 6CIT-Thai version, the scale-level content validity index (S-CVI) and the item-level content validity index for items (I-CVI) were found to be 1, indicating excellent validity. Test-retest reliability at 2-week intervals revealed a positive correlation coefficient ($r = 0.64, p < .001$).²⁰

The primary investigator (PI) developed a *Personal Data Questionnaire* based on literature reviews to gather information such as gender, age, body mass index (BMI), comorbidities, the number of medications taken, types of surgery, a history of falls within the first six months following the hip surgery, and the place where the fall occurred. This questionnaire consists of eight categorized and open-ended questions. *Recurrent Falls*, a part of the *Personal Data Questionnaire*, refers to the number of falls experienced within six months following discharge from the hospital.

The Hip Dysfunction and Osteoarthritis Outcome Score for Joint Replacement (HOOS, JR) is a patient-reported outcome questionnaire used to evaluate patients' functional abilities after hip fracture surgery in this study. The HOOS, JR was developed by Lyman²³ and was translated into Thai by Roopsawang.²⁴ It consists of two domains: pain (2 items, i.e., "Going up and down stairs") and mobility in daily activities (4 items, i.e., "Rising from sitting"). Each item is rated from none (0) to extreme (4). A total score ranges from 0-24; then, the raw summed scores are converted to interval-level scores between 0 (worst functional ability related to total hip disability) and 100 (best

functional ability related to perfect hip health). A score of more than 50 was considered a good functional ability in this study.

The HOOS, JR was tested for validity by comparing it to the Western Ontario and McMaster University Osteoarthritis Index (WOMAC). Results indicated a Spearman's correlation coefficient ranging from 0.60 to 0.94 for the pain and function domains, respectively, and a high internal consistency was reported at 0.86.²³ The HOOS, JR Thai version reported a content validity index (CVI) of 1.00. The Cronbach's alpha coefficient reliability was 0.83 and 0.87 in 10 and 120 older people, respectively.²⁴ In this study, the reliability of 180 older individuals was found to be 0.85.

The Activities-Specific Balance Confidence Scale (ABC scale) was developed by Powell and Myers²⁵ to evaluate older people's confidence in maintaining balance during daily activities. It was translated into Thai by Nanthapaiboon et al.²⁶ The ABC scale covers 16 questions that evaluate how confident individuals feel while performing activities, such as "Get into or out of a car?" and "Walking around the house?" Responses are expressed as a percentage, ranging from 0% to 100%. A score above 80% indicates a high level of confidence in functioning. A score between 50% and 80% reflects a moderate level of confidence in functioning. A score below 50% signifies a low level of confidence in functioning, while a score under 67% suggests a significant risk of falling.²⁵

The original version of the ABC scale was found to have good test-retest reliability and convergent criterion validity when tested in community older adults.²⁵ In the translated Thai version, the internal consistency reliability was high (Cronbach's alpha = 0.96). A significant negative correlation was observed with the Timed Up and Go Test at a low level (Spearman's rho = -0.34). In contrast, a significant positive correlation was noted with the Fall Self-Efficacy scale, with Spearman's rho reported as 0.66.²⁶ The reliability in this study involving 180 older individuals was 0.98.

The Falls Efficacy Scale-International: FES-I was developed to assess the fear of falling while performing activities inside and outside the home.²⁷ The FES-I was translated into Thai by Thiamwong.²⁸ It comprised 16 questions, such as “Going to the shop” and “Going up and down stairs.” Each question is rated from 1 (not concerned at all) to 4 (very concerned). The total scores range from 16 to 64. Additionally, total scores are categorized into three levels: low fear of falling (scores of 16–19), moderate fear of falling (scores of 20–27), and high fear of falling (scores of 28–64).

The original FES-I was tested for validity and reliability in a study involving 704 people between 60 and 95 years old; it demonstrated excellent internal consistency with Cronbach’s alpha of 0.96 and test-retest reliability, indicated by an intraclass correlation coefficient of 0.96.²⁷ For the FES-I Thai version, the internal consistency reliability with Cronbach’s alpha was 0.95 tested in 433 older adults,²⁸ and was 0.98 in this study.

St Thomas’s Risk Assessment Tool in Falling Elderly Inpatients or STRATIFY was developed to predict falls among hospitalized older adults.²⁹ The STRATIFY-Thai version³⁰ was used in this study to measure the risks of falls. Although STRATIFY is commonly used for hospitalized patients, it considers previous falls as a risk factor when calculating the score; therefore, it was suitable to evaluate recurrent falls in this study. The STRATIFY is a 5-question with binary answers (yes-or-no) such as “Visually impaired to the extent that every function is affected?” Each item scores 1 point for “yes” and 0 for “no.” The total score ranges from 0 to 5; a score of 2 or higher indicates a high fall risk.

The STRATIFY was found to have high sensitivity and specificity, with 93% and 88%, respectively.²⁹ Given its high predictability and ease of administration, with only three minutes required to complete, it has been widely used. The reliability of Kuder-Richardson 20 (KR-20) was demonstrated to be 0.72 in this study.

Data Collection: Data were collected after IRB approval. Prior to data collection, three research assistants (RAs)—one per setting—who were qualified with graduate

or graduate preparation and experienced in collecting data were approached. They were informed by the PI about the details of the study protocol, and they received training on appropriate data collection methods by practicing data collection and comparing their results with the PI. Data were collected from July 2023 to May 2024. To ensure data validity, interviews were conducted either face-to-face or by telephone with time spent between 30 and 45 minutes to accommodate participants with visual impairments. All data were checked for completeness before final analysis.

Data Analysis: Data were analyzed using the licensed version of the Statistical Package for the Social Sciences (SPSS) version 29, provided through the Mahidol University Software License. Descriptive statistics were utilized to analyze the participants’ personal information and study variables. Spearman’s rank correlation coefficient detected multicollinearity before employing multiple logistic regression to assess the predictive powers of functional ability, gait balance confidence, comorbidities, type of medications, fear of falls, and risk for falls on recurrent falls. The level of significance was set at 0.05.

Results

A total of 220 participants were screened and approached; 26 individuals did not meet the eligibility criteria, and 14 declined to participate in the study. Consequently, a final sample of 180 older participants remained in the analysis. Most participants were females (75.0%, $n = 135$) with an average age of 77.65 years ($SD = 7.32$; range 60–90 years). About the types of surgery, more than half of the participants (55.6%, $n = 100$) underwent hemiarthroplasty, followed by internal fixation (41.7%, $n = 75$) and total hip arthroplasty (2.8%, $n = 5$). The prevalence of recurrent falls within the first six months following hip surgery was found to be 27.8% ($n = 50$). Additional details of participants’ personal and health information can be found in **Table 1**.

Prevalence and Risk Factors of Recurrent Falls

Table 1 The number and percentage of personal and health information of the participants (N = 180)

| Personal factors | n | % | Health information | n | % |
|---|-----|------|-----------------------------|-----|------|
| Gender | | | Comorbidities** | | |
| Female | 135 | 75.0 | No | 4 | 2.2 |
| Male | 45 | 25.0 | Yes | 176 | 97.8 |
| Age (years) | | | Hypertension | 138 | 76.7 |
| 60-69 | 29 | 16.1 | Dyslipidemia | 103 | 57.2 |
| 70-79 | 69 | 38.3 | Diabetes mellitus | 72 | 40.0 |
| ≥ 80 | 82 | 45.6 | Cardiovascular disease | 41 | 22.8 |
| (Range = 60-90; Mean = 77.65, SD = 7.32) | | | Osteoporosis | 35 | 19.4 |
| BMI (kg/m ²)* | | | Chronic kidney disease | 26 | 14.4 |
| < 18.5 (Underweight) | 28 | 15.6 | Old stroke | 19 | 10.5 |
| 18.5-22.9 (Normal) | 87 | 48.3 | Cancer | 11 | 6.1 |
| 23.0-24.9 (Overweight) | 24 | 13.3 | Knee osteoarthritis | 9 | 5.0 |
| 25.0-29.9 (Obesity I) | 34 | 18.9 | Parkinson's disease | 8 | 4.4 |
| ≥ 30.0 (Obesity II) | 7 | 3.9 | Others | 13 | 7.2 |
| (Range = 14.57-32.87; Mean = 22.28, SD = 3.81) | | | Number of medications taken | | |
| Marital status | | | 1 tab | 6 | 3.3 |
| Widowed | 81 | 45.0 | 2 tabs | 18 | 10.0 |
| Married | 75 | 41.7 | 3 tabs | 13 | 7.2 |
| Single | 19 | 10.6 | 4 tabs | 15 | 8.3 |
| Divorced/separated | 5 | 2.8 | ≥ 5 tabs | 128 | 71.1 |
| Education level | | | Type of medications | | |
| No attendance | 13 | 7.2 | Related falls*** | 46 | 25.6 |
| Primary level | 95 | 52.8 | Others | 134 | 74.4 |
| Secondary level | 35 | 19.4 | Type of surgery | | |
| Diploma | 71 | 3.9 | Hemiarthroplasty | 100 | 55.6 |
| Bachelor's degree | 27 | 15.0 | Internal fixation | 75 | 41.7 |
| Higher than Bachelor's degree | 3 | 1.7 | Total hip arthroplasty | 5 | 2.8 |
| Type of residence | | | Recurrent falls in 6 months | | |
| Detached house | 53 | 85.0 | No | 130 | 72.2 |
| Shophouse | 16 | 8.9 | Yes | 50 | 27.8 |
| Apartment/Condominium | 8 | 4.4 | Activities leading to falls | | |
| Others | 3 | 1.7 | Raising from bed | 16 | 32.0 |
| | | | Activities in the restroom | 13 | 26.0 |
| | | | Activities inside the home | 11 | 22.0 |
| | | | Activities around the house | 6 | 12.0 |

Table 1 The number and percentage of personal and health information of the participants (N = 180) (Cont.)

| Personal factors | n | % | Health information | n | % |
|-----------------------------|-----|------|--|----|------|
| Type of living | | | Locations of falling | | |
| With children/grandchildren | 126 | 70.0 | Bedroom | 16 | 32.0 |
| With spouse | 32 | 17.8 | Restroom | 13 | 26.0 |
| Alone | 11 | 6.1 | Courtyard | 10 | 20.0 |
| With relatives | 6 | 3.3 | Others | 9 | 18.0 |
| Others | 5 | 2.8 | Market | 2 | 4.0 |
| Caregivers | | | Post fall management | | |
| Children/grandchildren | 131 | 72.8 | No injuries, no management | 26 | 52.0 |
| No caregivers | 25 | 13.9 | Go to a hospital, but not hospitalized | 12 | 24.0 |
| Others | 18 | 10.0 | Mild injuries, No treatment | 7 | 14.0 |
| Relatives | 6 | 3.3 | Go to a hospital and admit | 5 | 10.0 |
| Others | 4 | 8.0 | | | |

Note. *Based on Asian criteria; **multiple answers possible; ***such as sedatives, antidepressants, and benzodiazepines

Regarding the descriptive information about study variables, nearly all participants (97.2%) demonstrated good functional ability. Although about three-quarters of the participants reported average gait balance confidence

and a low risk of falling, while more than half of them experienced a high fear of falling (**Table 2**). **Table 3** illustrates the relationship among study variables, indicating no multicollinearity was detected ($r < 0.80$).

Table 2. Number and percentage of functional ability, gait balance confidence, fear of falls and risk for falls (N = 180)

| Variables | n | % |
|----------------------------|-----|------|
| Functional ability | | |
| Limited functional ability | 5 | 2.8 |
| Good functional ability | 175 | 97.2 |
| Gait balance confidence | | |
| Low | 62 | 34.4 |
| Average | 77 | 42.8 |
| High | 41 | 22.8 |
| Fear of falls | | |
| Low fear of falling | 49 | 27.2 |
| Moderate fear of falling | 30 | 16.7 |
| High fear of falling | 101 | 56.1 |
| Risk for falls | | |
| Low risk of falling | 134 | 74.4 |
| High risk of falling | 46 | 25.6 |
| Type of medication | | |
| Other | 134 | 74.4 |
| Related fall | 46 | 25.6 |

Prevalence and Risk Factors of Recurrent Falls

Table 3. Spearman’s rank correlation coefficient study variables and recurrent falls (N = 180)

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------------------|--------|----------|--------|---------|----------|--------|---------|-------|---|
| 1. Gender | 1 | | | | | | | | |
| 2. Age | 0.134 | 1 | | | | | | | |
| 3. Comorbidities | -0.045 | 0.043 | 1 | | | | | | |
| 4. Type of medication | 0.015 | 0.105 | 0.108 | 1 | | | | | |
| 5. Functional ability | -0.073 | -0.231** | -0.097 | -0.127 | 1 | | | | |
| 6. Gait balance confidence | 0.093 | 0.100 | 0.089 | 0.063 | -0.445** | 1 | | | |
| 7. Fear of falls | 0.162* | 0.193** | 0.031 | 0.153* | -0.307** | 0.196* | 1 | | |
| 8. Risk for falls | 0.032 | 0.080 | 0.080 | 0.136 | -0.368** | 0.359* | 0.341** | 1 | |
| 9. Recurrent falls | -0.014 | 0.035 | -0.101 | 0.205** | 0.046 | -0.009 | 0.262** | 0.037 | 1 |

Note. *p < 0.05, **p < 0.01

Our findings from the univariate logistic regression analysis highlighted significant factors associated with recurrent falls, specifically the type of medication taken and the risk of falling. Although a plausible significant association was identified, non-significant associations were observed in gender, old age, comorbidities, and functional abilities (**Table 4**).

Table 5 demonstrates the multiple logistic regression analysis results, which determined that the study variables could explain 20.2% of the variability of recurrent falls, as indicated by the Nagelkerke R² value of 0.202. Furthermore, the logistic regression model demonstrated accurately predicting recurrent falls with a precision of 77.2%.

Table 4. Multiple logistic regression analysis of the study’s variables and recurrent falls (N = 180)

| Variables | B | SE | Wald | df | p-value | OR | 95% CI |
|--------------------------|-----------|-------|--------|----|---------|-------|--------------|
| Gender | | | | | | | |
| Male | Reference | | | | | | |
| Female | -0.242 | 0.432 | 0.313 | 1 | 0.576 | 0.785 | 0.336-1.832 |
| Age | -0.002 | 0.026 | 0.009 | 1 | 0.924 | 0.998 | 0.949-1.049 |
| Comorbidities | | | | | | | |
| Less than 3 | Reference | | | | | | |
| ≥ 3 and more | -0.502 | 0.377 | 1.779 | 1 | 0.182 | 0.605 | 0.289-1.266 |
| Type of medication | | | | | | | |
| Other | Reference | | | | | | |
| Related fall | 0.997 | 0.401 | 6.188 | 1 | 0.013 | 2.710 | 1.236-5.945 |
| Gait balance confidence | | | | | | | |
| Low | Reference | | 3.073 | 2 | 0.215 | | |
| Average | 0.683 | 0.489 | 1.953 | 1 | 0.162 | 1.980 | 0.760-5.159 |
| High | 0.982 | 0.585 | 2.824 | 1 | 0.093 | 2.671 | 0.849-8.400 |
| Fear of falls | | | | | | | |
| No fear of falling | Reference | | 2.391 | 2 | 0.303 | | |
| Moderate fear of falling | -0.972 | 0.698 | 1.940 | 1 | 0.164 | 0.378 | 0.096-1.486 |
| High fear of falling | 0.013 | 0.457 | 0.001 | 1 | 0.977 | 1.013 | 0.414-2.480 |
| Risk for falls | | | | | | | |
| Low risk | Reference | | | | | | |
| High risk | 1.558 | 0.455 | 11.719 | 1 | 0.001 | 4.747 | 1.946-11.580 |

Table 4. Multiple logistic regression analysis of the study's variables and recurrent falls (N = 180) (Cont.)

| Variables | B | SE | Wald | df | p-value | OR | 95% CI |
|--------------------|-----------|-------|-------|----|---------|-------|-------------|
| Functional ability | | | | | | | |
| Good | Reference | | | | | | |
| Limited | 0.191 | 0.428 | 0.198 | 1 | 0.656 | 1.210 | 0.523-1.801 |
| Constant | -1.587 | 2.088 | 0.577 | 1 | 0.447 | 0.205 | |

Note. $-2LL = 185.563$; Nagelkerke $R^2 = 0.202$

Hosmer and Lemeshow test: $p > 0.05$, Classification accuracy = 77.2%

B = unstandardized regression weight, SE = standard error of the coefficient, df = degree of freedom, OR = Odds ratio, CI = confidence interval

Table 5. Univariate logistic regression analysis of the study's variables and recurrent falls (N = 180)

| Variables | B | SE | Wald | df | p-value | OR |
|--------------------------|--------|-------|--------|----|---------|-------|
| Gender (male) | 0.073 | 0.381 | 0.037 | 1 | 0.848 | 1.076 |
| Age | 0.008 | 0.023 | 0.109 | 1 | 0.741 | 1.008 |
| Comorbidities | 0.454 | 0.335 | 1.837 | 1 | 0.175 | 1.574 |
| Type medication | -0.981 | 0.363 | 7.321 | 1 | 0.007 | 0.375 |
| Gait balance confidence | | | | | | |
| Low | | | 0.444 | 2 | 0.801 | |
| Average | -0.289 | 0.444 | 0.424 | 1 | 0.515 | 0.749 |
| High | -0.214 | 0.422 | 0.256 | 1 | 0.613 | 0.808 |
| Functional ability | 0.442 | 1.131 | 0.153 | 1 | 0.696 | 1.556 |
| Fear of falls | | | | | | |
| No fear of falling | | | 3.627 | 2 | 0.163 | |
| Moderate fear of falling | 0.138 | 0.374 | 0.135 | 1 | 0.713 | 1.147 |
| High fear of falling | -1.010 | 0.580 | 3.039 | 1 | 0.081 | 0.364 |
| Risk for falls | -1.244 | 0.364 | 11.704 | 1 | 0.001 | 0.288 |

Note. B = unstandardized regression weight, SE = standard error of the coefficient, df = degree of freedom, OR = Odds ratio

Discussion

Based on our findings, the prevalence of recurrent falls among older adults who had undergone hip fracture surgery was 27.8% within the first six months after their discharge from the hospital, which is consistent with previous studies.^{11,12} Several factors may contribute to this prevalence, including comorbidities such as chronic diseases, age-related neuromuscular change, and mobility performance following surgery.^{1,16} Additionally, the findings from this study indicate that certain types of medications are significantly linked to falls and increased risk of recurrent falls in this older

population. According to the findings, we discovered that older individuals using medications related to falls exhibited a significantly higher risk of experiencing recurrent falls compared to those who did not use these medications. Several studies have underlined that medications related to falls might induce the risk of initial falls or re-falls through various mechanisms, that is, sedatives, cardiovascular, and anticholinergic drugs affect central nervous systems, increase orthostatic hypotension, heighten dizziness, and impair mobility.³¹ Consequently, these medications can lead to impaired gait balance and coordination, resulting in a heightened risk of falls as well as fall-related injury.^{31,32}

Regarding the risk of falling factor, the findings of this present study indicated that the participants classified as high risk for falling demonstrated a 4.74 times higher risk of experiencing recurrent falls compared to those classified as low risk. This aligns with a previous study, which found that older individuals with a history of falls in the past 12 months faced a 2.74 times higher risk of subsequent falls.³³ Another concern is that functional recovery and mobility after hip fracture surgery are crucial considerations in preventing recurrent falls. Prior evidence has noted that many older adults fail to regain their pre-fracture mobility levels, leading to persistent challenges in ambulation and daily activities.⁹ Moreover, the transition from hospital care to post-discharge management is critical for rehabilitation and fall prevention in this population.³⁴ The self-care capacity of elderly patients following hip fracture surgery—such as using walking aids, adhering to good self-care practices, and preventing late complications—significantly influences their susceptibility to recurrent falls and overall recovery.³⁵ Providing appropriate support and tailored rehabilitation programs can enhance patients' self-care abilities, thereby mitigating fall risks. To sum up, comprehensive nursing interventions and interdisciplinary healthcare collaboration during post-hospital discharge are essential for promoting health, reducing the risk of falls, and preventing recurrent falls.

Even though our findings show promising results in the prediction model, it was also found that there existed an insignificant association of selected factors—gender, age, comorbidities, gait balance confidence, fear of falls, and functional ability—with recurrent falls. The lack of significant findings regarding gender and recurrent falls aligns with a previous study.¹⁰ This may be due to several factors. Generally, older females typically experience a decline in physical functions, muscle functions, and stability, consequently increasing their risk of falls.^{32,36} Conversely, older males often engage in various activities more confidently, leading to increased movement.¹⁰ However, this, combined with age-related decline, heightens their risk of falls. As a result, older males

and females may be equally susceptible to experiencing recurrent falls.

Regarding age as a factor in the model, older participants had 0.99 times of developing recurrent falls compared to those who were one year younger. However, the observed difference did not reach statistical significance. This contrasts with a study conducted in Vietnamese hospitals, which reported that the mean age of patients with recurrent falls was significantly higher than those without falls.³⁷ For comorbidities, it was found that older individuals with at least three comorbidities had 0.60 times of developing recurrent falls compared to those with fewer comorbidities. However, it should be noted that our study failed to demonstrate a significant association between multiple comorbidities and recurrent falls in this population. Notably, our findings suggest some new insight ideas that the presence of multiple comorbidities may not directly increase the risk of falls or recurrent falls in older adults who have undergone hip fracture surgery, similar to a previous study that found no association between multimorbidity and falls.³⁸ Our substantial finding implies that the relationship between comorbidities and recurrent falls in older adults post hip-fracture surgery during the first six months of post-hospital discharge is multifaceted and may not always accord with general thoughts that increased comorbidity leads to a higher risk of falls or recurrent falls. Thus, further research is essential to elucidate the intricate interplay between comorbidities and recurrent falls in this population, as the relationship appears to be more profound than previously understood.

Concerning gait balance confidence, we found that the older persons with moderate levels of gait and balance confidence had a 1.98 times higher risk of experiencing recurrent falls, while those having a high level of gait and balance confidence had a 2.67 times higher risk of developing recurrent falls compared to those with a low level of gait and balance confidence. Our findings failed to show a statistically significant association between gait balance confidence and recurrent falls; therefore, this result differed from those

in previous studies. In a meta-analysis study investigating the risk factor of recurrent falls, older adults with gait and balance problems were 1.32 times more likely to experience recurring falls when compared to those older adults without gait and balance problems.¹ The different results may probably be from the participants with low gait and balance confidence levels, avoiding movement or activities that put them at risk of falling. Consequently, this avoidance may have led to a lower incidence of falls compared to older adults with a high gait and balance confidence level.³⁶ For the last predictive factor, we found that older people with a fear of falls had a 1.01 times higher chance of recurrent falls than those without a fear of falls. However, we did not observe a significant association between fear of falls and recurrent falls in this population. This suggests that differences in outcomes observed among individuals may be attributed to other factors. Their previous experiences with falls can influence the fear of falling in older adults.^{39,40} Individual responses to this fear can vary significantly. When faced with the fear of falling, some older adults may become hesitant to engage in physical movement and decrease their overall activity levels to minimize the risk of falling. This behavior can establish a detrimental cycle wherein the fear of falling intensifies as their physical abilities decline. Conversely, older adults who have encountered multiple falls may develop habituation to these occurrences, potentially resulting in a diminished fear of falling.

In relation to functional ability, our findings discovered that older people with limited functional ability had a 1.21 times higher risk of experiencing recurrent falls in comparison to those with good functional ability, albeit insignificantly in statistical analysis. Based on our analysis, this finding contradicted the previous evidence. These limitations in physical function impede their ability to participate in various activities, affecting their capacity to maintain balance while standing and walking. Consequently, this population faces an increased risk of recurrent falls. Therefore, poor physical function alone may not entirely

account for recurrent falls among the older adults, so further study is warranted.

Limitations

Considering the study design and findings, it is important to acknowledge certain limitations. Firstly, the participants were exclusively older individuals who received treatment or were visited for follow-up appointments at outpatient departments of tertiary care hospitals in Bangkok. Also, most of the participants were female. As a result, our findings may limit generalizability to older individuals who received treatment at other healthcare facilities, such as primary and secondary care settings and community hospitals, particularly in rural settings and among older males with hip fracture populations. Secondly, the instruments used to measure recurrent falls relied on questionnaires; it is worth noting that recall errors may potentially arise during data collection interviews. Lastly, data were collected through both face-to-face and phone interviews. In doing so, the results may have variations depending on the different environments in which data were collected.

Conclusions and Implications for Nursing Practice and Research

Our findings underlined that the type of medication related to fall risks and high risk of falling can predict recurrent falls in older adults who have undergone hip surgery and were discharged home for six months. Therefore, healthcare professionals, particularly gerontological nurse practitioners and nurses who care for older adults with the potential for falls, must prioritize assessing fall risks in older adults in advance before discharge. To prevent recurring falls, older individuals and their caregivers need to receive comprehensive explanations regarding the potential risk factors and side effects of medications that heighten the likelihood of falling once the patients return home. Additionally,

healthcare teams should remain vigilant about recurrent falls in elderly patients after hip fracture surgery. Furthermore, the insightful findings of the present study may shed light on initiating nursing interventions aimed at mitigating, preventing, and reducing the severity of recurring falls in this vulnerable population, ultimately improving the quality of nursing care.

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Prevalence and Risk Factors of Recurrent Falls

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ความชุกและปัจจัยเสี่ยงในการหกล้มซ้ำของผู้สูงอายุผ่าตัดกระดูกสะโพกหัก ภายหลังจำหน่ายออกจากโรงพยาบาล : การศึกษาภาคตัดขวาง

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บทคัดย่อ: การวิจัยการศึกษาแบบภาคตัดขวางครั้งนี้ มีวัตถุประสงค์เพื่อค้นหาความชุกและปัจจัยที่เกี่ยวข้องกับการเกิดการหกล้มซ้ำของผู้สูงอายุกระดูกสะโพกหักภายหลังจำหน่ายออกจากโรงพยาบาล กลุ่มตัวอย่างผู้สูงอายุจำนวน 180 ราย ได้มาโดยการคัดเลือกแบบเฉพาะเจาะจงโดยเป็นผู้ที่ได้รับการผ่าตัดกระดูกสะโพกหักมา 6 เดือน และมาติดตามการรักษาที่แผนกผู้ป่วยนอกโรคกระดูกและข้อในโรงพยาบาลระดับตติยภูมิ 3 แห่งในกรุงเทพมหานคร ระหว่างช่วงเดือนกรกฎาคม พ.ศ. 2566 ถึงเดือนพฤษภาคม พ.ศ. 2567 เก็บรวบรวมข้อมูลด้วยเครื่องมือวิจัยประกอบไปด้วย แบบสอบถามข้อมูลส่วนบุคคลและข้อมูลสุขภาพของผู้สูงอายุ แบบประเมินสมรรถภาพการรู้คิด 6 ข้อ แบบประเมินข้อสะโพก HOOS, JR. ฉบับสั้น แบบประเมินความมั่นใจเกี่ยวกับการหกล้ม แบบประเมินความมั่นใจในการทรงตัวเฉพาะกิจกรรม และแบบประเมินภาวะเสี่ยงต่อการหกล้มในผู้สูงอายุ วิเคราะห์ข้อมูลด้วยสถิติบรรยายและสถิติวิเคราะห์ความถดถอยโลจิสติก โดยกำหนดระดับนัยสำคัญที่ 0.05

ผลการวิจัย พบว่า ความชุกในการเกิดการหกล้มซ้ำของผู้สูงอายุที่ได้รับการผ่าตัดกระดูกสะโพกหักในช่วงระยะเวลา 6 เดือน ภายหลังจำหน่ายจากโรงพยาบาล พบร้อยละ 27.8 ผู้สูงอายุที่มีภาวะเสี่ยงหกล้มระดับสูงมีโอกาสเกิดการพลัดตกหกล้มซ้ำได้มากกว่าผู้สูงอายุที่มีภาวะเสี่ยงหกล้มระดับต่ำ 4.74 เท่า และผู้สูงอายุที่รับประทานยาที่มีความเสี่ยงต่อการหกล้ม มีโอกาสเกิดการหกล้มซ้ำได้มากกว่าผู้สูงอายุที่ไม่ได้รับประทานยาที่มีความเสี่ยงต่อการหกล้ม 2.71 เท่า

ผลการศึกษานี้สร้างความตระหนักสำหรับบุคลากรทางการแพทย์ โดยเฉพาะพยาบาลเวชปฏิบัติผู้สูงอายุ ในการให้ความสำคัญกับการประเมินภาวะเสี่ยงต่อการหกล้มและผลข้างเคียงของยาที่มีความเสี่ยงต่อการหกล้มก่อนผู้สูงอายุได้รับการจำหน่ายออกจากโรงพยาบาล

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คำสำคัญ: ปัจจัยเสี่ยงการหกล้ม การผ่าตัดกระดูกสะโพกหัก ผู้สูงอายุ การหกล้มซ้ำ

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