

Analysis of Adult Patients at Risk of Falls in Hospital Wards: A Retrospective Study

Hastane Servislerinde Yatan Düşme Riskli Erişkin Hastaların Analizi: Retrospektif Bir Çalışma

Muhammed Esat ÇETİN¹, Nurullah BAYRAM²

ABSTRACT

The aim of our study was to analyze the relationship between hospitalization status, gender, age, number of days of hospitalization variables and fall risk marking status of adult patients hospitalized in surgical and internal branch clinics. In this study, the variables of adult patients who were hospitalised in the wards of a large Training and Research Hospital in Istanbul in 2023 and 2024, their status of being marked as fall risk in the electronic patient files, their hospitalization status in surgical and internal clinics, gender, age and number of hospitalisation days were analysed. In this context, 53,174 hospitalizations were analyzed. In the data analysis, categorical variables were analysed using the chi-square test and numerical variables using the t-test. Logistic regression analysis was performed to examine the effect of numerical and categorical variables on the risk of falling. In our study, a significant regression relationship was found between being hospitalized in internal medicine wards and being a patient at risk of falling ($p<0.001$). Significant results were found indicating that the risk of falling was higher in male patients than in females. In addition, it has been shown that the increase in the duration of hospitalisation days also increases the risk of falls. Again in our study, it was observed that the risk of falls increased with increasing age. Our study shows that the risk of falls in hospitals varies depending on various factors. These results reveal that these variables should be taken into consideration in current fall prevention studies and in the training of patients and healthcare personnel against the risk of falls.

Keywords: Accidental Falls, Adult, Aged, Patient, Risk Factors.

ÖZ

Çalışmamızın amacı, cerrahi ve iç hastalıkları branşlarında yatan düşme riski işaretlenmiş yetişkin hastaların yatış durumu, cinsiyet, yaş, yatış süresi değişkenlerini analiz etmektir. Bu çalışmada, 2023 ve 2024 yıllarında İstanbul'daki büyük bir Eğitim ve Araştırma Hastanesi'nin servislerinde yatış gösteren yetişkin hastaların değişkenleri, elektronik hasta dosyalarında düşme riski olarak işaretlenme durumları, cerrahi ve iç hastalıkları kliniklerinde yatış durumları, cinsiyetleri, yaşları ve yatış gün sayıları analiz edilmiştir. Bu bağlamda, 53,174 yatış analiz edilmiştir. Veri analizinde kategorik değişkenler Ki-kare testi ile sayısal değişkenler de t-testi ile analiz edildi. Sayısal ve kategorik değişkenlerin düşme riski üzerindeki etkisini incelemek için lojistik regresyon analizi uygulandı. Çalışmamızda, dahili servislerde yatış ile düşme riski olan hasta olmak arasında anlamlı bir regresyon ilişkisi bulunmuştur. ($p<0.001$) Erkek hastalarda düşme riskinin kadınlara göre daha yüksek olduğunu gösteren anlamlı sonuçlar elde edilmiştir. Ayrıca, yatış gün sayısının artmasının düşme riskini de artırdığı gösterilmiştir. Yine çalışmamızda, yaşın artmasıyla düşme riskinin arttığı gözlemlenmiştir. Çalışmamız, hastanelerde düşme riskinin çeşitli faktörlere bağlı olarak farklılaştığını göstermektedir. Bu sonuçlar, mevcut düşme önleme çalışmalarında ve hastaların ve sağlık personelinin düşme riskine karşı eğitilmesinde bu değişkenlerin dikkate alınması gerektiğini ortaya koymaktadır.

Anahtar Kelimeler: Kazara Düşme, Yetişkin, Yaşlı, Hasta, Risk Faktörleri.

Highlights

- *The risk of falling was found to be higher in surgical wards.
- *The risk of falls is higher in male patients than in women.
- Long hospitalization increases the risk of falling.
- As age increases, the risk of falling increases in patients.

The study was approved by the Non-Interventional Clinical Research Ethics Committee of Haydarpaşa Numune Training and Research Hospital (Ethics Committee Approval No: HNEAH-GOAEK/KK/2025/13; approval date: January 28, 2025)

¹ Phd, Md, Muhammed Esat ÇETİN, Pyhsician, Haydarpaşa Numune Training and Research Hospital, University of Health Sciences, dr.mesadcetin@gmail.com, ORCID: 0000-0002-7531-5950

² Md, Nurullah BAYRAM, Department of Internal Medicine, University of Health Sciences, Kartal Dr. Lutfi Kırdar City Hospital, nurullahbyrm@gmail.com, ORCID: 0000-0002-6428-7747

İletişim / Corresponding Author: Muhammed Esat ÇETİN
e-posta/e-mail: dr.mesadcetin@gmail.com

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INTRODUCTION

Falls are one of the serious risks for patients in hospital wards. Falling is a serious condition that can cause disability as well as fatal consequences. Studies on the causes of falls have been widely discussed in the literature (1-4). In addition to its physical health consequences, falls also increase patient care costs, making them a significant economic burden on healthcare services (2, 4, 5). Studies aimed at preventing falls are essential for improving treatment, rehabilitation, and financial outcomes in healthcare services. The World Health Organization (WHO), in its report on strategies to prevent lifelong falls, has pointed out that most studies on falls in hospitals focus on the elderly population. Regarding the main causes of falls, it emphasizes factors such as the restrictive effects of surgeries, delirium, medication use, and environmental changes (3).

Mobilization of patients in the wards is an important step in discharge, but this process

brings with it the risk of falling (6). Furthermore, areas within patient rooms used to meet individuals' personal needs—such as patient bathrooms, patient corridors, slippery floors and inadequate lighting—along with the inability to use walking aids effectively due to insufficient physical space, can be cited as causes of fall risks related to the physical environment, in addition to the fall risks associated with the individual health issues mentioned above (4, 7). Various guidelines have been developed for fall prevention and the creation of safe areas (3, 8-10). Social factors such as advancements in technology, changing social structures, individual isolation, and an aging population necessitate continuous updates to the literature on falls.

The aim of our study was to contribute to the literature on fall prevention by analysing the relationship between hospital admission, gender, age, total length of stay, and the status of being flagged as at risk of hospital falls.

MATERIAL AND METHOD

In this study, the variables of adult patients hospitalized at the University of Health Sciences Haydarpaşa Numune Training and Research Hospital in 2023 and 2024 were analyzed as being marked as adult fall risk in the patient files in electronic environment, hospitalization status in surgical and internal clinics, gender, age and number of days of hospitalization. In this context, 53,174 hospitalizations were analyzed. The study was approved by the Non-Interventional Clinical Research Ethics Committee of Haydarpaşa Numune Training and Research Hospital (Ethics Committee Approval No: HNEAH-GOAEK/KK/2025/13; approval date: January 28, 2025). The research data were requested as a result of the ethics committee obtained from the Hospital Information Management System. In the data

analysis, the relationship between the categorical variables of polyclinic, gender, Public Social Security Institution(PSSI) and the status of fall risk marking was analyzed with Chi-Square Test Results. The relationship between the numerical variables of patient age, number of days of hospitalization and fall risk marker status was analyzed with t-test results. Logistic regression was applied to examine the effect of the numerical and categorical variables mentioned above on the risk of falling. Outpatients were not included in our study.

Statistical analyses were carried out with the support of expert statistics provided to the researchers by the hospital management. A p-value level of significance of 0.05 or less was considered statistically significant.

RESULTS

A significant correlation was found between internal and surgical branches and patients with fall risk markings. Likewise, it

was observed that there was a significant difference between male and female gender in terms of patient gender (Table 1).

Table 1. The Relationship Between Fall Risk Status and Categorical Variables, Chi-Square Test Results (n, (%))

Variable	Category	Patient with Fall Risk Marking n (%)	Patient without Fall Risk Marking n (%)	Chi-Square Value	p-Value
Clinic	Surgery	2,027 (9.92%)	18,414 (90.08%)	2194.159	.001**
	Internal	8,740 (26.70%)	23,993 (73.30%)		
Patient Gender	Female	5,194 (18.95%)	22,209 (81.05%)	58.506	.001**
	Male	5,573 (21.63%)	20,198 (78.37%)		

When the relationship between fall risk marking and numerical variables is examined, it is seen that the mean age of inpatients differs significantly in patients with fall risk marking and those without fall risk marking. The mean age of patients with

fall risk was found to be significantly higher than non-labeled patients with fall risk. Likewise, the number of hospitalization days was found to be significantly higher in patients with fall risk signs than in patients without fall risk signs (Table 2).

Table 2. The Relationship Between Fall Risk Status and Numerical Variables, t-Test Results

Variable	Average Patient with Fall Risk Marking (SD)	Fall Risk Average Without Marked (SD)	t-Statistics	p-Value
Patient Age	54.53 (25.14)	49.11 (19.63)	20.815	.001**
Number of Days of Hospitalization	7.81 (8.15)	4.58 (13.73)	31.309	.001**

When Table 1 is examined, the effects of the independent variables that are significant with the fall status in the logistic regression model are evaluated. It is seen that the model is generally statistically significant ($X^2=30088.22$, $p<0.001$). Independent variables have a significant effect on the fall status. When the regression coefficients are

examined; The clinical category variable has a negative effect. The odds ratio of 0.312 means that an increase of one unit in this category reduces the probability of a decrease by about 68%. This shows that there is a significantly higher probability of falling risk signs in internal branches compared to surgical branches (Table 3).

Table 3. Logistic Regression Analysis Findings of Fall Risk Status with Data Set

Variable	B	Standard Error	Z-Value	p-Value	Odds Ratio
const	0.627	0.083	7.517	.001	1.871
Clinic Category	-1.165	0.045	-25.981	.001	0.312
Patient Gender	-0.229	0.045	-5.128	.001	0.795
Patient Age	0.012	0.001	14.939	.001	1.012
Number of Days of Hospitalization	0.007	0.002	3.439	.001	1.007

Patient gender has a slight negative effect on the probability of falling male gender, and the risk of falling was found to be higher in men than in women. Odds ratio 0.795 indicates that the gender variable reduces the risk of falling by about 20%. This situation shows that the female gender is less likely to be marked at risk of falling than men (Table 3).

Falling age of the patient has a positive effect on the marking of risk. The odds ratio of 1.012 means that the probability of falling

increases by 1.2% with an increase of one unit of age. This shows that the risk of falling increases with increasing age in patients hospitalized in wards (Table 3).

The number of days of hospitalization has a positive effect on the marking of the risk of falling. Odds ratio 1.007 indicates that each additional day of hospitalization increases the probability of falling by 0.7%. These results suggest that an increase in the number of days of hospitalization increases the likelihood of being marked at risk of falling (Table 3).

DISCUSSION

The fact that there are significant differences in the number of patients marked at risk of falling, in surgical and internal services necessitates different arrangements between patient services regarding the measures to be taken against falling. Likewise, it is valuable in terms of showing that personnel working in internal and surgical services should be trained in different ways to prevent falls (11). A review of the relevant literature reveals that some studies, in line with our own, have reported that the rate of falling is higher in internal branches than in surgical branches (12, 13). In our study, a significant regression relationship was found between hospitalization in surgical services and being a patient at risk of falling.

In the literature, different results have been found in studies on the relationship between the risk of falling and gender (9, 10, 14-16). There are studies in the literature emphasizing that gender has an effect on falls and have results that are compatible with our study (9, 14, 15, 17). However, in some studies, it has been stated that gender does not make a significant difference in falls (16). In literature, there are studies stating that the female gender increases the risk of falling (18). In our study, significant results were found that being male increases the risk of falling. These results reveal the importance of considering the gender factor in action plans and trainings to be prepared for falling. In addition, it is a result that can guide future studies on this subject.

Advanced age is known to be one of the factors most associated with falling. The risk of falling is higher in the older population than in the younger and middle-aged population (3, 16-18). However, some literature studies have found that fall risk estimates in the elderly population are overestimated (19). In our study, it was observed that the risk of falling increased with increasing age. This result supports similar results in line with the literature.

The increase in the number of days of hospitalization of the patient may be the result of a medical process or may be the cause. Nosocomial infections and rising health care costs are some examples (20, 21). Falls can also be given as an example of this situation. The relationship between the duration of hospitalization days and the risk of falling shows that each increase in the duration of the day of hospitalization increases the risk of falling in our study. This is also consistent with the literature (22, 23).

Our study is expected to make a significant contribution to the relevant literature in recent years by analysing 53,174 electronic hospital admission records containing fall risk indicators. With regard to fall risk, it was concluded that a prolonged length of stay and hospitalisation in internal medicine wards are risk factors. Furthermore, the finding that male patients are at greater risk of falling than female patients will provide important contributions to the existing literature.

CONCLUSION AND RECOMMENDATIONS

Falls bring risks such as disability, prolongation of hospitalization, and risk of infection for patients. In terms of health service providers, it has consequences such as increased costs, inefficient use of hospital beds and dissatisfaction. Our study shows that despite the increasing use of technology, experience and opportunities, falls continue to be a significant risk in hospitals. At the same time, in our study, it is shown that the clinics where the patients were followed, their age,

gender and the number of days of hospitalization were important variables associated with the risk of falling. In current prevention studies, these variables should be taken into account in the training of patients and healthcare personnel against the risk of falling.

Research Strengths

The strengths of this research include extensive analysis of large patient numbers

and the use of real hospital data. The study evaluated different types of clinics and key demographic variables such as age and gender together, increasing the reliability of the findings. In addition, the multifaceted analysis of the factors associated with fall risk has provided practical results that will directly contribute to clinical applications.

Research Weaknesses

The generalizability of the findings is limited as the study was based on data from only a single hospital. Fall risk markings in electronic files may have been affected by differences in the assessment of healthcare personnel. In addition, different concomitant diagnoses of patients may have influenced the risk of falling. These situations constitute the weaknesses of our study.

Credit Author Statement

Çetin M. E.; Methodology; Investigation; Data analysis/ plotting; Initial draft preparation, Writing; Visualization; Çetin M. E., Bayram N.; Supervision, Conceptualization, reviewing and editing

All authors have read and accepted the published version of the article.

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Availability of Data and Materials

The use of the Data and Materials may only be obtained from the relevant authority.

Ethical approval and consent to participate

The study was conducted in accordance with the guidelines of the Declaration of Helsinki, and all procedures involving research participants were approved by the Non-Interventional Clinical Research Ethics Committee of Haydarpaşa Numune Training and Research Hospital on January 28, 2025, with Ethics Committee Approval No: HNEAH-GOAEK/KK/2025/13. The requirement for informed consent was waived due to the retrospective nature of the study.

Conflicts of Interest

The authors declare that they have no conflict of interest regarding the publication of this article.

REFERENCES

1. 2019 surveillance of falls in older people: assessing risk and prevention (NICE guideline CG161). London: National Institute for Health and Care Excellence (NICE); 2019.
2. Masud T, Morris RO. Epidemiology of falls. *Age Ageing*. 2001;30(Suppl 4):3-7. doi:10.1093/ageing/30.suppl_4.3.
3. World Health Organization. *Step safely: strategies for preventing and managing falls across the life-course*. Geneva: World Health Organization; 2021.
4. Dabkowski E, Cooper SJ, Duncan JR, Missen K. Exploring hospital inpatients' awareness of their falls risk: a qualitative exploratory study. *Int J Environ Res Public Health*. 2023;20(1):454. doi:10.3390/ijerph20010454.
5. Hendrie D, Hall SE, Arena G, Legge M. Health system costs of falls of older adults in Western Australia. *Australian Health Review*. 2004;28(3):363-73.
6. Oliver D, Daly F, Martin FC, McMurdo MET. Risk factors and risk assessment tools for falls in hospital in-patients: a systematic review. *Age Ageing*. 2004;33(2):122-30. doi:10.1093/ageing/afh017.
7. Taylor E, Hignett S. The SCOPE of hospital falls: a systematic mixed studies review. *HERD*. 2016;9(4):86-109. doi:10.1177/1937586716645918.
8. Montero-Odasso M, van der Velde N, Martin FC, Petrovic M, Tan MP, Ryg J, et al. World guidelines for falls prevention and management for older adults: a global initiative. *Age Ageing*. 2022;51(9):afac205. doi:10.1093/ageing/afac205.
9. Heinzmann J, Rossen ML, Efthimiou O, Baumgartner C, Wertli MM, Rodondi N, et al. Risk factors for falls among hospitalized medical patients: a systematic review and meta-analysis. *Arch Phys Med Rehabil*. 2025;106(2):292-9. doi:10.1016/j.apmr.2024.06.015.
10. Locklear T, Kontos J, Brock CA, Holland AB, Hemsath R, Deal A, et al. Inpatient falls: epidemiology, risk assessment, and prevention measures. A narrative review. *HCA Healthc J Med*. 2024;5(5):332-41. doi:10.36518/2689-0216.1562.
11. Turner K, Staggs VS, Potter C, Cramer E, Shorr RI, Mion LC. Fall Prevention Practices and Implementation Strategies: Examining Consistency Across Hospital Units. *Journal of Patient Safety*. 2022;18(1):e236-e42. doi:10.1097/pts.0000000000000758
12. Schwendimann R, Bühler H, De Geest S, Milisen K. Characteristics of hospital inpatient falls across clinical departments. *Gerontology*. 2008;54(6):342-8. doi:10.1159/000129954
13. Mikos M, Banas T, Czerw A, Banas B, Strzepak Ł, Curyło M. Hospital Inpatient Falls across Clinical Departments. *International Journal of Environmental Research and Public Health*. 2021;18(15):8167. doi:10.3390/ijerph18158167
14. Chang VC, Do MT. Risk Factors for Falls Among Seniors: Implications of Gender. *American Journal of Epidemiology*. 2015;181(7):521-31. doi:10.1093/aje/kwu268
15. Wang RH, Hsu HC, Chen SY, Lee CM, Lee YJ, Ma SM, et al. Risk factors of falls and the gender differences in older adults with diabetes at outpatient clinics. *Journal of Advanced Nursing*. 2021;77(6):2718-27. doi:10.1111/jan.14795
16. Heikkilä A, Lehtonen L, Junttila K. Fall rates by specialties and risk factors for falls in acute hospital: A retrospective study.

Journal of clinical nursing. 2023;32(15-16):4868-77.
doi:10.1111/jocn.16594

17. Stevens JA, Ballesteros MF, Mack KA, Rudd RA, DeCaro E, Adler G. Gender Differences in Seeking Care for Falls in the Aged Medicare Population. *American Journal of Preventive Medicine*. 2012;43(1):59-62. doi:10.1016/j.amepre.2012.03.008
18. Ziere G, Dieleman J, Hofman A, Pols HA, Van Der Cammen T, Stricker BC. Polypharmacy and falls in the middle age and elderly population. *British journal of clinical pharmacology*. 2006;61(2):218-23. doi:10.1111/j.1365-2125.2005.02543.x
19. Milisen K, Coussement J, Flamaing J, Vlaeyen E, Schwendimann R, Dejaeger E, et al. Fall prediction according to nurses' clinical judgment: differences between medical, surgical, and geriatric wards. *Journal of the American Geriatrics Society*. 2012;60(6):1115-21. doi:10.1111/j.1532-5415.2012.03957.x
20. Cosgrove SE. The Relationship between Antimicrobial Resistance and Patient Outcomes: Mortality, Length of Hospital Stay, and Health Care Costs. *Clinical Infectious Diseases*. 2006;42(Supplement_2):S82-S9. doi:10.1086/499406
21. Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ. The Impact of Surgical-Site Infections in the 1990s: Attributable Mortality, Excess Length of Hospitalization, And Extra Costs. *Infection Control & Hospital Epidemiology*. 1999;20(11):725-30. doi:10.1086/501572
22. Morello RT, Barker AL, Watts JJ, Haines T, Zavarsek SS, Hill KD, et al. The extra resource burden of in-hospital falls: a cost of falls study. *Med J Aust*. 2015;203(9):367-72. doi:10.5694/mja14.01635. doi:10.5694/mja15.00296
23. Dunne TJ, Gaboury I, Ashe MC. Falls in hospital increase length of stay regardless of degree of harm. *Journal of evaluation in clinical practice*. 2014;20(4):396-400. doi:10.1111/jep.12144