



E-ISSN: 3068-3726

Review Article

 Check for updates

Osteoarthritis Falls Origins, Risks and Implications 2020-2025

Ray Marks*

¹OARC Clinical Research and Education Director, Ontario L3T 5H3, Canada

*Correspondence author: Ray Marks, OARC Clinical Research and Education Director, Ontario L3T 5H3, Canada; E-mail: doctormarks74@gmail.com

Abstract

Citation: Marks R. Osteoarthritis Falls Origins, Risks and Implications 2020-2025. J Ortho Sci Res. 2026;7(1):1-11.

<https://doi.org/10.46889/JOSR.2026.7102>

Received Date: 24-11-2025

Accepted Date: 18-01-2026

Published Date: 25-01-2026



Copyright: © 2026 The Authors. Published by Athenaeum Scientific Publishers.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

License URL:

<https://creativecommons.org/licenses/by/4.0/>

Lower limb osteoarthritis, a strong age related chronic condition, is often accompanied by an increased tendency to fall and sustain various degrees of injury. The disease alone can in turn induce a high falls risk and cycle of recurrent falls and heightened disability. This report updates what is known about falls in the context of disabling osteoarthritis and where more emphasis could be placed in this regard. Using the PUBMED database and others, clinical studies published largely between January 1, 2020 and December 31, 2025 concerning possible falls and lower limb osteoarthritis linkages were sought. The search results revealed a growing interest in this topic and that osteoarthritis can lead to the chances of incurring one or more falls and further health and disability challenges, while falling can provoke the onset of osteoarthritis in its own right. Although confusing or overwhelming, proprioception issues not well studied to date merit exploration in our view as does Tai Chi an exercise approach that appears to improve proprioception in elderly subjects and others.

Keywords: Falls; Fall Injuries; Osteoarthritis; Pain; Prevention; Proprioception; TaiChi

Introduction

Osteoarthritis, a progressively disabling disease commonly affecting one or more joints and implicated in degrading mobility in joints such as the hip and knee joints of older adult populations, a group prone to falling, remains an ever growing public health concern [1-4]. At the same time, a wealth of data attests to many possible reasons for incurring any unwanted and often life changing falls risk, such as the presence of pain, possible muscle mass losses, ligament instability, obesity and muscle fat mass increases, poor

proprioception and balance, diabetes and cardiovascular diseases, but with no unifying consensus in this regard [5-7]. Adding to the confusion are other related data that reveal a possible role for depression, the lack of adequate sleep and possible medications that can heighten the risk of an older adult with or without osteoarthritis, for falls along with neurological disease correlates, such as impaired joint sense [7,8].

In the face of the numbers of aging adults worldwide suffering and expected to suffer from lower limb osteoarthritis by 2050 and knowledge that the presence of joint instability and pain may well increase falls risk in this group, even if these conditions are somewhat remediable more urgent attention to averting an immense health burden appears indicated [9,10]. Moreover, although falls and fractures after total hip replacement surgery alone remain underrecognized, their clinical importance in the realm of complications should not be ignored [5]. Moreover, acknowledging the importance of averting falls and identifying predictive preoperative factors such as knee extensor strength and gait speed, along with discrepancies between postoperative balance confidence and fall history may provide a high degree of actionable insights for risk stratification and fall-prevention strategies in clinical practice. However, whether mitigation should focus on a possible suboptimal relationship between desirable spinal proprioceptive input patterns and alterations in neuromuscular control strategies that potentially impair gait control or whether obesity induces joint instability and excess pain and muscle fat mass that impairs muscle reactively or the presence of cardiovascular disease, unsafe medication usage and type of medications affect falling is difficult to pinpoint [7,10,11].

Key Research Questions

In this review we sought to examine:

- If there is currently agreement on osteoarthritis falls risk factors that could be harnessed towards more effective falls prevention and osteoarthritis mitigation efforts
- Whether the association between falls and osteoarthritis is a uni- or bidirectional one in selected cases? If so, we sought to ascertain if linkages exist and if any are amenable to prevention or intervention

Since falls associated with osteoarthritis can magnify or induce a life time of suffering, as well as significant health costs even in the face of surgery, we sought to establish if there are specific preventive strategies indicated for community dwellers who wish to age 'in place' or whether some might actively avoid the prevention idea because they perceive this as ageist and/or 'stigmatizing or because they have a fear of falling [8].

Hypothesis

There is a consistent cyclical linkage between the onset and progression of disabling lower limb osteoarthritis and falls risk and falls events in the older adult population that can be mediated by neuromuscular factors and others that may be remediable.

Rationale for Overview

Osteoarthritis as well as falls where 1/4 may sustain serious injuries such bone fractures [<https://www.cdc.gov/falls/data-research/facts-stats/index.html>] currently pose an enormous challenge to many aging individuals, as well health providers and economists. At the same time even if a key cause is deemed to be injury rather than age, there is a pervasive lack of clarity in our view as to whether falling is a relevant pathogenic factor and whether a fall can initiate a cycle of suffering, as well as the onset of increasing osteoarthritis damage despite a host of possible clinical features that include the following, but where some may be remediable.

1. Pain
2. Joint stiffness
3. Joint movement limitations
4. Muscle weakness
5. Instability
6. Limited walking endurance
7. Slow walking speed
8. Poor dynamic balance control
9. Joint locking
10. Sleep disturbances and fatigue
11. Depression and anxiety
12. Faulty posture, joint receptor damage and deficient proprioception

As well, 400 risk factors are linked to a heightened falls risk in the elderly [<https://www.cdc.gov/falls/data-research/facts-stats/index.html>]

Since outcomes for knee osteoarthritis sufferers' alone who incur a falls event are found to be significantly worse over time than those outcomes of cases who do not fall and surgery to replace a diseased end stage knee joint does not always prevent falls post-surgery, it appears a better understanding of what specific variables might underpin this cycle of unwanted events is highly desirable [2]. Moreover, since falling, as well as excess pain and disability are not only paramount falls indicators, but can if serious, lead to premature mortality and morbidity it appears it may be beneficial to examine this topic in detail to ascertain if there is a consistent interactive linkage between the onset and progression of disabling osteoarthritis in the older population and certain variables that can arguably lead to and be exacerbated by falls injuries.

In formulating the present report, we limited this to recent plus new data believed to address the key questions posed in this mini review from a community dwelling - rather than a nursing home perspective. To this end, we largely extracted PUBMED electronic data base information using the key terms: "osteoarthritis and falls", "osteoarthritis and falls risk/injury" as listed and

catalogued from January 1, 2020-December 20, 2025. As well, the PubMed Central and Google Scholar databases were reviewed, as were some past salient documents. Accepted were articles published in the English language as full reports and pertinent to the current theme, with the exception of falls relative to older adults in general or in nursing homes, those with specific health challenges other than osteoarthritis, laboratory studies, and/or studies on total joint replacement surgery, intervention studies and articles that did not discuss osteoarthritis per se, for example those that discussed the perception of possible falls, the fear of falling or falls self-efficacy, but not osteoarthritis. Data were carefully reviewed by the author-an osteoarthritis expert- for relevance and those articles deemed potentially informative in the author's view were downloaded and analyzed. PUBMED was selected as the key electronic data source of information given its widespread data repository and effective method of organizing recent as well as relevant data. Prior data can be gleaned from those citations denoted as systematic reviews [e.g: 3,6,18,34].

Results

As of December 20, 2025, a scan of the current data shows osteoarthritis remains a topic of immense interest to researchers and its association with falls studied intermittently since 1987 continues more intently than not. Although limited numerically when compared to other clinical themes and as shown by differing study inclusion numbers, systematic reviews [eg, 3,18] do not focus on distinctly similar issues. Moreover, while most studies focusing on osteoarthritis and falls acknowledge this association as one of high importance, this is not obvious in all cases [3]. In addition, the importance of any remediable efforts and what these should be is unclear because this may vary with concepts such as 'the fallers concern level', along with their possible deficient walking stability, dynamic balance and slow walking speed [13-22].

The lack of unity in study themes and findings observed in this current examination does in our view stem from a largely atheoretical approach to this topic, for example, an ecological theory approach and hence the implied assumption that certain variables are salient falls mediators without any due validation process persists. At the same time, very few prospective analyses have been forthcoming that may inform on the relative importance of biology, behaviors, health status, demographics and mental health status. Generalizability of the data is further limited because almost all studies that prevail focus on the osteoarthritis knee joint, even though ankle, hip, spine and even shoulder osteoarthritis may disturb balance and gait control that leads to a high falls risk or falls in their own right that may provoke the onset of osteoarthritis and a recurrent risk of falling. Within the knee osteoarthritis data reports alone, most clearly exhibit diverse conclusions and may include impaired balance, muscle weakness, presence of comorbidities and increasing numbers of symptomatic joints [18]. The presence of knee pain was also identified as a risk factor for falls; however, the strength of evidence was rated as "conflicting" because of the inconsistency of the findings. Limited evidence was found for knee instability, impaired proprioception and use of walking aids.

The ability to discern trends via study aggregation must thus remain in question as most thematic articles are found to test differing research questions, use differing small size diverse samples, fail to conduct uniform assessment approaches and do not account for confounders or competing explanations for differing falls events, such as faulty footwear. Moreover, most appear to focus largely on one or more assumed 'physical' falls risk factors, while far fewer place any emphasis on deficits in cognition, psychological status and factors such as anxiety and a lack of vitality [14].

Rosado, et al., point out however, that cases with higher degrees of dysfunction on or other related osteoarthritis symptoms, such as a persistent fear of falls, low back pain, diabetes mellitus and an increased body mass index may be at risk [8]. As well, Rosadi, et al., did feel their study showed that knee proprioception and joint range of motion are potential noteworthy falls risk factors in the context of knee osteoarthritis as these tentatively serve as protective factors against falls when intact [8]. Other mediating or moderating factors include whole body angular momentum features, inter-segmental coordination variability during gait, pain manifestations and intensity and progressive knee joint damage and increasing instability [19-21].

According to Iijima, et al., who examined cases with sarcopenic knee osteoarthritis, those with both these attributes tended to have a 4.17 times higher odds of incurring two or more falls than controls after adjustment for age, sex and body mass index [22]. Although the increased recurrent falls experience was not clearly confirmed in participants with isolated sarcopenia and knee osteoarthritis, a loss of muscle mass is likely to have an impact on balance and timely reflex response ability, especially if replaced by fat mass. However, results of falls over time may vary depending on what is assessed or not assessed in our view. For example, in their study, Van Schoor, et al., who observed Individuals with clinical knee osteoarthritis to be at an increased risk for recurrent falls argued this was likely mediated by pain medication, particularly the use of opioids [23].

Other studies show that having a falls risk appears to be more likely in cases experiencing challenges in carrying out dual tasks when walking or trying to balance or specific features of any altered gait and gaze behaviors deemed falls determinants [24-27]. Additional findings imply a further falls role for high levels of back pain and a reduced walking distance capacity [4]. Others imply falls risk is increased in osteoarthritis older women found to have cognitive symptoms of anxiety and excess stress, although others imply muscle weakness and early pathological changes in the neuromuscular system are the most salient risk factors [13,28].

Others imply older adults with radiographic evidence of osteoarthritis who may tend to have an increased likelihood of experiencing recurrent falls may do so because they have decreased mobility and use opioids or paracetamol to control pain [23,29-33]. They may also exhibit repeated falls especially if they are experiencing abnormal gait cycle mechanics and proprioception, depression and/or exhibit a fear of falling and the presence of concurrent back and hip pain [13,15,31-37]. Moreover the combined role of physical as well as psychological correlates may be implicated [7,19].

In addition, impaired balance, muscle weakness, the presence of one or more comorbidities and increasing number of symptomatic joints are potential falls risk factors associated with osteoarthritis [18]. As well, disease severity or grade of disease is another possibly highly salient falls predictor in addition to stability and balance dysfunction and level of pain [39]. It is also increasingly apparent personal factors are likely to impact falls risk as may environmental factors, but these are often not studied in this regard in tandem [39]. Another view is that compared with older disease free adults, those with osteoarthritis may exhibit a significantly reduced step length, as well as gait speed and subnormal vertical ground reaction forces in both normal walking as well as in the first recovery step following a backward slip perturbation. As well, their inadequate joint flexion and extension angles and generation of joint moments could predispose the older adult with osteoarthritis to injurious falls [40].

This aforementioned possible scenario may well reflect the convergence of multiple disease-related osteoarthritis influences on bipedal postural control during activities of daily living that require attention and are often not assessed objectively. Lack of any longitudinal observations obviate an understanding of what order and to what degree each observed variable is a salient falls or osteoarthritis damage determinant [41]. An associated failure to seek and identify the presence of any disease associated muscle force declines as well as nerve associated pathway attrition that can adversely affect gait and balance control may raise the risk for falling and degrade adaptive walking, plus associated reflex responsiveness, regardless of whether joint replacement surgery has been forthcoming or not [42-44]. Additional findings show falls in end stage knee osteoarthritis may also be due to low back pain coupled with a limited walking endurance that is not rectified directly by surgery [4,37]. Unsurprisingly, knee osteoarthritis may be an independent risk factor for falls in its own right but this may depend on the circumstances in which the older adult falls as well as their cognitive and mental health state [2,45].

In short, over time, the literature and data currently cited and others have revealed many variables that may explain falls risk or predict the damaging nature of the osteoarthritis-falls linkage, but almost all are hard to unify and unravel readily in our view. In addition, in the absence of careful sub studies, the general exclusion of high age adults with severe osteoarthritis from many studies, as well as a failure to examine the role of multiple affected joints, osteoarthritis radiographic severity and pain, muscle force capacity and timing, as well as balance, their relevance as salient widespread risk factors is uncertain. As well, walking ability, neuropathic pain, nutrition and medication intake impacts that appear of key import are challenging to verify or weight [47-53]. Moreover, both within samples diagnosed with osteoarthritis who have been studied, many diverse perspectives, rather than uniform attributes appear to prevail. Even in isolated studies, noteworthy themes are often not studied in depth or objectively. Joints other than the knee are rarely studied and may include cases with differing degrees of pathology and site damage. Largely based on retrospective data or observational study, osteoarthritis-falls trajectories are also rarely studied prospectively to any degree over time, despite their relevance and possible clinically meaningful changes over time. A potential association between falls fatty muscle infiltration and falls in female patients who underwent total hip joint replacement also indicates a role for obesity as a falls risk factor, but is one rarely studied [54,55]. Other identified falls risk factors-such as the implied role of advancing age, having a lower than desirable body mass index, heart disease, vision alterations and a history of narcotics use, gait disturbances and depression are also hard to unravel in the absence of sound data from sizeable samples using validated measures [56-61].

In particular, future efforts to enable predictions and methods that can foster the ability to identify high-risk individuals and to intervene accordingly appear crucial. However, at present, study inclusion criteria that often omit cases with mental health issues or those adults of higher ages with severe joint disease will continue to render it unclear as to whether possible cognitive factors or physical factors or biology underpin falls risk or not among many older adults suffering from osteoarthritis. Whether these attributes if any are remediable and should be treated at all and if so, separately in their own right or not, needs to be examined especially in the face of a possible role for poor muscle coordination attributes, muscle contractures, muscle fibrosis and pathology, ligament or meniscus damage, poor balance, comorbid disability, obesity, low activity levels and common health challenges that raise falls risk, such as deficits in gait control, plus multi pain joint sites [13,24,37,52,57].

In the interim, it appears safe to say osteoarthritis, an important contributor to falling in its own right, even among healthy older adults, is especially relevant to mitigate and avert given its impact on recurrent falls and disability extent.

Discussion

Osteoarthritis, a progressively disabling joint disease and one increasing in prevalence despite years of study is a costly health concern that reduces independence among many older adults in all parts of the world. At the same time, the prevalence of falls among older populations and that can be attributed in part to osteoarthritis disease features is an understudied topic even though it may have a bearing on the disease progression as well as its costs [42]. Moreover, when studied the key importance of identifying remediable disease outcomes and pathogenic factors remains confusing to apply uniformly even though most current authors support the view that falls are inextricably linked to osteoarthritis of the knee joint among other determinants and that more should be done to revert this link. This may be because few groups have sought to examine if falls, a major health determinant of the elderly in its own right, can lead to the onset of knee or other forms of osteoarthritis, a hypothesis that cannot be ruled out. Moreover, even if it appears those with more severe disease may fall to the same degree as those with less joint damage, this appears mostly true for radiological not the clinical disease features.

At the same time, even when the data sources examined in cumulative reviews are known to be reputable and give the impression that they house a reasonable number of relevant papers on the present topic of interest, most do not appear to be based on any sound theoretical framework and thus a high number either examine many possible falls osteoarthritis correlates simultaneously, while others only examine a small number. Some data drawn from specific data repositories and not others and analyses that employ secondary data sets captured in the previous decade using surveys and medical charts, may not represent the entirety of the situation as this occurs globally in 2025 and only knee osteoarthritis and intrinsic as opposed to extrinsic factors seems to have been studied to any degree across time. Moreover, the trajectory and relevance of osteoarthritis and falls interactions are rarely studied prospectively in non surgical contexts as opposed to those detailing post surgical knee or hip osteoarthritis follow up studies and falls occurrences. At the same time, what is being measured specifically is unclear as the terms applied for both knee osteoarthritis as well as falls, falling and recurrent falls are not uniformly defined or employed in a standardized manner across available studies. As well, a high number of studies continue to rely on subjective reports and measures that could be flawed, for example estimating the frequency of falls incidents as recounted by the faller who must rely on memory.

The possible confounding factors of differing osteoarthritis phenotypes, types of falls, falls location, disease duration and extent, plus the role of prior surgery, overall health status, corticosteroid injections and others is also a profound limitation to progress in this realm in our view. As well, no current trend has emerged that would advance this field that currently omits wide age range of study subjects, with limited stratification attempts to group key cohorts selected for study at baseline and strength of evidence rated as "conflicting" because their inconsistent findings. Consequently, while some older adults with knee osteoarthritis may be more prone to falling or falls than healthy age-matched adults, this idea is not universally supported or possible to contextualize or validate. On the contrary, it has been possible to argue that that osteoarthritis may actually be protective against falls and related fractures, especially if it is severe and induces less rather than more weight bearing activities. However, if this is so, it is unclear how poor grip strength on the affected side appears to raise the risk for falling in knee osteoarthritis cases [46] or why joint replacement surgery does not obviate falls risk entirely [14]. There is also evidence that a persistent preoccupation related to an incident fall or 'fear of falling' is not only of interest in the fields of geriatrics and gerontology in general, but because it is related to the risk of falling and the subsequent morbidity of falling [36].

Unfortunately, even if it is accepted that this variable is noteworthy, its assessment is often overlooked or conducted alongside other assessments where its unique impact cannot be readily discerned. Moreover, in general, even though the topic of falls and osteoarthritis has been discussed intermittently for decades, this topic continues to yield the same vague outcomes noted as long ago as 1998 [72]. As at that time, what the weightings of the possible role of balance, muscle strength and proprioception and other factors play in explaining the prevailing falls risk and adverse outcomes among osteoarthritis cases as well as the vulnerable older adult remains to be studied more carefully and comprehensively to allow for salient clinically relevant patterns to emerge in our view. The role of comorbid health conditions, gender and age, plus gait challenges and obesity are also clearly relevant, but their relative magnitude and degree of clinical import is currently hard to establish with any degree of confidence [9].

It is also apparent that some data may be erroneous, inaccurate, unrecognized, underreported or exaggerated by the immense reliance on self-reports, along with the frequent exclusion of osteoarthritis cases other than the knee and who might be cognitively challenged or at high risk for falls due to vision problems or heart disease. Additionally, efforts to examine the precise role of potentially modifiable risk factors not highlighted in the literature, such as diabetic neuropathy, joint inflammation, assistive device use, footwear, sedatives, sleep issues, frailty, fatigue, social factors, unsafe environments and erroneous health beliefs about falling may prove insightful as may a focus on nutritional factors [63]. At the same time, efforts to differentiate static from dynamic balance, which has not been studied to any degree in any osteoarthritis population and its possible falls risk and injury linkage warrant study among samples of cases with well-defined and clearly established clinical and radiological osteoarthritis of varied joints, as well as in the case of differential disease sub groups.

Research Implications

To advance this line of inquiry it is evident more comprehensive theory based insights are required including broadening our understanding of the falls risk linkages between:

- Nutritional [e.g. magnesium intake], cognitive and health status factors [44,47,63]
- Medication intake, environmental and sleep factors [11]
- Specific osteoarthritis correlates, such as pain, joint instability, poor dynamic balance during gait, poor proprioceptive sensitivity, muscle fatigue, contractures, muscle weakness and atrophy, plus falls fears, falls self-efficacy and obesity [9,34,41,4650,61]

In addition, with strong evidence of a literature that exhibits many gaps and unexpected findings, we specifically advocate for efforts that can more clearly differentiate high from low falls risk individuals using samples that match the median age of most osteoarthritis cases and who have either distinctive unilateral versus bilateral or multi joint disease [78]. The development and validation of practical cost-effective reliable personalized screening tools, including those that can capture falls history accurately are paramount in this regard as well [51]. To this end, the role of a simplified, two-question screening approach distinguishing those who have osteoarthritis and those who do not, as well as a multidimensional falls questionnaire, can be effectively implemented in the clinic to identify high-risk individuals for targeted preventive interventions such as balance and proprioception training and that may prove beneficial [34,48,64,67]. Identifying and targeting those with a fear of falling that is either excess fear or absent is also indicated in our view [69].

In the interim, even though studied and identified as a sizeable serious costly public health problem for more than 10 years, it appears much more clarity and specificity in topic selection, plus research design and implementation processes is essential to advancing future related studies [71]. In particular, agreed upon validated 'gold' standard assessments appear essential as well. As many falls appear to occur in conjunction with environmental factors, more ecologically oriented studies are also clearly desirable even if laboratory based simulations are informative. Case studies that reveal the possible weight of personal factors, cognitive and medication factors, alongside environmental factors and efforts to integrate this with AI diagnostics may help to enlighten as well as personalize what is needed and why to prevent falling injuries among osteoarthritis cases, as well as elders, in general.

Until then, rather than relying on aggregate views of controlled studies accessible to only those who fulfill the study criteria that may not accurately account for the high [40%] percentage of those with a falls history undergoing surgery, more personalized routine efforts to examine the spectrum of falls issues relative to the osteoarthritis sufferers in question may prove helpful [56]. In addition, the role of home based versus on line exercises or treatment plans that are not individualized or closely monitored

must be weighed in light of new as well as past data and possible contra indications to intervention impacts in the face of intractable pain, depression, frailty and neuromuscular deficits, plus deficient cognitive ability, poor physical and emotional status, erroneous health beliefs and multiple medical conditions that can induce injurious falls [65,68,69].

Clinical Implications

As per Ling, until more compelling deterministic data are forthcoming about the cause effect osteoarthritis falls linkage, applying what we do know carefully may have both profound health cost benefits as well as favorable longevity implications [64,78]. The degree of prevailing fears regarding falling [immense fear or no fear-that could also prove problematic] should be studied in its own right [69]. Additionally, the relative role of type and usage of prescribed medications, osteoarthritis severity, pain extent, walking and balance facility, hip impairments and environmental safety issues requires clarification [37].

In the meantime, five assessment methods-single-leg stance, six-minute walk test, timed up and go test, chair stand test and fall efficacy scale and identifying those exhibiting cautious' walking and hip impairments may prove beneficial, alongside the at risk subject's cognitive, physical and medical profile [13,37]. The individual's personal beliefs and concerns if generating anxiety, numbers and type of falls risk factors, mode of falling if recurrent, activity preceding fall if relevant, functional mobility and mental status warrant due attention as well in our view, as do estimates of whether at risk elders will be or are able to follow and benefit from a TaiChi oriented program of motor training or dual-task gait training protocol, as well as behavioral efforts directed towards increasing falls self-efficacy [55,56-58,65,73]. The use of a falls predictive model, history report, inertial measures and a sensory weighting analytic approach in addition to measures of muscle mass, volume and thickness over time, may also prove extremely helpful in efforts to advance statistically and clinically reliable observations [74,80-82].

In the interim, TaiChi, an ancient form of gentle exercise, found to improve brain metabolism, posture and muscle energetics in older adults may have the ability to foster preventive biomechanical benefits that help stabilize the weight bearing joint, while averting excessive destabilizing forces and pain [65,83,84].

It is also concluded that as with standard care approaches, osteoarthritis cases should be screened for their falls risk periodically at their annual or regular visits, as well as pre joint replacement surgery. They should be made aware of their falls risk and their help should be sought in averting falls in the future rather than ignored even after surgery.

Conclusion

Despite a lack of unity and a strong reliance on data already collected plus data largely focused solely on the diseased knee joint, it is clear falls are serious injuries that now prevail in sizeable numbers of osteoarthritis cases and aging adults and can account for their oftentimes substantive independence losses and magnification of any concurrent disability in multiple ways, even after surgery. As in 2019 when Mat, et al., implied the negative impact of falls in older persons has been recognized, the association between the presence of pain and falls remains inconclusive, even though pain is a dominant knee osteoarthritis disabling attribute. This group observed however, that while severe knee pain is an independent predictor for falls, this was not apparent in isolation and was only evidenced after data adjustment for functional impairment and psychological status. It was thus proposed that the presence of mild, moderate and severe knee pain may have an indirect rather than a direct effect on falls and can do this by fostering functional impairment, which in turn, increases psychological concerns. Thus this group advocated further studies be implemented to explore this relationship prospectively and evaluate whether interventions which alleviate psychological concerns such as anxiety and fear of falling as well as improving function will reduce falls risk in those community dwelling older adults suffering persistent mild to moderate knee pain, a conclusion we strongly support and of high relevance for those caring for elders in pain, regardless of source, including post operative pain.

In this regard, we further conclude posture and balance as well as muscle modulation and proprioception factors appear of high import among those many factors tentatively explaining falling occurrences and risk in many osteoarthritis cases as well as aging adult populations and to avoid adverse preventable outcomes should be assessed and targeted accordingly.

However, to advance this line of inquiry our present review shows equivocal or weak fragmented evidence and thus low support for making significant societal investments in community-based multi-component falls risk assessment and prevention programs. despite a great need and rationale for doing this. To assist in advancing this realm of potentially remediable disability

and costs we strongly conclude and advocate for more timely objective and routine gait and neuromuscular analogue evaluations and screenings alongside efforts to identify any cognitive, emotional, lifestyle, health beliefs and general health factors known to heighten falls risk. In addition, in planning to avert excess falls associated with osteoarthritis disability, efforts to address the specific role of muscle weakness, muscle wasting, muscle fatigue, obesity, medication safety, environmental factors and deficient proprioceptive reflex and feed forward responsiveness earlier rather than later appear to warrant a high degree of dedicated attention.

To this end, to specifically offset high degrees of osteoarthritis disability and pain, as well as recurrent falls and a low life quality, those in the higher age ranges, those who exhibit sarcopenia, those with symptomatic hip or knee osteoarthritis, those with radiographic osteoarthritis who have undergone total joint replacements, those suffering possible malnutrition, sleep challenges or heart disease, deficient motor control and require multiple medications to quell pain should be preferentially targeted, even if many evidence gaps, potential biases, methodological flaws and observational discrepancies persist.

CODA

Although there is no cure for osteoarthritis, careful timely management that includes falls safety interventions and prevention can yet foster a viable rather than a debilitating life course. Those older adults exhibiting risk factors for osteoarthritis, as well as falling, plus hip and knee osteoarthritis symptoms, should be targeted early on as the chance of falling increases with numbers of risk factors [<https://www.cdc.gov/falls/data-research/facts-stats/index.html>].

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

Acknowledgement

None

Data Availability Statement

Not applicable.

Ethical Statement

The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore, was exempt.

Informed Consent Statement

Informed consent was taken for this study.

Authors' Contributions

All authors contributed equally to this paper.

References

1. Karimi MT, Sharifmoradi K. Static and local dynamic stability of subjects with knee joint osteoarthritis. *Proc Inst Mech Eng H*. 2022;236(8):1100-5.
2. Wilfong JM, Perruccio AV, Badley EM. Examination of the increased risk for falls among individuals with knee osteoarthritis: A Canadian longitudinal study on aging population-based study. *Arthritis Care Res*. 2023;75(11):2336-44.
3. Deng ZH, Xu J, Long LJ. Association between hip and knee osteoarthritis with falls: A systematic review and meta-analysis. *Int J Clin Pract*. 2021;75(10):e14537.
4. Aljehani MS, Crenshaw JR, Rubano JJ. Falling risk in patients with end-stage knee osteoarthritis. *Clin Rheumatol*. 2021;40(1):3-9.

5. Konishi T, Hamai S, Fujita T. Falls and fractures after total hip arthroplasty: Associations with preoperative physical function and postoperative balance confidence. *JBJS Open Access*. 2025;10(4):e25.
6. Zhang Y, Li X, Wang Y. Association of knee and hip osteoarthritis with the risk of falls and fractures: A systematic review and meta-analysis. *Arthritis Res Ther*. 2023;25(1):184.
7. Cheng LY, Chien YC, Lin TT. Assessment of gait and balance in elderly individuals with knee osteoarthritis using inertial measurement units. *Sensors*. 2025;25(20):6288.
8. Rosadi R, Jankaew A, Wu PT. Factors associated with falls in patients with knee osteoarthritis: A cross-sectional study. *Medicine (Baltimore)*. 2022;101(48):e32146.
9. GBD 2023 Disease and Injury and Risk Factor Collaborators. Burden of 375 diseases and injuries and risk-attributable burden of 88 risk factors, 1990-2023. *Lancet*. 2025;406(10513):1873-922.
10. Bhatt M, Shah M, Rathi M. Effect of ankle neuromuscular exercises and mat exercises on chronic ankle instability and balance in overweight and obese individuals. *Foot Ankle Spec*. 2025;19386400251371136.
11. Ager E, Jones A, Lewis A. Medical conditions and medications associated with falls in low-income community-dwelling older adults. *Sr Care Pharm*. 2025;40(10):424-30.
12. Zhang Q, Liu T, Xie H. Refined proprioceptive feedback framework for spatiotemporal mapping of spinal afferent input during gait in female knee osteoarthritis patients. *IEEE Trans Neural Syst Rehabil Eng*. 2025;33:4614-23.
13. Britting S, Krumpoch S, Lindemann U. Interaction of gait characteristics and concerns about falling in community-dwelling older adults. *Sci Rep*. 2025;15(1):43815.
14. Ceolin C, Siviero P, Limongi F. EPOSA Research Group. Impact of a four-domain intrinsic capacity measure on falls. *Front Aging*. 2025;6:1645712.
15. Chan DOM, Subasinghe Arachchige RSS, Wang S. Whole-body angular momentum during stair ascent and descent in individuals with and without knee osteoarthritis. *Sci Rep*. 2024;14(1):30754.
16. Hemmati F, Rusta MM, Karimi MT. Variability in inter-segmental coordination of the lower limb during walking in older adults. *Proc Inst Mech Eng H*. 2025;239(9):952-65.
17. Mat S, Tan PJ, Ng CT. Mild joint symptoms and risk of falls in osteoarthritis. *PLoS One*. 2015;10(10):e0141368.
18. Manlapaz DG, Sole G, Jayakaran P. Risk factors for falls in adults with knee osteoarthritis: A systematic review. *PMR*. 2019;11(7):745-57.
19. Norouzi P, Javadian Y, Hosseini SR. Comparison of falls in elderly with and without knee osteoarthritis. *J Babol Univ Med Sci*. 2023;25(1):46-57.
20. Raizah A, Reddy RS, Alshahrani MS. Knee joint proprioception and limits of stability in bilateral knee osteoarthritis. *J Clin Med*. 2023;12(8):2764.
21. Iosimuta N, Santos WN, Sousa T. Number of falls in elderly with knee osteoarthritis. *Arch Phys Med Rehabil*. 2022;103(3):e36.
22. Iijima H, Aoyama T. Recurrent falls in older adults with sarcopenia and knee osteoarthritis. *BMC Geriatr*. 2021;21(1):698.
23. van Schoor NM, Dennison E, Castell MV. Clinical osteoarthritis and fall risk. *Semin Arthritis Rheum*. 2020;50(3):380-6.
24. Leung KL, Li Z, Huang C. Validity of gait speed and knee flexion via smartphone application. *Sensors (Basel)*. 2024;24(23):7625.
25. Abdallat R, Sharouf F, Button K. Dual-task effects on gait and balance in knee pain. *J Clin Med*. 2020;9(5):1554.
26. Amano T, Tamari K, Suzuki N. Screening tool to distinguish fallers in knee osteoarthritis. *Arch Phys Med Rehabil*. 2021;102(4):598-603.
27. Le Rossignol S, Fraser E, Grant A. Altered gait and gaze patterns in knee osteoarthritis. *PLoS One*. 2023;18(11):e0283451.
28. Devassy SM, Scaria L. Prevalence and risk factors for falls in older adults in Kerala. *Heliyon*. 2023;9(8):e18737.
29. Harris R, Strotmeyer ES, Sharma L. Radiographic knee osteoarthritis severity and recurrent falls. *J Gerontol A Biol Sci Med Sci*. 2023;78(1):97-103.
30. Taqi A, Gran S, Knaggs RD. Analgesic use and fall risk in knee osteoarthritis. *Osteoarthr Cartil Open*. 2021;3(2):100165.
31. Ragusa FS, Di Bella G, Dominguez LJ. Risk stratification algorithm predicting falls. *Age Ageing*. 2024;53(8):afae187.
32. Huang J, Hu X, Wang T. Osteoarthritis, paracetamol and falls. *Aging Clin Exp Res*. 2025;37(1):232.
33. Capiau A, Huys L, van Poelgeest E. Benzodiazepines, Z-drugs and fall risk. *Eur Geriatr Med*. 2023;14(4):697-708.
34. Labanca L, Ciardulli F, Bonsanto F. Balance and proprioception after total hip arthroplasty. *BMC Musculoskelet Disord*. 2021;22(1):1055.

35. Ofori-Asenso R, Ackerman IN, Soh SE. Falls in middle-aged adults with osteoarthritis. *Health Soc Care Community*. 2020.

36. González-Olgún A, Ramos Rodríguez D, Higueras Córdoba F. Center of mass acceleration patterns and fear of falling. *Int J Environ Res Public Health*. 2022;19(19):12890.

37. Knox PJ, Coyle PC, Pugliese JM. Hip osteoarthritis and fall risk. *Arthritis Res Ther*. 2021;23(1):71.

38. Lee PA, Wu KH, Lu HY. Balance control in bilateral knee osteoarthritis. *Sci Rep*. 2021;11(1):3742.

39. Soh SE, Barker AL, Morello RT. Predictors of falls and fractures in osteoarthritis. *BMC Musculoskelet Disord*. 2020;21(1):138.

40. Ren X, Lutter C, Kebbach M. Slip-induced perturbation responses in knee osteoarthritis. *Front Bioeng Biotechnol*. 2022;10:893840.

41. de Freitas REJ, de Freitas JGA, Vieira CP. Postural control and fall risk in knee osteoarthritis. *Adv Orthop*. 2023;2023:5536304.

42. Ackerman IN, Barker A, Soh SE. Falls prevention and osteoarthritis. *Disabil Rehabil*. 2023;45(4):733-8.

43. Mawarikado Y, Uchihashi Y, Inagaki Y. Foot pressure parameters and fall history. *Sci Rep*. 2025;15(1):26723.

44. Zheng Z, Luo H, Xu W. Magnesium intake and recurrent falls. *J Nutr Health Aging*. 2023;27(9):775-84.

45. Delbari A, Azimi A, Najafi M. Falls and fear of falling in older adults. *Arch Acad Emerg Med*. 2023;12(1):e9.

46. Mawarikado Y, Inagaki Y, Fujii T. Toe grip strength and fall history. *PLoS One*. 2023;18(3):e0282944.

47. Wesselink EJ, van der Vegt M, Remmelzwaal S. Mental state-altering medications and falls after arthroplasty. *Patient Saf Surg*. 2024;18(1):6.

48. Sohn J, Kim S. Proprioception, postural stability and slips. *Biomed Mater Eng*. 2015;26(Suppl 1):S693-703.

49. Fukaya T, Mutsuzaki H, Mori K. Center of mass changes after total knee arthroplasty. *Geriatrics (Basel)*. 2022;8(1):2.

50. Kiyohara M, Hamai S, Okazaki K. Balance before and after total knee arthroplasty. *Arch Orthop Trauma Surg*. 2022;142(11):3461-7.

51. Sakurai K, Yanai R, Isozaki T. Psychotropic drug use and falls in rheumatoid arthritis. *Mod Rheumatol*. 2024;35(1):64-71.

52. Fernandes VO, Moreira BS, de Melo GASC. Fear of falling in women with knee osteoarthritis. *Geriatr Nurs*. 2024;55:333-8.

53. Khan NF, Bykov K, Katz JN. Opioids and fall risk in osteoarthritis. *Pharmacoepidemiol Drug Saf*. 2024;33(3):e5773.

54. Blasco JM, Pérez-Maletzki J, Díaz-Díaz B. Falls after total knee replacement. *Sci Rep*. 2022;12(1):19839.

55. Shinonaga A, Matsumoto H, Uekawa M. Gluteus medius fatty infiltration and falls after THA. *Geriatr Gerontol Int*. 2025.

56. Saokhieo P, Pliannuom S, Vidhayakula N. Falls in older adults in Thailand. *J Prim Care Community Health*. 2025;16:21501319251385068.

57. Hu Y, Ren Q. Daily activity limitations and fall risk in arthritis. *Prev Med Rep*. 2025;57:103184.

58. Yoshikawa A, Wu HS. Factors associated with falls in osteoarthritis. *J Appl Gerontol*. 2025.

59. Kiko Y, Uchitomi H, Matsubara M. Gait characteristics in hip osteoarthritis fallers. *Healthcare (Basel)*. 2025;13(6):654.

60. Mekariya K, Vanitcharoenkul E, Chotiyarnwong P. Knee osteoarthritis in fragility hip fracture patients. *J Arthroplasty*. 2025;40(8):2179-85.

61. Tsonga T, Michalopoulou M, Malliou P. Falls in severe knee osteoarthritis. *Clin Orthop Surg*. 2015;7:449-56.

62. Khuna L, Plukwongchuen T, Yaemrattanakul W. Functional performance tests and fall risk. *Medicine (Baltimore)*. 2025;104(21):e42578.

63. Witard OC, Hughes AK, Morgan PT. Protein-based perioperative nutrition interventions. *Exp Physiol*. 2025;110(12):1802-9.

64. Diep NT, Nguyen TV, Phuong BTM. Fall risk in older adults in Vietnam. *Front Public Health*. 2025;13:1609745.

65. Fan X, Soh KG, Mun CY. Tai Chi and motor function in older adults. *Aging Clin Exp Res*. 2025;37(1):32.

66. Alenazi AM. Multisite pain and fall risk in knee osteoarthritis. *Am J Phys Med Rehabil*. 2025;104(5):452-7.

67. Sobhani V, Hashemi SE, Mir SM. Proprioceptive exercises and fall risk in knee osteoarthritis. *Cureus*. 2024;16(10):e70885.

68. Grønne DT, Ryg J, Rubin KH. Concerns about falling in knee or hip osteoarthritis. *Age Ageing*. 2024;53(10):afae224.

69. Silangirn P, Chaichana K, Thummayot S. Knee pain and fear of falling in older adults. *Narra J*. 2024;4(2):e915.

70. Ng CT, Tan MP. Osteoarthritis and falls in the older person. *Age Ageing*. 2013;42(5):561-6.

71. Ling SM, Bathon JM. Osteoarthritis in older adults. *J Am Geriatr Soc*. 1998;46(2):216-25.

72. Jattanond W, Satalangka C, Namkorn P. Cognitive-motor dual-task training and fall prevention. *J Prev Med Public Health*. 2025;58(6):609-19.

73. Aoki R, Shindo M. Vertical ankle sway in static standing. *Annu Int Conf IEEE Eng Med Biol Soc*. 2025;2025:1-4.

74. Mat S, Razack AH, Lim J. Risk of falls in knee pain: MELoR study. *Front Med (Lausanne)*. 2019;6:277.

75. Mat S, Ng CT, Fadzil F. Psychological symptoms and falls risk. *Clin Interv Aging*. 2017;12:2025-32.

76. Ahler JR, Busk H, Holm PM. Outdoor physical activity and health outcomes. *Prev Med*. 2024;107966.

77. Veronese N, Honvo G, Bruyère O. Knee osteoarthritis and adverse health outcomes. *Aging Clin Exp Res.* 2023;35(2):245-52.
78. Lunt E, Ong T, Gordon AL. Muscle mass and strength measures in older people. *Age Ageing.* 2021;50(1):88-95.
79. Doré AL, Golightly YM, Mercer VS. Lower-extremity osteoarthritis and fall risk. *Arthritis Care Res (Hoboken).* 2015;67(5):633-9.
80. Riddle DL, Golladay GJ. Risk factors for postoperative falls after arthroplasty. *Arch Phys Med Rehabil.* 2018;99(5):967-72.
81. Bai X, Xiao W, Soh KG. Brisk walking and Tai Chi in older women. *PLoS One.* 2023;18(10).
82. Wu G, Zhao F, Zhou X. Tai Chi improves knee strength and balance. *Arch Phys Med Rehabil.* 2002;83(10):1364-9.
83. Chen W, Li M, Li H. Tai Chi for fall prevention in older adults. *Front Public Health.* 2023;11.
84. Bannuru RR, Abariga S, Wang C. Tai Chi therapy for knee osteoarthritis. *Osteoarthritis Cartilage.* 2012;20:S281-2.

About the journal

Journal of Orthopaedic Science and Research is an international, peer-reviewed, open-access journal published by Athenaeum Scientific Publishers. The journal publishes original research articles, case reports, editorials, reviews, and commentaries relevant to its scope. It aims to disseminate high-quality scholarly work that contributes to research, clinical practice, and academic knowledge in the field.

All submissions are evaluated through a structured peer-review process in accordance with established editorial and ethical standards. Manuscripts are submitted and processed through the journal's online submission system.

Manuscript submission: <https://athenaeumpub.com/submit-manuscript/>

