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Cochrane Corner

Investigating population-based strategies to preclude falls and injuries in the elderly: A Cochrane Review summary with commentary

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The aim of this commentary is to discuss in a rehabilitation perspective the Cochrane Review "Population-based interventions for preventing falls and fall-related injuries in older people" by Lewis et al.[1] published by Cochrane Bone, Joint and Muscle Trauma and Cochrane Public Health Groups. This Cochrane Corner is produced in agreement with the *Turkish Journal of Physical Medicine and Rehabilitation by Cochrane Rehabilitation* with views* of the review summary author in the "implications for practice" section.

Falls are a leading cause of injury and disability among the elderly, posing a significant challenge to public health systems worldwide.[2] As the aging population continues to grow, the incidence of falls and fall-related injuries is expected to increase, highlighting the urgent need for effective prevention strategies.[3] Population-based approaches, which focus on interventions that can be implemented across communities or regions, have emerged as a promising solution to mitigate this risk.[4] These interventions often include community-wide exercise programs, home safety modifications, public awareness campaigns, and policy-driven initiatives aimed at reducing environmental hazards.[5] Population-based strategies offer the potential to significantly reduce the incidence of falls and improve the overall well-being of older adults. A Cochrane review explored the effectiveness of population-based strategies in preventing falls and fall-related injuries among the elderly.[1]

Population-based interventions for preventing falls and fall-related injuries in older people (Lewis et al., 2024)[1]

What is the aim of this Cochrane review?

The aim of this Cochrane review was to examine and integrate the existing evidence regarding the impact of interventions targeted at populations for preventing falls and injuries related to falls among older adults. They defined these population-based interventions as initiatives implemented across communities to alter the fundamental societal, cultural, or environmental factors that heighten the risk of falls.

What was studied in the Cochrane review?

The review authors included randomized controlled trials (RCTs), cluster RCTs, stepped-wedge designs, and non-RCTs, that assessed the effects of community-wide falls prevention interventions. They excluded studies that lacked control groups and those that relied on historical controls. They also excluded studies that randomized individuals rather than communities.

The population included in the review was community-dwelling older adults aged 60 and above, regardless of where they live. Studies targeting only

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**The views expressed in the summary with commentary are those of the Cochrane Corner author (different than the original Cochrane Review authors) and do not represent the Cochrane Library or Wiley.*

institutionalized older adults, and studies focusing on individuals selected based on specific diseases, conditions, or risk factors, were excluded as they wouldn't represent the entire community.

Interventions that were included targeted entire communities or large segments of communities to reduce the incidence of falls and fall-related injuries among older adults. The authors categorized the components of interventions into six broad groupings: exercise and physical activity, medication or nutrition, environmental, educational, other, and multicomponent interventions.

The review's primary outcome measures were rate of falls, number of fallers, and number of people experiencing one or more fall-related injuries. Secondary outcome measures were number of people experiencing one or more fall-related fractures, number of people experiencing one or more falls resulting in hospital admission, number of people experiencing one or more falls requiring medical attention, health-related quality of life (HRQoL), fall-related mortality, concerns about falling, number of people experiencing one or more adverse events. The authors also aimed to conduct an economic analysis.

Search methodology and up-to-dateness of the Cochrane review

The review authors searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register, the Cochrane Central Register of Controlled Trials (CENTRAL), Medical Literature Analysis and Retrieval System Online (MEDLINE), Embase, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and PsycINFO electronic databases along with two trials registers (the World Health Organization International Clinical Trials Registry Platform [WHO ICTRP] and ClinicalTrials.gov) in December 2020, and performed an additional search of CENTRAL, MEDLINE, and Embase in January 2023. They also reviewed the reference lists of included studies and other systematic reviews from database searches and reached out to researchers in the field to identify ongoing and unpublished studies.

What are the main results of the Cochrane review?

The authors included nine studies in the review. Among the studies, two were cluster RCTs, while the others were non-randomized or quasi-experimental. The authors classified the non-randomized studies into controlled before-and-after (CBA) studies (five studies) and controlled interrupted time-series (CITS) studies (two studies), with intervention or control group allocation done at the population level. The studies were conducted in seven countries: Australia, China, Denmark, the Netherlands, Norway, Spain, and Sweden.

The target populations and their matched controls were residents aged over 60 years in one study, at least 66 years in another, at least 70 years in one study, and 65 years or older in the remaining studies. It wasn't possible for the authors to provide the exact total target population size for all studies, as two studies reported only the size of the entire population and two studies reported an approximate total target population size. With the provided information the combined target population size, including residents who met the age criteria for the intervention and control groups, was approximately 254,004 (115,320 in the intervention and 136,978 in the control groups). The smallest intervention region had about 1,800 older adult residents, while the largest had 79,425.

Multicomponent interventions were used in all nine of the studies. In general, the components were knowledge/education, staff training, environment (both home and community), exercise, medication, and social environment. The intervention lasted anything from fourteen months to eight years.

Most studies collected data using hospital or healthcare record systems in the selected regions, ensuring that the outcome data included the entire target population. Three studies relied solely on questionnaires or telephone surveys for data collection, while one study used both hospital records and telephone surveys.

No studies reported data for the number of people experiencing one or more falls requiring medical attention, HRQoL, fall-related mortality, concerns about falling, or adverse events.

Medication or nutrition fall prevention interventions versus control: evidence from RCTs

- Only one study, a cluster RCT with 4,542 participants, included an intervention classified as a 'medication or nutrition', with data available for just one outcome: Number of people experiencing one or more falls resulting in hospital admission.
- According to data obtained from Danish Hospital Registration Database female residents who participated in a "Calcium and Vitamin D" falls prevention program had a lower rate of fall-related hospital admissions compared to those in the control group

(Risk Ratio [RR] 0.89; p<0.10). However, the program did not show a significant difference in outcomes for male residents (RR 1.08). Data were reported without confidence intervals (CI), and no *p* value was reported with the effect estimate for male residents in the primary study.

- The certainty of evidence was graded as very low due to very serious risk of bias and imprecision.
- No studies reported data about rate of falls, number of fallers, number of people experiencing one or more fall-related injuries, number of people experiencing one or more fall-related fractures, number of people who experienced one or more adverse events, and economic analysis.

Multicomponent fall prevention interventions versus control: evidence from RCTs

- One cluster RCT with 1,422 participants (723 in the intervention and 699 in the control group) reported data using self-reported questionnaires on:
  - Rate of falls (lower in the intervention area than in the control area [Rate Ratio (RaR) 0.356, 95% CI 0.253 to 0.501])
  - Number of fallers (lower in the intervention area than in the control area [RR 0.34, 95% CI 0.19 to 0.62])
  - Number of people experiencing one or more fall-related injuries (lower in the intervention area than in the control area [RR 0.39, 95% CI 0.20 to 0.77])
  - Number of people experiencing one or more fall-related fractures (no difference between the intervention and control group areas [RR 0.55, 95% CI 0.17 to 1.85])
- Another cluster RCT with 7179 participants reported data using hospital records on "number of people experiencing one or more falls resulting in hospital admission" and found no evidence of a difference between the intervention and control areas in number of females (RR 0.96) or males (RR 1.07). The study also found that combining this intervention with a "Calcium and Vitamin D" program did not lead to any notable difference between the groups for both females (RR 0.90) and males (RR 1.14).
- The certainty of evidence was graded as very low for all reported outcomes due to very serious risk of bias and imprecision.
- No RCTs reported adverse events or cost-effectiveness.

Multicomponent fall prevention interventions versus control: evidence from non-randomized trials

- No studies reported direct evidence for number of people experiencing one or more falls resulting in hospital admission and any evidence for adverse events. Other outcome measures were reported by at least one study.
- Rate of falls was directly reported by two studies with 4,197 participants in total (samples of the whole target populations). Data was collected through self-reported questionnaires or hospital records. There was no evidence of a difference between the intervention and control groups in neither one of the studies.
- Number of fallers was directly reported by two studies with 3,047 participants in total (samples of the whole target populations). Data was collected using self-reported questionnaires. There was no evidence of a difference between the intervention and control groups in neither one of the studies.
- Number of people experiencing one or more fall-related injuries was reported by one study with 67,300 participants (whole population). Data was collected through healthcare center records. There was no evidence of a difference between the intervention and control areas except for a reduction in fall-related injuries for people aged 75 to 79 years of age (Odds Ratio [OR] 0.71, 95% CI 0.52 to 0.99).
- Number of people experiencing one or more fall-related fractures was directly reported by one study with 24,365 participants. Data was collected through hospital injury record system. There was little or no difference in the number of fractures between the intervention and control groups.
- Two studies with 163,683 participants total reported data on cost-effectiveness using healthcare records. Both studies reported a cost-benefit in favor of the intervention. One of them reported the average overall benefit-cost ratio for the program as 20.6:1 and the standardized cost ratio (SCR) as 87.18 (95% CI 84.6 to 89.8). The other study authors reported rate reductions for hospital admissions (16.1%), hospital bed-days (16.7%), and operations related to falls (35.1%).

- The certainty of the evidence was graded as very low for all outcomes under this heading, for various reasons such as imprecision, inconsistency, or indirectness. The review authors found no reason to upgrade the evidence for any outcome.
- No studies reported direct evidence for number of people experiencing one or more falls resulting in hospital admission and no studies reported adverse events.

How did the authors conclude?

The authors concluded that they cannot be certain whether nutrition, medication, or multicomponent interventions lower the rate of falls, the number of people who fall, the number of people who sustain injuries from falls, experience fractures or require hospital admissions; adverse events, or the cost savings because of the very low-certainty evidence in this review. They also stated that they did not find any data on other specific types of falls prevention interventions, such as exercise and physical activity, environmental modifications, or educational programs. They recommended that more studies are needed to strengthen the evidence for population-based falls prevention interventions. They also urged future research to use the Prevention of Falls Network Europe (ProFaNE) taxonomy for describing interventions, adhere to ProFaNE's core outcome measures, and apply clear definitions for injurious falls.

What are the implications of the Cochrane evidence for practice in rehabilitation?

Community-based programs provide older adults with opportunities for health promotion through exercise and educational initiatives, and population-wide falls prevention strategies may play a crucial role in reducing fall-related injuries among older adults.[6] These strategies typically involve multicomponent interventions that combine education, exercise, environmental modifications, and other approaches. While they are multicomponent like multifactorial interventions, the latter are specifically tailored to address individual needs and risk factors.[5] Numerous high-quality trials have demonstrated that both multifactorial and exercise interventions are effective in reducing falls, with exercise consistently showing the most statistically significant benefits across various fall-related outcomes.[7]

Despite the overall evidence in this review being graded as very low, there are indications that specific age groups, such as those aged 75 to 79, may benefit more from community-based fall prevention interventions. Substantial evidence suggests that most falls among older adults are associated with modifiable risk factors, and targeted prevention strategies have proven to be cost-effective. The most successful interventions are those tailored to individual risk profiles.[8] Given the current lack of sufficient evidence for community-based fall prevention interventions, rehabilitation efforts should continue to focus on high-risk groups, providing strategies tailored to their unique needs and vulnerabilities.

For fall-prevention evidence to be effectively integrated into practice, it's crucial to implement healthy public policies and proven prevention strategies that are specifically tailored to the needs of target populations.[8] The public health system and the aging services network must work collaboratively to ensure that fall prevention initiatives reach as many people in the community as possible.[9] Despite these constructive recommendations a knowledge gap remains in effectively implementing multifactorial falls prevention interventions into clinical practice.[10]

Finally, this Cochrane systematic review highlights the very low certainty of evidence due to bias, imprecision, and inconsistency, underscoring the need for further high-quality research. Rehabilitation professionals should actively support and participate in research efforts to refine and validate effective falls prevention strategies, thereby contributing to a deeper understanding of what works best in different contexts. Continuous research is vital to improving the quality of evidence supporting these interventions.

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