



Calcium, vitamin D, or combined supplementation to prevent fractures and falls

No clinically meaningful benefit for most older people

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About 30% of people aged 65 years and older, and more than half of those living in nursing homes, experience falls at least annually, 5% of which result in fractures.¹ Admission to hospital because of fractures leads to functional decline for many; in Canada, about 17% of older adults admitted to hospital for a fall subsequently require admission to long term care.² Increases in fall related deaths and disability are being observed in ageing populations, as well as associated costs to national health systems.¹ Globally, the incidence of falls and disability adjusted life years resulting from falls increased by 182% and 142%, respectively, from 1990 to 2021, and both are projected to rise further.³ Clearly, effective interventions are needed to reduce falls and their sequelae among older adults.

Many factors, including biological, behavioural, environmental, and socioeconomic, contribute to fall risk, with low body mass index and low bone density increasing the risk of fractures from falls.¹ Multicomponent, multifactorial (tailored), and single interventions have been studied to address risk factors, falls prevention, and avoidance of injuries from falling.

Given the role of each in bone metabolism, calcium, vitamin D, or combined supplementation was thought to provide a relatively effortless and inexpensive solution to a complex problem. Observational studies have associated low dietary calcium and low serum levels of vitamin D with low bone density and falls.⁴ Consequently, calcium, vitamin D, or combined supplementation has been widely promoted for preventive musculoskeletal health in older adults. Although costs may be considered low for individuals (\$10 (£7; €8) to \$50 per year for vitamin D depending on dose and country),⁵ at a population level they are considerable. In Quebec, Canada, vitamin D prescriptions cost the public health system \$43m in 2025, which excludes over-the-counter preparations and vitamin D testing.⁶ In the UK, vitamin D prescription costs (£111m in 2021) and testing rates increased 14-fold and 10-fold, respectively, in the first two decades of this century, without a strong evidence base on effectiveness for patient important outcomes.⁷ Critical examination of the results from randomised controlled trials is required to avoid reverse causation and confounding factors inherent in observational studies.

In a linked paper, Massé and colleagues (doi:10.1136/bmj-2025-088050) report on this issue in a comprehensive systematic review.⁴ As they describe, earlier systematic reviews evaluating the impact of calcium, vitamin D, or combined supplementation to prevent falls and fractures have

come to differing conclusions. This discrepancy may be related to differences in study eligibility criteria, analytical approaches, including examinations of heterogeneity in effects, and the way authors draw conclusions. Massé and colleagues used broad eligibility criteria, included extensive subgroup analyses exploring potential effect moderators across participant and intervention variables, and interpreted the effects using updated guidance for certainty assessments applying decision thresholds for clinical significance of absolute effects.⁸ Their review included 69 randomised controlled trials including 153 902 participants, with more than 50 000 individuals in four recent trials of vitamin D supplementation. The authors found little to no benefit from calcium, vitamin D, or combined supplementation, with moderate to high certainty evidence for almost all outcomes (eg, 1% (95% confidence interval 0.1% to 1.8%) absolute risk reduction for total fractures with combined supplementation). Findings were largely consistent in subgroup analysis when using a composite of high risk (mean age ≥80 years, living in a care home, previous history of fracture or falls, diagnosis of osteoporosis, or low (<25 nmol/L) mean baseline vitamin D level), although the evidence was limited, especially when considering individual risk factors.

A major difference from most previous reviews is Massé and colleagues' application of predefined clinical decision thresholds for the outcomes, using absolute reductions (eg, total fractures (2%), hip fractures (0.7%), and vertebral fractures (2%)), rather than relying on statistical significance. The thresholds were based on consensus among the review team rather than among patients, owing to difficulties in finding or generating such evidence.⁹ Other interest holders may choose different thresholds.^{10 11} For example, a review commissioned by the US Preventive Services Task Force used a lower threshold of 1% for total fractures and reached similar conclusions.¹⁰

As Massé and colleagues point out, evidence for specific populations (eg, vitamin D deficient, previous fractures, taking osteoporosis drugs, living in a care home) was limited for several outcomes and leaves some room for doubt on the lack of supplement effectiveness. In the absence of clear evidence of effectiveness, however, rigorous and well powered trials are warranted examining patient important outcomes in these populations, preferably using patient elicited thresholds. Given the lack of benefit, potential for harm (at least for calcium supplementation),¹² and costs to the healthcare system, recommendations for supplementation in

higher risk populations should await evidence from such trials.

Other interventions, such as balance and resistance exercise, and several multicomponent interventions (eg, combining exercise, hazard assessment, or education with other interventions tailored to risk assessment¹¹) have been shown to offer meaningful prevention of falls and falls related injuries.¹¹⁻¹³ For most older people, Massé and colleagues' findings show that calcium, vitamin D, or combined supplementation does not prevent fractures or falls. Efforts and funding should be redirected from supplementation to ensuring access to proven interventions.

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- 1 World Health Organization. Step safely: strategies for preventing and managing falls across the life-course. Geneva: WHO; 2021. <https://www.who.int/teams/social-determinants-of-health/safety-and-mobility/step-safely>
- 2 Scott V, Wagar L, Elliott S. Falls and related injuries among older Canadians: fall-related hospitalizations and intervention initiatives. Victoria Scott Consulting. 2010. <https://baycrest.echoontario.ca/wp-content/uploads/2018/06/Falls-related-injuries-among-older-Canadians-Fall-related-hospitalizations-intervention-initiatives.pdf>
- 3 Chen Y, Dai F, Huang S, et al. Global, regional, and national burden of falls among older adults: findings from the Global Burden of Disease Study 2021 and Projections to 2040. *NPJ Aging* 2025;11. doi: 10.1038/s41514-025-00275-4. pmid: 41068164
- 4 Massé O, Mercurio CM, Dupuis S, Al Sahwi M, Arruda A, Dallaire G, et al. Calcium and/or vitamin D supplementation to prevent fractures and falls: systematic review and meta-analysis. *BMJ* 2026;303.
- 5 Demay MB, Pittas AG, Bikle DD, et al. Vitamin D for the prevention of disease: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab* 2024;109:-47. doi: 10.1210/clinem/dgae290. pmid: 38828931
- 6 Quebec Health Insurance Board. https://www.ramq.gouv.qc.ca/sites/default/files/documents/non_indexes/10-medicaments-frequequent-payees_1.pdf
- 7 Bolland MJ, Avenell A, Smith K, Witham MD, Grey A. Vitamin D supplementation and testing in the UK: costly but ineffective? *BMJ* 2021;372:. doi: 10.1136/bmj.n484. pmid: 33653683
- 8 Zeng L, Brignardello-Petersen R, Hultcrantz M, et al. GRADE guidelines 32: GRADE offers guidance on choosing targets of GRADE certainty of evidence ratings. *J Clin Epidemiol* 2021;137:-75. doi: 10.1016/j.jclinepi.2021.03.026. pmid: 33857619
- 9 Guyatt G, Vandvik PO, Iorio A, et al. Core GRADE 7: principles for moving from evidence to recommendations and decisions. *BMJ* 2025;389:e083867. doi: 10.1136/bmj-2024-083867. pmid: 40461180
- 10 Vitamin D, Calcium, or Combined Supplementation for the Primary Prevention of Falls and Fractures in Community-Dwelling Adults: A Draft Evidence Update for the U.S. Preventive Services Task Force. <https://www.uspreventiveservicestaskforce.org/uspstf/document/draft-evidence-review/vitamin-d-calcium-combined-supplementation-primary-prevention-falls-fractures-communitydwelling-adults>
- 11 Pillay J, Gaudet LA, Saba S, et al. Falls prevention interventions for community-dwelling older adults: systematic review and meta-analysis of benefits, harms, and patient values and preferences. *Syst Rev* 2024;13:. doi: 10.1186/s13643-024-02681-3. pmid: 39593159
- 12 Reid IR. Calcium supplementation - efficacy and safety. *Curr Osteoporos Rep* 2025;23:. doi: 10.1007/s11914-025-00904-7. pmid: 39937345
- 13 Montero-Odasso M, van der Velde N, Martin FC, et al. Task Force on Global Guidelines for Falls in Older Adults. World guidelines for falls prevention and management for older adults: a global initiative. *Age Ageing* 2022;51:afac205. doi: 10.1093/ageing/afac205. pmid: 36178003