Journal of Rural Community Nursing Practice (JRCNP)
Volume 4 Issue 1, March 2026, pp 64-80
https://ebsina.or.id/journals/index.php/JRCNP
eISSN 2986-7401, pISSN 2986-8424

Comprehensive Fall Risk Assessment in an Older Adult Male with Diabetes Mellitus, Hypertension, and a History of Transient Ischemic Attack Using the Morse Fall Scale and Berg Balance Test: A Case Report

Ummi Malikal Balqis[1]*, Rizkiyani Istifada[1], Agnestria Winarto[1], Lailiyatul Munawaroh[1]

1 Faculty of Nursing, Universitas Jember, Indonesia

Correspondence
Ummi Malikal Balqis,
Jl. Kalimantan No.37, Sumbersari, Kabupaten Jember, Jawa Timur 68121, Indonesia
Email: ummimb@mail.unej.ac.id

Article History
Submitted: 03-12-2025
Revised: 12-02-2026
Accepted: 16-03-2026

ABSTRACT

Background: Fall risk in older adults is a multifactorial condition associated with balance impairment, muscle weakness, and chronic as well as neurological diseases, requiring a comprehensive assessment. **Purpose:** This case report aims to analyze fall risk in an older adult with chronic comorbidities using the Morse Fall Scale (MFS) and the Berg Balance Test (BBT). **Method:** A descriptive case study was conducted on a 70-year-old older adult male with a history of diabetes mellitus, hypertension, and a transient ischemic attack (TIA) in 2025, accompanied by left upper extremity weakness with a muscle strength of 4. Assessment was performed through direct clinical examination using the MFS and BBT instruments. **Results:** The patient scored 35 on the MFS, indicating a moderate fall risk, and 38 out of 56 on the BBT, indicating moderate balance impairment, particularly in dynamic activities. **Conclusions:** These findings suggest that the patient's fall risk is influenced by a combination of post-TIA neurological factors, muscle strength imbalance, and chronic diseases. The combined use of the MFS and BBT provides a comprehensive overview of fall risk, serving as a basis for planning targeted and sustainable nursing interventions.

KEYWORDS

Older adult, Fall risk, Morse Fall Scale, Berg Balance Test, TIA

How to cite:
Balqis, U. M., Istifada, R., Winarto, A., & Munawaroh, L. (2026). Comprehensive Fall Risk Assessment in an Older Adult Male with Diabetes Mellitus, Hypertension, and a History of Transient Ischemic Attack Using the Morse Fall Scale and Berg Balance Test: A Case Report. Journal of Rural Community Nursing Practice. 4(1), 64-80. https://doi.org/10.58545/jrcnp.v4i1.666

1. BACKGROUND

The increase in life expectancy has led to a growing older adult population in various countries, including Indonesia (Kudrna et al., 2022; Sabri et al., 2022). This demographic shift is accompanied by a higher prevalence of health problems associated with the aging process. One of the most common issues among older adults is the risk of falls, which can result in various complications. Falls in older adults are complex and multifactorial events. Intrinsic factors such as reduced muscle strength, balance impairments, and physiological

changes contribute significantly to this risk (Pilastri et al., 2025; Xing et al., 2023). In addition, extrinsic factors, such as unsafe environments, also play a role in fall occurrences (Li et al., 2023; Waterval et al., 2023).

Falls in older adults can lead to substantial physical and psychological consequences (Lee & Kim, 2024; Salari et al., 2022). Physical impacts range from minor injuries to severe outcomes such as fractures and soft tissue trauma. Falls may also result in decreased functional capacity and reduced independence in daily activities (Adam et al., 2024; Komisar et al., 2022). Psychologically, older adults who have experienced falls often develop fear of re-engaging in activities, which can lead to activity restriction and diminished quality of life (Salsabiil et al., 2025; Sattler et al., 2025). Consequently, identifying and preventing fall risk has become a key focus in gerontological nursing practice.

Chronic diseases frequently observed in older adults further exacerbate fall risk through distinct mechanisms. Diabetes mellitus can cause peripheral neuropathy, impairing sensation and proprioception (Gupta et al., 2025; Kardm et al., 2025). Hypertension may affect cerebral perfusion, thereby disrupting balance and coordination (Ungvari et al., 2021; Wang et al., 2024). Moreover, a history of transient ischemic attack (TIA) may result in residual neurological deficits affecting muscle strength (Chu et al., 2023; Simmatis et al., 2021). The coexistence of these conditions is common among older adults with multiple comorbidities. Even mild impairments can significantly increase fall risk.

In clinical practice, a 70-year-old older adult male was identified with a history of diabetes mellitus, hypertension, and a TIA in 2025, presenting with left upper extremity weakness. Although the weakness was mild, it potentially affects balance and postural stability (Khan & Andersen, 2022; Manafi et al., 2025). Fall risk assessment in such cases is crucial, as overt symptoms may not always be present. Therefore, a comprehensive evaluation using appropriate instruments is required. The Morse Fall Scale (MFS) was utilized to assess clinical risk factors, while the Berg Balance Test (BBT) was employed to evaluate functional balance (Cossio-Bolaños et al., 2024; Dengiz et al., 2025). This case report aims to provide an in-depth analysis of fall risk in this patient as a basis for planning appropriate nursing interventions.

2. METHODS

Case Presentation

The subject of this case study was a 70-year-old older adult male with a history of diabetes mellitus, hypertension, and a transient ischemic attack (TIA) in 2025. The patient was alert, oriented (compos mentis), and able to communicate cooperatively throughout the assessment process. Physical examination revealed mild weakness in the left upper extremity, with a muscle strength grade of 4, while the remaining body regions exhibited normal muscle strength. The patient was still able to perform activities of daily living independently but demonstrated caution in mobility. No significant cognitive impairment was observed; however, preliminary observations indicated potential balance deficits. These characteristics made the patient a relevant subject for an in-depth fall risk analysis.

Intervention or Clinical Examination

This study employed a descriptive case study design with a clinical approach on a single older adult at risk of falling. The methodology was observational, focusing on an in-depth assessment of the patient's individual condition (Pedrosa et al., 2025; Stuby et al., 2025). The patient was a 70-year-old male with a history of diabetes mellitus, hypertension, and transient ischemic attack (TIA) in 2025, accompanied by mild weakness in the left upper extremity (muscle strength 4/5). Data were collected directly in the patient's living environment to obtain an accurate and current representation of his functional status. Structured interviews explored the patient's medical history, previous falls, and daily activity patterns, while observation assessed mobility, gait, and postural stability. Environmental factors, such as floor surfaces, lighting, and furniture arrangement, were documented to identify potential extrinsic contributors to fall risk. Ethical approval was obtained through informed consent, ensuring the patient understood the procedures and voluntarily participated.

The instruments used for assessment were the Morse Fall Scale (MFS) to evaluate clinical risk factors and the Berg Balance Test (BBT) to assess functional balance (Ayvat et al., 2024; Dengiz et al., 2025). MFS assessment was conducted via interviews and observation, focusing on prior falls, secondary diagnoses, ambulatory aids, gait pattern, and mental status (Dengiz et al., 2025; Jiang et al., 2025). Each domain was scored according to standardized MFS

criteria, resulting in a total score of 35, indicating moderate fall risk. This assessment provided structured insight into clinical contributors to fall risk, including mobility limitations and cognitive factors.

The BBT was administered following a stepwise clinical protocol, starting with the patient seated, then progressing through tasks such as standing independently, transferring between chairs, reaching forward, turning 360 degrees, and standing on one leg (Miranda & Tiu, 2026; Önal et al., 2025). Safety precautions included the use of a gait belt and close supervision to prevent accidental falls. Performance on each of the 14 items was scored, resulting in a total score of 38 out of 56, reflecting moderate impairment in dynamic balance. During the assessment, the examiner noted compensatory strategies, including slow steps, cautious postural adjustments, and use of hand support, which provided important context for individualized intervention planning.

The integration of MFS and BBT results allowed for a multidimensional evaluation of fall risk, highlighting the interaction between intrinsic factors, such as neuromuscular weakness and post-TIA deficits, and extrinsic environmental risks. This comprehensive clinical examination informed targeted interventions, including balance training, muscle strengthening, fall-prevention education, and environmental modifications tailored to the patient's functional abilities. The case demonstrates how structured assessment tools combined with direct clinical observation can effectively guide personalized fall-prevention strategies in older adults with complex health conditions.

Ethical consideration

Data collection procedures began with establishing a therapeutic relationship to foster trust and comfort for the patient. The researcher then provided a detailed explanation of the objectives, benefits, and procedures of the assessment (Strini et al., 2021b; Tolosa-Merlos et al., 2023). Ethical considerations were met through obtaining informed consent, signed by the patient to indicate voluntary participation in the assessment process (Arellano et al., 2023; Balqis & Suryadin, 2022). Subsequently, baseline data collection was conducted, including demographic information, medical history, and physical condition of the patient.

3. RESULTS

The patient was a 70-year-old male with a history of diabetes mellitus, hypertension, and a transient ischemic attack (TIA) in 2025. At the time of assessment, the patient was alert (compos mentis) and able to communicate cooperatively. He followed instructions throughout the examination without significant difficulty. Muscle strength testing revealed mild weakness in the left upper extremity (grade 4), while the remaining muscle groups demonstrated normal strength (grade 5). This condition indicated an imbalance in muscle strength that could potentially affect postural stability. Furthermore, the patient moved cautiously, reflecting awareness of his physical limitations.

Assessment using the Morse Fall Scale (MFS) revealed a total score of 35, corresponding to a moderate risk of falls. This score was influenced by secondary diagnoses, including diabetes mellitus, hypertension, and a history of TIA, which contributed to the patient's overall clinical condition. The patient did not use walking aids; however, he exhibited a slower and controlled gait. Shortened step length was observed as a compensatory strategy for balance impairment. Mental status was intact, and the patient demonstrated adequate understanding of his condition. Overall, MFS results indicated a fall risk that required careful monitoring and preventive measures.

Berg Balance Test (BBT) assessment yielded a score of 38 out of 56, also categorized as moderate fall risk. The patient maintained static balance adequately while sitting and standing without assistance. However, dynamic balance activities, such as single-leg stance and 360-degree turns, posed difficulty. The patient appeared unstable and required more time to complete these movements. Tasks such as picking up objects from the floor were performed cautiously and slowly. These findings indicate significant dynamic balance impairment, although not severe.

Based on these assessments, the patient's fall risk was influenced by interacting factors. Left upper extremity weakness contributed to postural instability. Residual neurological deficits from TIA potentially affected coordination. Chronic conditions, such as diabetes mellitus and hypertension, further exacerbated balance challenges. Consistency between MFS and BBT scores reinforced these observations. Thus, the patient was considered at risk of

injury from falls without targeted intervention.

Consequently, the nursing diagnosis was established as risk for falls related to impaired balance, left upper extremity weakness, and history of chronic and neurological conditions (Herdman et al., 2024). This diagnosis was supported by objective data, including an MFS score of 35 and a BBT score of 38. Left upper extremity weakness indicated postural stability deficits, while TIA history suggested possible coordination impairments. The combination of these factors indicated vulnerability to fall incidents, forming the basis for focused nursing interventions.

Nursing interventions were aimed at fall prevention and functional enhancement. Muscle-strengthening exercises, particularly for the left upper extremity, were planned to address identified weakness. Gradual dynamic balance training was implemented according to patient capability. Education on fall prevention, safe ambulation, and postural changes was provided. Environmental modifications, such as avoiding slippery floors and ensuring adequate lighting, were recommended. These interventions were tailored to the patient's specific needs, given the moderate fall risk (Moorhead et al., 2018).

Evaluation was conducted to assess the patient's response to interventions. Evaluation parameters included changes in balance performance, muscle strength improvement, and reduction of fall risk (Wagner et al., 2023). Reassessment using MFS and BBT provided objective indicators of progress. In addition, increased confidence in performing daily activities was considered an important outcome. The patient was expected to achieve safer and more stable mobility. Evaluation results guided the planning of subsequent nursing interventions.

4. DISCUSSION

Assessment of the patient revealed that he was at moderate risk of falls, with a Morse Fall Scale (MFS) score of 35 and a Berg Balance Test (BBT) score of 38. This indicates that although the patient remains capable of independent activity, there are impairments that increase fall potential (Dengiz et al., 2025; Strini et al., 2021a). This is particularly important, as fall risk in older people is not always apparent upon superficial observation. In this case, no severe deficits were noted; however, an accumulation of mild-to-moderate risk factors was present (Escosura Alegre et al., 2023; Racey et al., 2021). The combination of

these factors is a primary determinant of the patient's fall risk. Therefore, the analysis focused on the specific characteristics of this patient.

MFS assessment indicated that a score of 35 reflected the presence of clinically significant risk factors. This score was likely influenced by secondary diagnoses, including diabetes mellitus, hypertension, and a history of TIA (Dengiz et al., 2025; Jiang et al., 2025). Although the patient did not use mobility aids, his cautious gait suggested decreased confidence in mobility, a common feature in older adults with mild balance impairment. Mental status was intact, serving as a protective factor, yet it was insufficient to reduce overall risk. Therefore, the MFS results accurately reflected a clinical condition warranting attention.

BBT assessment yielded a score of 38, indicating moderate balance impairment. Observation revealed difficulty performing activities requiring dynamic balance, such as single-leg stance and 360-degree turns. These activities highlighted postural instability and suggested suboptimal function of the patient's balance control system (de Abreu et al., 2024; Mandalidis & Karagiannakis, 2020). Such deficits may lead to loss of balance during routine activities. Thus, BBT results corroborated the patient's fall risk (Jiang et al., 2025; Khan et al., 2025).

Mild weakness in the left upper extremity (muscle strength grade 4) was a clinically relevant finding. Although only one grade below normal, this imbalance could significantly affect postural stability (DelMastro et al., 2025; Shin & Lee, 2026). Asymmetry in muscle strength between the left and right sides may impair load distribution (Nasiri et al., 2024; Si et al., 2024). This was evident during standing and walking activities, where the patient tended to favor the stronger side. Such compensation increases the likelihood of imbalance, particularly during positional transitions.

The patient's history of TIA in 2025 was highly relevant to current functional status. TIA may result in transient neurological deficits, yet residual effects often persist (Chu et al., 2023; Hede Ebbesen et al., 2023). In this case, left upper extremity weakness likely reflected residual impairment. TIA may also affect coordination and reflexes, which may not be evident under static conditions but become apparent during dynamic activities. These deficits contribute to increased fall risk in older adults (Roelofs et al., 2023; Ruotsalainen et al., 2025).

Diabetes mellitus further contributed to fall risk through potential peripheral neuropathy, which impairs lower limb sensation (Iliescu et al., 2025; Tavares et al., 2024). Impaired proprioception can compromise gait and balance without the patient's awareness. Additionally, suboptimal glycemic control may exacerbate nerve dysfunction, increasing fall susceptibility in older adults (Kardm et al., 2025; Wang et al., 2024).

Hypertension also influenced balance and fall risk. Cerebral perfusion deficits associated with chronic hypertension may impair central nervous system function. Sudden fluctuations in blood pressure during positional changes can transiently compromise cerebral perfusion, inducing dizziness and postural instability (Christie et al., 2022; Huang & Aronow, 2024; Sible et al., 2023). Impaired cerebral autoregulation further limits the brain's ability to adapt to hemodynamic changes, contributing to fall risk in older adults with long-standing hypertension (Lattanzi et al., 2023).

Overall, the patient's fall risk resulted from the interaction of multiple factors rather than a single dominant cause. Muscle weakness, neurological deficits, and chronic comorbidities interacted to reduce adaptive capacity to positional changes (Tian et al., 2024; Wang et al., 2024). This profile is characteristic of older people with multiple comorbidities, emphasizing the need for a comprehensive approach.

From a nursing perspective, interventions should be specific and targeted. Muscle-strengthening exercises should focus on the weaker extremity, while dynamic balance training should be administered progressively (Choudhary et al., 2025; Ma et al., 2026). Patient education is crucial to enhance awareness of fall risk, promoting adherence to recommended interventions. Overall, this case demonstrates that fall risk in older adults is multifactorial. The patient's combination of chronic conditions, muscle weakness, and balance impairment underlines the need for individualized assessment and management. Consistent findings across MFS and BBT suggest that these instruments are effective for evaluating fall risk in clinical case studies. With appropriate interventions, fall risk can be minimized, highlighting the importance of condition-specific, tailored nursing strategies.

5. CONCLUSION

Based on the fall risk assessment of a 70-year-old older adult male with a history of diabetes mellitus, hypertension, and

transient ischemic attack (TIA), findings indicated that the patient was at moderate risk of falls. The Morse Fall Scale (MFS) assessment yielded a score of 35, while the Berg Balance Test (BBT) score was 38, both consistently reflecting a moderate risk level. These findings demonstrate that the combined use of MFS and BBT provides a comprehensive evaluation of fall risk in older adults with complex clinical conditions. The patient's fall risk was influenced by the interaction of left upper extremity muscle weakness, dynamic balance impairment, and a history of chronic and neurological conditions. Although the patient remained capable of independent activity, there was a reduction in postural stability, increasing susceptibility to falls. Therefore, this case study highlights the importance of comprehensive fall risk assessment as a basis for planning appropriate and sustainable nursing interventions in older adults with similar clinical characteristics.

ACKNOWLEDGEMENT

The authors would like to thank the patient for his participation and cooperation during the assessment.

AUTHOR CONTRIBUTION

UMB: Conception, Design, Screening and selection, Quality checks, analysis. RI, AW, and LM: Interpretation, Drafting, and review of the manuscript.

CONFLICT OF INTEREST

The author declares no conflicts of interest regarding the publication.

FUNDING

This study did not receive any specific grant or funding from public, commercial, or non-profit sectors.

REFERENCES

Adam, C. E., Fitzpatrick, A. L., Leary, C. S., Ilango, S. D., Phelan, E. A., & Semmens, E. O. (2024). The impact of falls on activities of daily living in older adults: A retrospective cohort analysis. PLOS ONE, 19(1), e0294017. https://doi.org/10.1371/journal.pone.0294017

Arellano, L., Alcubilla, P., & Leguízamo, L. (2023). Ethical considerations in informed consent. In Ethics - Scientific Research, Ethical Issues, Artificial Intelligence and Education [Working Title]. IntechOpen. https://doi.org/10.5772/intechopen.1001319

Ayvat, E., Doğan, M., Ayvat, F., Kılınç, Ö. O., Sütçü, G., Kılınç, M., & Yıldırım, S. A. (2024). Usefulness of the Berg Balance Scale for prediction of fall risk in multiple sclerosis. Neurological Sciences, 45(6), 2801–2805. https://doi.org/10.1007/s10072-024-07318-w

Balqis, U. M., & Suryadin, A. (2022). The Family Care's Telenursing for Elderly with COVID-19. Journal of Health Science and Prevention, 6(1). https://doi.org/10.29080/jhsp.v6i1.683

Choudhary, P. K., Choudhary, S., Saha, S., Katanić, B., İlbak, İ., & Tornóczky, G. J. (2025). Effectiveness of Balance- and Strength-Based Exercise Interventions for Fall Prevention in Community-Dwelling Older Adults: A Systematic Review of Randomized Controlled Trials. Life, 16(1), 41. https://doi.org/10.3390/life16010041

Christie, I. N., Windsor, R., Mutsaerts, H. J., Tillin, T., Sudre, C. H., Hughes, A. D., Golay, X., Gourine, A. V, & Hosford, P. S. (2022). Cerebral perfusion in untreated, controlled, and uncontrolled hypertension. Journal of Cerebral Blood Flow & Metabolism, 42(12), 2188–2190. https://doi.org/10.1177/0271678X221124644

Chu, T., Lee, S., Jung, I.-Y., Song, Y., Kim, H.-A., Shin, J. W., & Tak, S. (2023). Task-residual effective connectivity of motor network in transient ischemic attack. Communications Biology, 6(1), 843. https://doi.org/10.1038/s42003-023-05212-3

Cossio-Bolaños, M., Vidal-Espinoza, R., Caceres-Bahamondes, J., de Campos, L. F. C. C., Urzua-Alul, L., de Lázari, M. S. R., Luarte-Rocha, C., & Gomez-Campos, R. (2024). Translation, validity and reliability of the fall risk scale for older adults. BMC Geriatrics, 24(1), 708. https://doi.org/10.1186/s12877-024-05292-8

de Abreu, D. C. C., Bandeira, A. C. L., Magnani, P. E., de Oliveira Grigoletto, D. A., de Faria Junior, J. R., Teixeira, V. R. S., Fuentes, V. M., & de Matos Brunelli Braghin, R. (2024). Standing balance test for fall prediction in older adults: a 6-month longitudinal study. BMC Geriatrics, 24(1), 947. https://doi.org/10.1186/s12877-024-05380-9

DelMastro, H. M., Wall, T., McPartland, D. J., Plaia, E. S., Trimble, N. J., Ruiz, J. A., Harris, K., & Gromisch, E. S. (2025). Lower Limb Strength Differentiates Between Fallers and Nonfallers With Multiple Sclerosis. Archives of Physical Medicine and Rehabilitation, 106(8), 1207–1216. https://doi.org/10.1016/j.apmr.2025.01.001

Dengiz, A., AYTEPE, A., SIRRI, B., & EFE, M. (2025). Investigation of commonly used assessment methods for predicting fall risk in the elderly. Experimental Gerontology, 206, 112784. https://doi.org/10.1016/j.exger.2025.112784

Escosura Alegre, I., Fernández Rodríguez, E. J., Sánchez Gómez, C., García Martín, A., & Rihuete Galve, M. I. (2023). Living Conditions and the Incidence and Risk of Falls in Community-Dwelling Older Adults: A Multifactorial Study. International Journal of Environmental Research and Public Health, 20(6), 4921. https://doi.org/10.3390/ijerph20064921

Gupta, G., Arun Maiya, G., Bhat N, S., & Manjunatha Hande, H. (2025). Multifactorial balance rehabilitation in diabetic neuropathy elders: Randomized controlled trial. Journal of Bodywork and Movement Therapies, 42, 736–744. https://doi.org/10.1016/j.jbmt.2025.01.059

Hede Ebbesen, B., Modrau, B., Kontou, E., Finch, E., Crowfoot, G., Crow, J., Heron, N., Hodson, T., Skrubbeltrang, C., & Turner, G. (2023). Lasting impairments following transient ischemic attack and minor stroke: a systematic review protocol. Frontiers in Neurology, 14. https://doi.org/10.3389/fneur.2023.1177309

Herdman, T. H., Kamitsuru, S., & Lopes, C. (2024). NANDA-I International Nursing Diagnoses: Definitions & Classification, 2024-2026 (Thieme Med). Thieme Medical Publishers, Inc.

Huang, L., & Aronow, W. S. (2024). Association of Hypertension with Different Cognitive Disorders. Journal of Clinical Medicine, 13(20), 6029. https://doi.org/10.3390/jcm13206029

Iliescu, B., Herascu, A., Gaita, L., Avram, V.-F., & Timar, B. (2025). Associations Between Diabetic Neuropathy and Balance Impairments in Patients with

Type 2 Diabetes: A Cross-Sectional Study. Journal of Clinical Medicine, 14(23), 8323. https://doi.org/10.3390/jcm14238323

Jiang, H., Liu, H., Wu, H., Yang, Y., & Li, X. (2025). A Real-World Study on the Morse Fall Scale and Clinical Judgment Method for Fall Risk in Adult Inpatients. International Nursing Review, 72(4). https://doi.org/10.1111/inr.70110

Jiang, J., Zhou, Q., Zhang, C., & Cong, K. (2025). Activities of daily living mediate the association between balance and falls in middle aged and older adults. Scientific Reports, 15(1), 28694. https://doi.org/10.1038/s41598-025-14608-6

Kardm, S. M., Kardm, A. S., Alanazi, Z. A., Alnakhli, H. H., Alkhamis, B. A., & Reddy, R. S. (2025). Sensorimotor dysfunction and postural instability in older adults with type 2 diabetes mellitus: the role of proprioception and neuropathy. Frontiers in Aging Neuroscience, 17. https://doi.org/10.3389/fnagi.2025.1615399

Khan, K. S., & Andersen, H. (2022). The Impact of Diabetic Neuropathy on Activities of Daily Living, Postural Balance and Risk of Falls - A Systematic Review. Journal of Diabetes Science and Technology, 16(2), 289–294. https://doi.org/10.1177/1932296821997921

Khan, M. J., Fong, K. N. K., Wong, T. W.-L., Tsang, W. W., Chen, C., Chan, W., & Winser, S. J. (2025). Effectiveness of dual-task exercise in improving balance and preventing falls among older adults: systematic review with meta-analysis and meta-regression. European Geriatric Medicine, 16(6), 2047–2083. https://doi.org/10.1007/s41999-025-01328-3

Komisar, V., Dojnov, A., Yang, Y., Shishov, N., Chong, H., Yu, Y., Bercovitz, I., Cusimano, M. D., Becker, C., Mackey, D. C., & Robinovitch, S. N. (2022). Injuries from falls by older adults in long-term care captured on video: Prevalence of impacts and injuries to body parts. BMC Geriatrics, 22(1), 343. https://doi.org/10.1186/s12877-022-03041-3

Kudrna, G., Le, T., & Piggott, J. (2022). Macro-Demographics and Ageing in Emerging Asia: the Case of Indonesia. Journal of Population Ageing, 15(1), 7–

38. https://doi.org/10.1007/s12062-022-09358-6

Lattanzi, S., Słomka, A., & Divani, A. A. (2023). Blood Pressure Variability and Cerebrovascular Reactivity. American Journal of Hypertension, 36(1), 19–20. https://doi.org/10.1093/ajh/hpac114

Lee, E. S., & Kim, B. (2024). The impact of fear of falling on health-related quality of life in community-dwelling older adults: mediating effects of depression and moderated mediation effects of physical activity. BMC Public Health, 24(1), 2459. https://doi.org/10.1186/s12889-024-19802-1

Li, Y., Hou, L., Zhao, H., Xie, R., Yi, Y., & Ding, X. (2023). Risk factors for falls among community-dwelling older adults: A systematic review and meta-analysis. Frontiers in Medicine, 9. https://doi.org/10.3389/fmed.2022.1019094

Ma, N., Lu, Z., Mei, X., Ma, L., & Zhang, Q. (2026). The effectiveness of exercise interventions on muscle strength and balance function in pre-frail older adults: a systematic review and Bayesian network meta-analysis. Frontiers in Public Health, 13. https://doi.org/10.3389/fpubh.2025.1718120

Manafi, M. M., Wolfe, A., Zhou, J., Yu, W., Iloputaife, I., You, T., Manor, B., & Jor'dan, A. J. (2025). The effects of type 2 diabetes mellitus on postural adaptation and complexity during a visual search task in older adults. Frontiers in Aging Neuroscience, 17. https://doi.org/10.3389/fnagi.2025.1650484

Mandalidis, D. G., & Karagiannakis, D. N. (2020). A comprehensive method for assessing postural control during dynamic balance testing. MethodsX, 7, 100964. https://doi.org/10.1016/j.mex.2020.100964

Miranda, N., & Tiu, T. K. (2026). Berg Balance Testing. In StatPearls. http://www.ncbi.nlm.nih.gov/pubmed/31057092

Moorhead, S., Swanson, E., Johnson, M., & Maas, M. L. (2018). Nursing Outcomes Classification (NOC): Measurement of Health Outcomes (6th ed.). Elsevier Health Sciences.

Nasiri, Z., Letafatkar, A., & Hosseinzadeh, M. (2024). Investigating the association between intralimb strength ratio,

interlimb strength and range of motion asymmetry index, and functional limitations with fall incidence among older adults: protocol for a prospective cohort study. BMJ Open Sport & Exercise Medicine, 10(3), e002110. https://doi.org/10.1136/bmjsem-2024-002110

Önal, B., Köse, N., Önal, Ş. N., & Zengin, H. Y. (2025). Validity and Reliability of the Berg Balance Scale in Different Tele-Assessment Methods in Patients With Stroke. Journal of Evaluation in Clinical Practice, 31(4). https://doi.org/10.1111/jep.70141

Pedrosa, A. R., Dixe, M. dos A., Sousa, L., Ferreira, R., Marques-Vieira, C., Marques, A., & Baixinho, C. L. (2025). Learning to assess the fall risk in clinical nursing education: an interpretative study. International Journal of Orthopaedic and Trauma Nursing, 59, 101241. https://doi.org/10.1016/j.ijotn.2025.101241

Pilastri, F. B., Lopez, J. F., Boateng, E. N., & Marques, N. R. (2025). What to Know About Falls in Older Adults? Risk Factors, Predictors, and Therapeutic Interventions. International Journal of Environmental Research and Public Health, 22(12), 1863. https://doi.org/10.3390/ijerph22121863

Racey, M., Markle-Reid, M., Fitzpatrick-Lewis, D., Ali, M. U., Gagne, H., Hunter, S., Ploeg, J., Sztramko, R., Harrison, L., Lewis, R., Jovkovic, M., & Sherifali, D. (2021). Fall prevention in community-dwelling adults with mild to moderate cognitive impairment: a systematic review and meta-analysis. BMC Geriatrics, 21(1), 689. https://doi.org/10.1186/s12877-021-02641-9

Roelofs, J. M. B., Zandvliet, S. B., Schut, I. M., Huisinga, A. C. M., Schouten, A. C., Hendricks, H. T., de Kam, D., Aerden, L. A. M., Bussmann, J. B. J., Geurts, A. C. H., & Weerdesteyn, V. (2023). Mild Stroke, Serious Problems: Limitations in Balance and Gait Capacity and the Impact on Fall Rate, and Physical Activity. Neurorehabilitation and Neural Repair, 37(11–12), 786–798. https://doi.org/10.1177/15459683231207360

Ruotsalainen, I., Patten, C., Niemirepo, T., Pajula, J., Similä, H., & Immonen, M. (2025). Gait Characteristics in Acute Stroke and Transient Ischemic Attack

Measured with Accelerometers. Restorative Neurology and Neuroscience, 43(3–4), 112–121. https://doi.org/10.1177/09226028251395715

Sabri, S. M., Annuar, N., Rahman, N. L. A., Musairah, S. K., Mutalib, H. A., & Subagja, I. K. (2022). Major Trends in Ageing Population Research: A Bibliometric Analysis from 2001 to 2021. International Academic Symposium of Social Science 2022, 19. https://doi.org/10.3390/proceedings2022082019

Salari, N., Darvishi, N., Ahmadipanah, M., Shohaimi, S., & Mohammadi, M. (2022). Global prevalence of falls in the older adults: a comprehensive systematic review and meta-analysis. Journal of Orthopaedic Surgery and Research, 17(1), 334. https://doi.org/10.1186/s13018-022-03222-1

Salsabiil, R., Dharmanta, R. S., Yulianti, E., & Sulistiawaty, N. N. (2025). Fear of Falling in Elderly at a Tertiary Hospital Rehabilitation Clinic: A Cross-Sectional Study. Majalah Ilmiah Fisioterapi Indonesia, 13(1), 024–029. https://doi.org/10.24843/mifi.000000606

Sattler, T., Gottschalk, S., König, H.-H., Braun, T., Büchele, G., Denkinger, M., Fleiner, T., Nerz, C., Rapp, K., Schäufele, M., Werner, C., & Dams, J. (2025). Path model explaining the association between fear of falling and health-related quality of life in (pre-)frail older adults. BMC Geriatrics, 25(1), 87. https://doi.org/10.1186/s12877-025-05718-x

Shin, S., & Lee, Y. (2026). Cross-sectional comparison of lower-limb muscle strength and contractile properties according to Parkinson's disease and sarcopenia status. Frontiers in Medicine, 13. https://doi.org/10.3389/fmed.2026.1546672

Si, B., Zhu, H., Wei, X., Li, S., & Wu, X. (2024). The mechanism of static postural control in the impact of lower limb muscle strength asymmetry on gait performance in the elderly. PeerJ, 12, e17626. https://doi.org/10.7717/peerj.17626

Sible, I. J., Jang, J. Y., Dutt, S., Yew, B., Alitin, J. P. M., Li, Y., Blanken, A. E., Ho, J. K., Marshall, A. J., Kapoor, A., Shenasa, F., Gaubert, A., Nguyen, A., Sturm, V. E., Mather, M., Rodgers, K. E., Shao, X.,

Wang, D. J., & Nation, D. A. (2023). Older Adults With Higher Blood Pressure Variability Exhibit Cerebrovascular Reactivity Deficits. American Journal of Hypertension, 36(1), 63–68. https://doi.org/10.1093/ajh/hpac108

Simmatis, L. E. R., Scott, S. H., & Jin, A. Y. (2021). Quantifying changes over 1 year in motor and cognitive skill after transient ischemic attack (TIA) using robotics. Scientific Reports, 11(1), 17011. https://doi.org/10.1038/s41598-021-96177-y

Strini, V., Schiavolin, R., & Prendin, A. (2021a). Fall Risk Assessment Scales: A Systematic Literature Review. Nursing Reports, 11(2), 430–443. https://doi.org/10.3390/nursrep11020041

Strini, V., Schiavolin, R., & Prendin, A. (2021b). The Role of the Nurse in Informed Consent to Treatments: An Observational-Descriptive Study in the Padua Hospital. Clinics and Practice, 11(3), 472–483. https://doi.org/10.3390/clinpract11030063

Stuby, J., Leist, P., Hauri, N., Jeevanji, S., Méan, M., & Aubert, C. E. (2025). Intervention to systematize fall risk assessment and prevention in older hospitalized adults: a mixed methods study. BMC Geriatrics, 25(1), 45. https://doi.org/10.1186/s12877-025-05703-4

Tavares, N. M. B., Silva, J. M., Silva, M. D. M. da, Silva, L. D. T., Souza, J. N. de, Ithamar, L., Raposo, M. C. F., & Melo, R. S. (2024). Balance, Gait, Functionality and Fall Occurrence in Adults and Older Adults with Type 2 Diabetes Mellitus and Associated Peripheral Neuropathy. Clinics and Practice, 14(5), 2044–2055. https://doi.org/10.3390/clinpract14050161

Tian, Y., Zhou, X., Jiang, Y., Pan, Y., Liu, X., & Gu, X. (2024). Bidirectional association between falls and multimorbidity in middle-aged and elderly Chinese adults: a national longitudinal study. Scientific Reports, 14(1), 9109. https://doi.org/10.1038/s41598-024-59865-z

Tolosa-Merlos, D., Moreno-Poyato, A. R., González-Palau, F., Pérez-Toribio, A., Casanova-Garrigós, G., & Delgado-Hito, P. (2023). Exploring the therapeutic relationship through the reflective practice of nurses in acute mental health units: A qualitative study.

Journal of Clinical Nursing, 32(1–2), 253–263. https://doi.org/10.1111/jocn.16223

Ungvari, Z., Toth, P., Tarantini, S., Prodan, C. I., Sorond, F., Merkely, B., & Csiszar, A. (2021). Hypertension-induced cognitive impairment: from pathophysiology to public health. Nature Reviews Nephrology, 17(10), 639–654. https://doi.org/10.1038/s41581-021-00430-6

Wagner, C. M., Butcher, H. K., & Clarke, M. F. (2023). Nursing Interventions Classification (NIC) (8th ed.). Elsevier Health Sciences.

Wang, C.-S., Pai, Y.-W., Lin, C.-H., Lee, I.-T., Chen, H.-H., & Chang, M.-H. (2024). Diabetic peripheral neuropathy: age-stratified glycemic control. Frontiers in Endocrinology, 15. https://doi.org/10.3389/fendo.2024.1377923

Wang, J., Yang, Y., Su, Q., Wang, J., Zeng, H., Chen, Y., Zhou, J., & Wang, Y. (2024). Association between muscle strength and cardiometabolic multimorbidity risk among middle-aged and older Chinese adults: a nationwide longitudinal cohort study. BMC Public Health, 24(1), 2012. https://doi.org/10.1186/s12889-024-19521-7

Waterval, N. F. J., Claassen, C. M., van der Helm, F. C. T., & van der Kruk, E. (2023). Predictability of Fall Risk Assessments in Community-Dwelling Older Adults: A Scoping Review. Sensors, 23(18), 7686. https://doi.org/10.3390/s23187686

Xing, L., Bao, Y., Wang, B., Shi, M., Wei, Y., Huang, X., Dai, Y., Shi, H., Gai, X., Luo, Q., Yin, Y., & Qin, D. (2023). Falls caused by balance disorders in the elderly with multiple systems involved: Pathogenic mechanisms and treatment strategies. Frontiers in Neurology, 14. https://doi.org/10.3389/fneur.2023.1128092