

The use of a multifactorial falls risk assessment and management plan reduces the risk of falling and the monthly fall rate of older adults, and is the most effective component of a falls prevention programme

Prepared by; Lauren Costelloe (Email:causing_a_rukkas@yahoo.com.au)
4th year occupational therapy student, University of Western Sydney

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CLINICAL SCENARIO:

Falls among older adults are often a major cause of morbidity and mortality. Complications resulting from falls are also often of a more serious nature in the older adult population. As there are many factors that may contribute to causing a fall, a multifactorial falls assessment and management plan incorporates all possible factors in the prevention of falls among older adults. What is the evidence to support the use of a multifactorial falls assessment and management plan in preventing falls in older adults?

FOCUSSED CLINICAL QUESTION:

What is the evidence that a multifactorial falls assessment and management plan is more effective in reducing the number of falls in older adults than any other falls prevention intervention?

Summary of Search: Seven (7) citations and three (3) clinical guidelines were located that met the inclusion/exclusion criteria. One systematic review (Level 1a) was retrieved and appraised (Chang, Morton, Rubenstein, Mojica, Maglione, Suttorp, Roth, & Shekelle, 2004). The review was the most recent evidence found, and the highest level of evidence relevant to the clinical question. This article was reviewed as opposed to the clinical guidelines (Registered Nurses Association of Ontario, 2002; Feder, Cryer, Donovan, Carter, 2000; American Geriatric Society, British Geriatrics Society, American Academy of Orthopaedic Surgeons 2001) and systematic review (Gillespie, Robertson, Lamb, Cumming, Rowe, 2004) as these articles covered topics which were broader in scope than the question asked.

Key Findings: The guidelines and systematic review (American Geriatric Society et al, 2002; Feder et al, 2000; Registered Nurses Association, 2002; Gillespie et al, 2004;) found that among other results, a multifactorial falls risk assessment and management plan was effective in the prevention and reduction of falls among older adults. Lower levels of evidence retrieved (Jensen, Lundin-Olsson, Nyberg, & Gustafson, 2002; Close, Ellis, Hooper, Glucksman, Jackson, & Swift, 1999; Rizzo, Baker, McAvay & Tinetti, 1996; Tinetti, McAvay & Claus 1996; Edelberg, 2001; Roberts & Garvin, 2003) also supported the use of a multifactorial falls risk assessment and management plan for the prevention of falls of older adults.

CLINICAL BOTTOM LINE:

The use of a multifactorial falls intervention plan involving the assessment and management of balance and gait, IADLs and ADLs, cognitive evaluation, and environmental hazard evaluation, as well as other factors, is more effective than other falls prevention interventions in reducing the risk of falling and the monthly fall rate of older adults previously at risk of falling.

Limitation of this CAT: This critically appraised paper has been individually prepared as part of a university subject, reviewed and marked by a lecturer, but has not been externally peer-reviewed.

SEARCH STRATEGY:

Using the levels of evidence defined by the Oxford Centre for Evidence-Based Medicine (Phillips, Ball, Sackett, Badenoch, Straus, Haynes & Dawes, 1998), this search strategy aimed to locate the following study designs:

- (Clinical Practice Guidelines;)
- **Level 1a** - Systematic Reviews (SRs) and Meta-analyses of Randomised Control Trials (RCTs);
- **Level 1b** or **Level 2b** - Individual RCTs;
- **Level 1c** - Case series (Post-test, or Pre/Post-test)
- **Level 2a** – SRs and meta-analyses of RCTs and non-randomised control trials;
- **Level 2b** – Individual Cohort Studies, Controlled trials;
- **Level 2c** – Outcomes research
- **Level 3a** – SRs of case-control studies
- **Level 3b** – Individual Case-control Study
- **Level 4** – Case-series
- **Level 5** – Expert opinion

Terms used to guide Search Strategy:

Patient/Client: Older Adults

Intervention: Comprehensive Falls Assessment and Management Plan

Comparison: Other falls prevention intervention

Outcome(s): Decrease in number of Falls

Databases and sites searched	Search Terms	Limits used
<ul style="list-style-type: none"> • National Health and Medical Research Council (NHMRC) • New Zealand Guidelines Group • National Guidelines Clearinghouse • Scottish Intercollegiate Guidelines Network (SIGN) • Cochrane Library • PEDro and OTSeeker • PubMed and Medline • CINAHL and Proquest 	<p>Patient/Client: Older Adult/s, Frail Elderly, Elderly, Aged, Geriatric [AND], [OR]</p> <p>Intervention: Comprehensive fall\$ management plan, Multifactorial fall\$ intervention [AND], [OR]</p> <p>Comparison: Fall\$ prevention, Fall\$ intervention [AND], [OR]</p> <p>Outcomes: Decreased fall\$, Fall rate,</p>	<p>Studies published in English</p>

INCLUSION AND EXCLUSION CRITERIA

Inclusion:

- Studies that involve any form of occupational therapy intervention as part of the multifactorial falls assessment and management plan
- Studies that compare the multifactorial falls assessment and management plan with other falls prevention interventions
- Studies published in English
- Data based on participants aged 60 or more

Exclusion:

- Studies with participant populations primarily of other diagnoses, ie: 'falling' or 'fall-related complications' not primary diagnosis for falls interventions.

RESULTS OF SEARCH

Three (3) clinical guidelines and seven (7) relevant studies were located and categorised as shown in Table 1 (based on Levels of Evidence, Centre for Evidence Based Medicine, 1998).

Table 1: Summary of Study Designs of Articles retrieved

Level of Evidence	Study Design/ Methodology of Articles Retrieved	Number Located	Source(s)
N/A	Clinical Guideline	3	<ul style="list-style-type: none">• American Geriatric Society et al (2001); National Guideline Clearinghouse• Feder et al (2000); National Guideline Clearinghouse• Registered Nurses Association of Ontario (2002); National Guideline Clearinghouse
1a	Systematic Review	1	<ul style="list-style-type: none">• Gillespie et al (2004); Cochrane Library
1b	RCT	2	<ul style="list-style-type: none">• Jensen et al (2002); PEDro - Annals of Internal Medicine• Close et al (1999); OT Seeker
2b	Controlled Trial	2	<ul style="list-style-type: none">• Rizzo et al (1996); PEDro• Tinetti et al (1996); PEDro
5	Literature/Journal Article Review	2	<ul style="list-style-type: none">• Edelberg (2001); ProQuest• Roberts et al (2003); ProQuest

BEST EVIDENCE

The review by Chang and colleagues (2004) was identified as the 'best' evidence and selected for critical appraisal. Reasons for selecting this article were: Most current available evidence; highest level of evidence; most appropriately addressed PICO format question; addressed both multifactorial falls assessment and management plans as an intervention, and compared this intervention to other commonly used falls prevention interventions

SUMMARY OF BEST EVIDENCE

Description and appraisal of Systematic Review and Meta-Analysis by Chang et al (2004).

Aim of the Study: To identify and assess the relative effectiveness of falls prevention interventions in an older adult population.

Methods: A meta-analysis was conducted of 40 relevant randomised controlled trials studying the impact of various falls prevention interventions on the reduction in falling among older adults. 4 categories of falls prevention interventions were generalised from the included studies: multifactorial falls risk assessment and management plans, exercise, environmental modifications, and education.

Design of Included Studies: Randomised controlled trials

Sources of Data Collection: Reference lists from 82 British Medical Journal reviews, American Physical Therapy Association reviews, American Geriatrics Society reviews, and experts.

The Cochrane Library was searched in 2002. Medline, Ageline, Embase, CINAHL, and PsycINFO databases from 1992 to 2002 were searched. Search terms used were: accidental falls, falling, or fall *and* aged, aging, elder care, elderly, elderly care, geriatric, geriatric assessment, older, or senior *and* clinical trial or randomised controlled trial. Language of publication was not restricted.

Study Inclusion Criteria: Focus on falls prevention, data on participants aged 60 or more, randomised controlled trial, detailed data abstraction, and inclusion of a usual care or control group.

Study Exclusion Criteria: Non-randomised and/or controlled studies, studies that were outside specified follow-up period, use of idiosyncratic interventions for which data could not be pooled (eg: restraints), and the inclusion of duplicate study populations.

Number of studies screened: n = 830

Number of studies accepted: n = 40

Patient Population: Not thoroughly described. 60+ year old adults. Living situation of study participants were not specified.

Data Extraction: Components of falls intervention: multifactorial falls risk assessment with management programme, exercise, environmental modifications, or education.

Multifactorial falls risk assessment and management plan: A post fall assessment or systematic screening for risk factors followed up with interventions specifically targeted to all risks uncovered through assessment.

Intervention components include remediation of problems related to: balance and gait; instrumental activities of daily living (IADLs); activities of daily living (ADLs); cognitive evaluation; environmental hazards; and others.

Other areas of management may include the remediation of: muscle strength and range of motion (ROM) dysfunction; self management difficulties; psychosocial problems; review of assistive devices.

Exercise programmes: Study included both general (endurance exercises, eg: walking, aerobics, cycling) and specific exercises (target-aimed training, eg: balance, gait and strength training).

Environmental modification programmes: Included a home visit to identify environmental hazards and the development and implementation of recommendations based on findings from home visits.

Educational interventions: Education was targeted at an individual, group, and/or community level, and ranged from basic, informal education (eg: availability of pamphlets and posters) to intensive education sessions (eg: individual risk factor counselling).

Outcome Measures: Two primary outcomes – Falling at least once during a specified follow up period, and the monthly rate of falling. *Secondary:* Not specified.

Analysis: Data analysis extensively reported. Validity of included studies not reported.

A risk ratio (or multiple risk ratio for multiple intervention groups) was estimated for the studies that compared the number of falls by participants of an intervention group with a usual care or control group at follow-up of 18 months. A sensitivity analysis was performed to assess the impact of correlation among these ratios.

Heterogeneity testing was reported, and adjusted across interventions. An exploratory analysis was conducted to determine the relative effectiveness of the components of the multifactorial falls risk assessment.

The number needed to treat or number needed to harm for the statistically significant adjusted risk ratios was calculated and reported.

Results: Data from 26 intervention groups in 22 studies was used for the meta-analysis of participants who fell at least once. The combined data from these intervention groups showed a significant reduction in the risk of falling (risk ratio 0.88, 95% confidence interval 0.82 to 0.95; $p = 0.03$; $I^2 = 31\%$, 95% uncertainty interval, 0% to 61%).

Data from 30 intervention groups in 27 studies was used for the meta-analysis on monthly fall rate. The combined data showed a significant reduction in the monthly rate of falling (incidence rate ratio 0.80, 0.72 to 0.88; $p < 0.001$; $I^2 = 81\%$, 74% to 86%).

As none of the studies directly assessed the relative effectiveness of intervention components, the magnitude of the effect of each of the intervention components to a control group that received usual care was assessed using a meta-regression model.

A multifactorial falls risk assessment and management programme had a statistically significant beneficial effect on both risk of falling (adjusted risk ratio 0.82, 0.72 to 0.94) and monthly rate of falling (adjusted incidence rate ratio 0.63, 0.49 to 0.83). Some trends were identified regarding the relative effectiveness of major components of a multifactorial falls risk assessment and management programme, but no component was found to be most or least effective.

Exercise was an intervention in the largest number of studies. This also had a statistically significant beneficial effect on the risk of falls (adjusted risk ratio 0.86, 0.75 to 0.99), but on monthly rate of falling (adjusted incidence rate ratio 0.86, 0.73 to 1.01) did not reach conventional statistical significance. A meta-regression analysis was not able to detect statistically significant differences or consistent trends in the efficacy of different types of exercises.

Two other falls interventions, environmental modification and education, were primary components of some studies, and the pooled estimates did not show statistically significant effects on the reduction of monthly fall rates or reduction in falls risk.

Original Authors' Conclusions:

Among current randomised clinical trials, a multifactorial falls risk assessment and management programme was the most effective component of a falls prevention programme. The next most effective component was exercise.

CRITICAL APPRAISAL:

Validity:

- Intensity of interventions undertaken not specified.
- Validity of the included studies was determined using the Jadad tool for study quality. The review reported that findings were not changed by stratifying studies based on quality determined by Jadad score.
- Although all included studies were of RCT design, double blinding was reported as not being conceptually possible, and concealment of allocation was uncommon among included studies.
- A χ^2 test of heterogeneity was conducted, and two random effects meta-regressions of the log risk ratio for falling at least once were conducted to adjust for the heterogeneity across interventions as a function of different predictors.
- A visual inspection of the funnel plots indicated no evidence of publication bias for all studies included in the meta-analyses for the risk ratio of falling at least once and for the falls incidence rate ratio. The adjusted rank correlation test indicated no evidence of publication bias.
- Follow up of participants of included studies not adequately described in detail.
- Detection bias was minimised by the allocation of methods sections only to each investigator, which had been retyped to include no identifying information.
- For classification of content and methods of included studies, calculations were not performed for inter-rater reliability. The review reported no discrepancies in coding the interventions, however this may be a potential bias.

Results:

- No information on falls prevention intervention costs provided.
- Dropouts from included studies not reported.
- Intensity and time spent on interventions in included studies not specified, intensity of treatment not taken into account.
- Inclusion and exclusion criteria for selection to the study listed.
- Ethical approval for the trial documented – not required.

IMPLICATIONS FOR PRACTICE/ APPLICABILITY

This paper is a systematic review (level 1a evidence), published in 2004. Potential biases included lack of information on biases included within included studies.

Use of a multifactorial falls risk assessment and management plan was found to be most effective in reducing the risk of falling and reducing the monthly rate of falling among older adults. Cost effectiveness of this falls prevention intervention was not discussed within the review.

REFERENCES

- Phillips, B., Ball, C., Sackett, D., Badenoch, D., Straus, S., Haynes, B., Dawes, M. (1998). Levels of evidence and grades of recommendations. <http://cebm.jr2.ox.ac.uk/docs/levels.html>.

Article critically appraised:

- Chang, J. T., Morton, S. C., Rubenstein, L. Z., Mojica, W. A., Maglione, M., Suttrop, M. J., Roth, E. A., Shekelle, P. G. (2004). Interventions for the prevention of falls in older adults: Systematic review and meta-analysis of randomised clinical trials. *British Medical Journal*, 328, 680.

Related Articles (not individually appraised)

Clinical Guidelines:

1. American Geriatric Society, British Geriatrics Society, American Academy of Orthopaedic Surgeons. (2001) Guideline for the prevention of falls in older persons. *J American Geriatric Society*, 49(5):664-72.
2. Feder, G., Cryer, C., Donovan, S., Carter, Y. (2000). Guidelines for the prevention of falls in people over 65. The Guidelines' Development Group. *British Medical Journal*, 21 (7267):1007-11.
3. Registered Nurses Association of Ontario (2002). *Prevention of fall injuries in the older adult*. Toronto, Canada: Registered Nurses Association of Ontario.

Level 1 Evidence

4. Close, J., Ellis, M., Hooper, R., Glucksman, E., Jackson, S., & Swift, C. (1999). Prevention of falls in the elderly trial (PROFET): A randomised controlled trial. *The Lancet*, 353 (9147): 93 – 97.
5. Gillespie, L. D., Gillespie, W. J., Robertson, M. C., Lamb, S. E., Cumming, R. G., Rowe, B. H. (2004). Interventions for preventing falls in elderly people (Cochrane Review). In: *The Cochrane Library, Issue 2*. Chichester, UK: John Wiley & Sons, Ltd
6. Jensen, J., Lundin-Olsson, L., Nyberg, L., and Gustafson, Y. (2002). Fall and Injury Prevention in Older People Living in Residential Care Facilities: A Cluster Randomized Trial. *Ann Intern Med*, 136: 733 - 741.

Level 2 Evidence

7. Rizzo, J.A., Baker, D.I., McAvay, G., Tinetti, M.E. (1996). The cost-effectiveness of a multifactorial targeted prevention program for falls among community elderly persons. *Medical Care*, 34(9):954-69.
8. Tinetti, M.E., McAvay, G., Claus, E. (1996). Does multiple risk factor reduction explain the reduction in fall rate in the Yale FICSIT Trial? Frailty and Injuries Cooperative Studies of Intervention Techniques. *American Journal of Epidemiology*, 144(4):389-99.

Levels 3/ 4 Evidence: None found

Level 5 Evidence

9. Edelberg, H. K. (2001). Falls and function: How to prevent falls and injuries in patients with impaired mobility. *Geriatrics*. 56 (3): 41-47.
10. Roberts, B. L., Garvin, C. F. (2003). Falls in Older People: Prevention and Management/Falls in Older People: Risk Factors and Strategies for Prevention. *The Gerontologist*, 43(4): 598.

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