



Nicholas Waldron
Anne-Marie Hill
Anna Barker

Falls prevention in older adults

Assessment and management

Background

Falls increase with age, with substantial patient harm resulting in high healthcare utilisation. High level evidence exists for a range of effective falls prevention strategies.

Objective

To provide an evidence based update of falls prevention recommendations, applicable to the primary care setting.

Discussion

For older adults in the community, exercise programs and vitamin D supplementation in those with deficiency are highly effective in preventing falls. Psychoactive drug withdrawal, home visits, vision optimisation and a multifactorial approach are also effective. In residential aged care, routine vitamin D supplementation is highly effective in preventing falls and fractures. General practitioners are well placed to identify those at risk of falls and implement prevention strategies utilising other healthcare professionals as required. The general practitioner's role in educating and supporting patient behaviour change is critical to the uptake of falls prevention recommendations.

Keywords

elderly; accidental falls; prevention; exercise, vitamin D



Falls in older people are a major concern in terms of disability, institutionalisation, mortality and socioeconomic burden.¹ An Australian study found 8% of women aged in their 40s, 14% in their 50s, 25% in their 60s and 40% in their 70s had experienced a fall in the previous 12 months.² In older adults, up to 30% of falls can result in moderate to severe injuries, such as lacerations, hip fractures and head trauma, resulting in an increased risk of early death.³ A fall may lead to a fear of falling, avoidance of daily activities, social isolation, lowered quality of life and can precipitate a move to residential aged care.⁴⁻⁶

In the past decade, the falls prevention evidence has expanded and many guidelines now exist.⁷⁻¹⁴ Despite this, there remains a national trend of increasing fall related hospitalisations, which, if unchanged, will result in escalating healthcare costs.^{15,16} Improving outcomes requires addressing evidence practice gaps for individual patients in addition to a systemwide approach. General practitioners may identify patients who will benefit from fall prevention measures, develop and implement treatment plans with other health professionals and support patient uptake of recommendations. An Enhanced Primary Care plan may facilitate implementing falls prevention strategies.^{7,17}

Why older people fall

Many falls are multifactorial in nature and linked to both patient specific and environmental risk factors.¹⁸ Key intrinsic risk factors are age, sensory decline, reduced lower limb strength and comorbidity.^{2,19} Cognitive impairment, even subtle deficits, increases risk.²⁰ A single identifiable major factor accounts for up to 20% of falls.¹⁸

Assessment of falls and risk factors

The strongest predictors of risk are previous falls, with injurious falls and a walking or balance difficulty increasing risk even further.^{12,21} Screening balance tests can help identify those with deficits who will benefit from an exercise program (*Table 1*).^{22,23} High risk patients may require a more complex multifactorial assessment.¹²

Key components of a multifactorial assessment include:

- a detailed falls history, medication review, risk factor assessment including osteoporosis, urinary incontinence and cardiovascular disease
- physical examination including gait and balance, neurological and cognitive function, lower limb strength, visual acuity, feet and footwear

**Table 1. Screening tests for balance deficits**

| Test | Method | Scoring | Interpretation |
|----------------------------|---|--|---|
| Single leg stance test | Observe patient standing on one leg with their eyes open on a firm surface for 10 seconds Repeat two more times | 1: completed all three trials 2: completed one or two of three trials 3: unable to complete any trials | A score of 2 or 3 indicates significant sensory and strength impairment |
| Timed Up and Go (TUG) test | Patient to stand from being seated in a chair, walk at a comfortable speed for 3 metres to a line on the floor, turn, return to the chair, and sit down | Time in seconds from beginning to end of test | A time of 15 seconds or longer identifies those with a high risk of falling |

- functional assessment such as activities of daily living, perceived functional ability and fear of falling.

The history should identify presyncope, syncope and unexplained falls as these presentations have considerable overlap and may require specialist referral (Table 2). History from an observer is invaluable, as older people may have ‘amnesia of syncope’ or cognitive deficits effecting recall. Carotid sinus syndrome (CSS) is a neurally mediated cause of syncope which may account for a portion of ‘unexplained falls’ attending emergency departments.²⁴ Pacemaker insertion in this group can reduce the rate of falls, however trial results have been mixed.^{8,25,26}

Falls prevention strategies in the community

The cornerstone of effective falls prevention is identifying modifiable risk factors and intervening with effective strategies (Table 3). In general, multiple strategies should be used for high risk patients, however for selected patients a single strategy may be equally effective and more acceptable.²⁷ Osteoporosis diagnosis and management should also be addressed.²⁸

Older people are often not receptive to ‘falls prevention’ as they underestimate their falls risk and don’t see themselves as ‘fallers’. However, strategies that help maintain independence and emphasise that falls are not inevitable with age are better received.²⁹ Discussing the positive aspects of falls prevention such as social and health benefits as well as engaging the family improves adherence.²⁹

The evidence for effective falls prevention strategies for people with dementia living in the community is not well established. Guidelines recommend that falls prevention interventions should not be withheld, but may need modification and supervision.⁷

Multifactorial assessment and targeted interventions

This approach involves a detailed assessment, often by multiple health professionals, followed by development and implementation of a targeted intervention plan to address modifiable risk factors. Common interventions include exercise, a home safety review, optimising management of medical conditions and a medication review.¹²

Table 2. High risk patients who may benefit from geriatrician or falls clinic review

| Target population = community dwelling older adults |
|--|
| <p>Frequency</p> <ul style="list-style-type: none"> • Recurrent falls (two or more falls in past 12 months) <p>Clinical features</p> <ul style="list-style-type: none"> • Unexplained falls with syncope, dizziness or poor recall* • Falls as part of downward physical, social or psychological spiral • Falls occurring at low threshold (such as basic activities or daily activities) • Falls with head injury, low trauma fracture or on floor >1 hour • Gait disturbance or unsteadiness present <p>* Consider cardiologist referral if cardiogenic syncope is suspected</p> |

Falls clinics apply this model and the evidence shows that it achieves a reduction in falls, and improved mobility, balance and confidence.³⁰

Single strategies

Exercise programs

The link between exercise and decreased falls in older people living in the community is well-established. There is also good evidence that disability can be reduced by well-designed exercise in this population.³¹ There have been four systematic reviews and a number of more recent trials that have demonstrated that well-designed exercise can reduce falls in older people living in the community.^{7,8,10,11,13} Systematic reviews have also identified that tai chi can reduce falls by 37% and the New Zealand developed, Otago Exercise Programme, by 32%.^{8,11} The Otago Exercise Programme also significantly reduces the risk of death.¹¹ Characteristics of effective programs from the largest and most recent review are outlined in Table 4. Exercise uptake can be hampered by concerns about increased pain or lack of efficacy, however recommendation from the GP significantly increases uptake.^{32,33}



Vitamin D

Vitamin D supplementation for older adults with deficiency is an effective and simple strategy for fall and fracture prevention, with fracture benefits persisting with increasing age.^{8,10} Vitamin D supplementation can reduce falls by 17% and higher doses of

cholecalciferol (800–2000 IU/daily) reduce hip fracture risk by 30%.^{10,34} Daily, weekly or 4 monthly regimens appear effective, but annual high dose administration should be avoided.^{34,35} A vitamin D level of >60 nmol/L is required for falls and fracture prevention with the benefit of additional calcium supplementation uncertain.³⁴ Those

Table 3. Evidence for fall prevention strategies

| Community dwelling older adults | | | |
|---|---------------------|--|--|
| Strategy | Rating | Patients who benefit | Practice points |
| Exercise | | Effective for both high falls risk and general older adult populations. Adaptation may be required if cognitive impairment present | May be home or group program, requires balance component. Needs to be performed for 2 hours/week on an ongoing basis |
| High dose vitamin D | | Low vitamin D level (<60 nmol/L) | Cholecalciferol >800 IU/daily prevents fractures and falls |
| Psychoactive medication withdrawal | | Taking benzodiazepine or other psychoactive medication | GP supported stepped withdrawal, average five visits |
| Occupational therapy home visit | | High risk patients especially those with visual impairment or recent hospitalisation | Hazard reduction, training and education. Best as part of a multifactorial strategy |
| Restricted multifocal spectacle use | | Active older people using multifocal lenses (caution – may harm inactive older adults) | Use an additional pair of single lens spectacles when outside |
| Expedited cataract surgery | | First cataract appropriate for surgery | Wait time less than 4 weeks |
| Podiatry intervention ⁵⁸ | | Disabling foot pain attending podiatry clinic | May include orthoses, footwear advice, foot and ankle exercises |
| Multifactorial assessment with targeted interventions | | High risk patients such as those with recurrent unexplained falls or those who have suffered a fall injury | Effective if interventions provided or arranged directly by assessment team |
| Older people living in residential care | | | |
| Single intervention | Rating | Residents who benefit | Practice points |
| Vitamin D in high dose | | All, unless known hypercalcaemia | Cholecalciferol >800 IU/daily Serum vitamin D monitoring not required |
| Medication review by pharmacist | | All residents | Comprises multiple changes to regimen and increasing tests for monitoring |
| Hip protectors | Good practice point | Mobile residents who will be compliant | Acceptability and adherence a major challenge. Prevents fractures if worn |
| <p> = Strongly recommended based on high quality evidence (NHMRC level A), relevant to most older adults, easily implementable</p> <p> = Strongly recommended based on high quality evidence (NHMRC level A), relevant to subpopulations of older adults, implementation dependant on service availability</p> <p> = Recommended based on good evidence (NHMRC level B), relevant to subpopulations of older adults, implementation requires application of practice points</p> <p>Good practice point = Recommendation based on expert opinion with limited evidence, relevant to sub-population, complex to implement</p> | | | |



requiring anti-osteoporosis treatment should have supplemental vitamin D and calcium when dietary intake is inadequate.²⁸

Reduced benzodiazepine use

Psychoactive medications are taken by 22% of community dwelling older people and there is strong evidence they increase the risk of falls.^{36,37} There is no evidence that shorter acting benzodiazepines, selective serotonin reuptake inhibitors (SSRI) antidepressants and atypical antipsychotics are safer in terms of fall risk than earlier generation drugs.³⁸

Psychoactive drug withdrawal can reduce falls by 66%.⁸ Almost 1 in 5 older adults take benzodiazepines long term (>4.5 years) despite a lack of evidence supporting efficacy beyond the short term.⁴⁰ A meta-analysis which included the newer Z compounds (eg. zolpidem, zopiclone) demonstrated that the small sleep benefits were outweighed by adverse effects including fractures and motor vehicle accidents.⁴¹ Recent data associates the use of such sedatives with higher rates of falls, fractures, death and cancer.^{42,43} In contrast, cognitive behavioural therapy and sleep restriction are effective strategies for treating long term insomnia in older people.⁴⁴ Prolonged release melatonin has been approved for adults >55 years of age with primary insomnia and poor quality sleep and does not result in next day impairment or rebound insomnia.⁴⁵

Although benzodiazepine withdrawal is challenging, 18% of older adults quit by themselves after receiving written advice from their GP, and 62% of patients for whom this is insufficient but enrol in a stepped withdrawal program achieve cessation.⁴⁶ The approach begins with transfer to equivalent diazepam dose, followed by a dose reduction of 25% per week with five consultations. Meta-analysis supports this stepped withdrawal method.⁴⁷ In recent years, melatonin has been used by clinicians to support sedative withdrawal, which also appears effective.⁴⁸

Optimised vision

Visual impairment is an independent risk factor for falls and fractures. Multifocal spectacles increase falls risk by distorting the lower visual field (*Figure 1*).⁴⁹ Adults who undertake regular outdoor activity can reduce their falls risk by using single lens distance glasses instead of multifocals when going outside or to an unfamiliar environment.⁵⁰ This advice however, increases falls risk in less active adults. Improving spectacle prescription alone has not resulted in falls prevention. Short waiting time for first eye cataract surgery is an effective falls and fracture prevention strategy.⁸

Table 4. Characteristics of effective exercise programs¹³

- Moderate or high challenge to balance (eg. tai chi, Otago Exercise Programme)
- 2 hours/week on an ongoing basis
- Home or group setting
- Optional strength training: cognitive and functional benefits
- Brisk walking is not recommended for high risk individuals

Home modification

Home safety modifications in association with transfer training and education are effective in high-risk populations⁸ such as patients with poor vision or those recently hospitalised.⁵¹ The benefits are greater when delivered as part of a multifactorial strategy.¹⁴

Falls prevention strategies in residential aged care settings

Falls rates are high in residential aged care facilities (RACFs), with 1 in 2 residents falling within a 6 month period.⁵² Residents have increased rates of cognitive impairment, continence problems, comorbidities and polypharmacy, which contribute to the increased falls risk. The evidence for falls prevention is outlined in *Table 3*.

Vitamin D deficiency is very high in Australian RACF residents, with 89% having a vitamin D level <60 nmol/L.⁵³ Falls and fractures can be prevented with cholecalciferol supplementation (800–2000 IU/day) given to all residents, with the requirement for calcium supplementation uncertain.^{34,53} In Australia, there is no uniform approach to implementation of this evidence: other countries have addressed this using routine administration of oral cholecalciferol 50 000 IU monthly (not routinely available in Australia).⁵⁴ The expert panel recommended that vitamin D level should not be tested or monitored and the only contraindication was known hypercalcaemia.



Figure 1. Distortion of lower vision field in a patient wearing multifocal spectacles



Changing medication prescription may reduce falls in RACFs.⁹ One randomised controlled trial using pharmacist review followed by written recommendations to the GP resulted in drug changes and decreased falls, with 75% of the recommendations accepted by the GP.⁵⁵ Although regular pharmacist reviews occur in Australia, studies suggest 43% of RACF residents are prescribed at least one inappropriate medication.⁵⁶

The evidence for exercise programs preventing falls for RACF residents is inconclusive.⁹ As some studies show an increase in falls rate, individuals capable of participation in exercises should be monitored if these are adopted. Multifactorial assessment and intervention can be effective when delivered by a multidisciplinary team. Hip protectors reduce hip fractures when worn, however, their effectiveness as an injury prevention strategy is not established, as programs are hampered by poor acceptance and adherence.⁵⁷

Key points

- Challenging balance exercise for 2 or more hours per week on an ongoing basis reduces falls risk in older adults living in the community.
- Daily 800–2000 IU vitamin D supplementation prevents falls and fractures in those with vitamin D levels <60 nmol/L, regardless of living location.
- Benzodiazepine withdrawal, occupational therapy home modifications, expedited cataract procedure and restricted multifocal spectacle use outdoors for active older adults are effective single interventions to reduce falls risk.
- High risk patients with recurrent, unexplained or injurious falls should be considered for specialist referral and multidisciplinary intervention.

Authors

Nicholas Waldron MBChB, FRACP, is Clinical Lead and Consultant Geriatrician, Health Networks Branch, Department of Health, Perth, Western Australia. nicholas.waldron@health.wa.gov.au

Anne-Marie Hill PhD, is Research Fellow (supported by NHMRC early career fellowship), School of Physiotherapy, The University of Notre Dame, Fremantle, Western Australia

Anna Barker PhD, is Senior Research Fellow, Centre of Research Excellence in Patient Safety, Monash University, Melbourne, Victoria.

Conflict of interest: none declared.

Acknowledgement

Thanks to Professor Stephen Lord, Neuroscience Research Australia, for provision of the multifocal image and gold bar concept.

References

1. Sartini M, Cristina ML, Spagnolo AM, et al. The epidemiology of domestic injurious falls in a community dwelling elderly population: an outgrowing economic burden. *Eur J Public Health* 2010;20:604–6.
2. Nitz JC, Low Choy NL. Falling is not just for older women: support for pre-emptive prevention intervention before 60. *Climacteric* 2008;11:461–6.
3. Sterling DA, O'Connor JA, Bonadies J. Geriatric falls: injury severity

- is high and disproportionate to mechanism. *J Trauma Acute Care Surg* 2001;50:116–9.
4. Vu MQ, Weintraub N, Rubenstein LZ. Falls in the nursing home: are they preventable? *J Am Med Dir Assoc* 2006;7:S53–8, 52.
5. Delbaere K, Crombez G, Vanderstraeten G, Willems T, Cambier D. Fear-related avoidance of activities, falls and physical frailty. A prospective community-based cohort study. *Age Ageing* 2004;33:368–73.
6. Vellas BJ, Wayne SJ, Romero LJ, Baumgartner RN, Garry PJ. Fear of falling and restriction of mobility in elderly fallers. *Age Ageing* 1997;26:189–93.
7. Australian Commission on Safety and Quality in Healthcare (ACSQHC). Preventing falls and harm from falls in older people: best practice guidelines for Australian community care. Canberra (ACT): Commonwealth of Australia, 2009.
8. Gillespie LD, Robertson MC, Gillespie WJ, et al. Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev* 2009(2):CD007146.
9. Cameron ID, Murray GR, Gillespie LD, et al. Interventions for preventing falls in older people in nursing care facilities and hospitals. *Cochrane Database Syst Rev* 2010(1):CD005465.
10. Michael YL, Whitlock EP, Lin JS, Fu R, O'Connor EA, Gold R. Primary care-relevant interventions to prevent falling in older adults: a systematic evidence review for the U.S. Preventive Services Task Force. *Ann Intern Med* 2010;153:815–25.
11. Thomas S, Mackintosh S, Halbert J. Does the 'Otago Exercise Programme' reduce mortality and falls in older adults?: a systematic review and meta-analysis. *Age Ageing* 2010;39:681–7.
12. Summary of the Updated American Geriatrics Society/British Geriatrics Society clinical practice guideline for prevention of falls in older persons. *J Am Geriatr Soc* 2011;59:148–57.
13. Sherrington C, Tiedemann A, Fairhall N, Close JC, Lord SR. Exercise to prevent falls in older adults: an updated meta-analysis and best practice recommendations. *New South Wales Public Health Bulletin* 2011;22:78–83.
14. Chase CA, Mann K, Wasek S, Arbesman M. Systematic review of the effect of home modification and fall prevention programs on falls and the performance of community-dwelling older adults. *Am J Occup Ther* 2012;66:284–91.
15. Moller J. Current costing models: are they suitable for allocating health resources? The example of fall injury prevention in Australia. *Accid Anal Prev* 2005;37:25–33.
16. Kreisfeld RH, J. Hospital separations due to injury and poisoning 2005–06. Canberra: Australian Institute of Health and Welfare, 2010.
17. Monagle S. Reducing falls in community dwelling elderly. The role of GP care planning. *Aust Family Physician* 2002;31:1111–5.
18. Campbell AJ, Borrie MJ, Spears GF. Risk factors for falls in a community-based prospective study of people 70 years and older. *J Gerontol* 1989;44:M112–7.
19. Low Choy NL, Brauer SG, Nitz JC. Age-related changes in strength and somatosensation during midlife: rationale for targeted preventive intervention programs. *Ann N Y Acad Sci* 2007;1114:180–93.
20. Muir SW, Gopaul K, Montero Odasso MM. The role of cognitive impairment in fall risk among older adults: a systematic review and meta-analysis. *Age Ageing* 2012;41:299–308.
21. Deandrea S, Lucenteforte E, Bravi F, Foschi R, La Vecchia C, Negri E. Risk factors for falls in community-dwelling older people: a systematic review and meta-analysis. *Epidemiol* 2010;21:658–68.
22. Low Choy NL, Brauer S, Nitz JC. Linking stability to demographics, strength and sensory system function in women over 40 to support pre-emptive preventive intervention. *Climacteric* 2008;11:144–54.
23. Whitney JC, Lord SR, Close JC. Streamlining assessment and intervention in a falls clinic using the Timed Up and Go test and physiological profile assessments. *Age Ageing* 2005;34:567–71.
24. Davies AJ, Steen N, Kenny RA. Carotid sinus hypersensitivity is common in older patients presenting to an accident and emergency department with unexplained falls. *Age Ageing* 2001;30:289–93.



25. Kenny RA, Richardson DA, Steen N, Bexton RS, Shaw FE, Bond J. Carotid sinus syndrome: a modifiable risk factor for nonaccidental falls in older adults (SAFE PACE). *J Am Coll Cardiol* 2001;38:1491–6.
26. Ryan DJ, Nick S, Colette SM, Roseanne K. Carotid sinus syndrome, should we pace? A multicentre, randomised control trial (Safepace 2). *Heart* 2010;96:347–51.
27. Campbell AJ, Robertson MC. Rethinking individual and community fall prevention strategies: a meta-regression comparing single and multifactorial interventions. *Age Ageing* 2007;36:656–62.
28. Bell JS, Blacker N, Edwards S, et al. Osteoporosis – pharmacological prevention and management in older people. *Aust Fam Physician* 2012;41:110–8.
29. National Falls Prevention for Older People Initiative (2000). Step Out with Confidence – A study into the information needs and perceptions of older Australians concerning falls and their prevention. Commonwealth Department of Health and Aged Care, Managing Innovation – Marketing Consultancy Network Pty Ltd. 2000. Available at [www.health.gov.au/inter-net/main/publishing.nsf/Content/F8258F38E1722BB1CA25702F00779E08/\\$File/fallsinfo.pdf](http://www.health.gov.au/inter-net/main/publishing.nsf/Content/F8258F38E1722BB1CA25702F00779E08/$File/fallsinfo.pdf) [Accessed 31 October 2012].
30. Hill KD, Moore KJ, Dorevitch MI, Day LM. Effectiveness of falls clinics: an evaluation of outcomes and client adherence to recommended interventions. *J Am Geriatr Soc* 2008;56:600–8.
31. Pahor M, Blair SN, Espeland M, et al. Effects of a physical activity intervention on measures of physical performance: results of the lifestyle interventions and independence for Elders Pilot (LIFE-P) study. *J Gerontol A Biol Sci Med Sci* 2006;61:1157–65.
32. Hill A-M, Hoffmann T, McPhail S, et al. Factors associated with older patients' engagement in exercise after hospital discharge. *Arch Phys Med Rehab* 2011;92:1395–403.
33. Whitehead CH, Wundke R, Crotty M. Attitudes to falls and injury prevention: what are the barriers to implementing falls prevention strategies? *Clin Rehabil* 2006;20:536–42.
34. Bischoff-Ferrari HA, Willett WC, Orav EJ, et al. A pooled analysis of vitamin D dose requirements for fracture prevention. *N Engl J Med* 2012;367:40–9.
35. Sanders KM, Stuart AL, Williamson EJ, et al. Annual high-dose oral vitamin D and falls and fractures in older women: a randomized controlled trial. *JAMA* 2010;303:1815–22.
36. Preville M, Hebert R, Boyer R, Bravo G. Correlates of psychotropic drug use in the elderly compared to adults aged 18–64: results from the Quebec Health Survey. *Aging Ment Health* 2001;5:216–24.
37. Bloch F, Thibaud M, Dugue B, Breque C, Rigaud AS, Kemoun G. Psychotropic drugs and falls in the elderly people: updated literature review and meta-analysis. *J Aging Health* 2011;23:329–46.
38. Boyle N, Naganathan V, Cumming RG. Medication and falls: risk and optimization. *Clin Geriatr Med* 2010;26:583–605.
39. Jorm AF, Grayson D, Creasey H, Waite L, Broe GA. Long-term benzodiazepine use by elderly people living in the community. *Aust N Z J Public Health* 2000;24:7–10.
40. Jorm AF, Grayson D, Creasey H, Waite L, Broe GA. Long-term benzodiazepine use by elderly people living in the community. *Aust New Z J Public Health* 2000;24:7–10.
41. Glass J, Lancot KL, Herrmann N, Sproule BA, Busto UE. Sedative hypnotics in older people with insomnia: meta-analysis of risks and benefits. *BMJ* 2005;331:1169.
42. van der Hoof CS, Schoofs MW, Ziere G, et al. Inappropriate benzodiazepine use in older adults and the risk of fracture. *Br J Clin Pharmacol* 2008;66:276–82.
43. Kripke DF, Langer RD, Kline LE. Hypnotics' association with mortality or cancer: a matched cohort study. *BMJ open* 2012;2(1):e000850.
44. McCurry SM, Logsdon RG, Teri L, Vitiello MV. Evidence-based psychological treatments for insomnia in older adults. *Psychol Aging* 2007;22:18–27.
45. Lemoine P, Nir T, Laudon M, Zisapel N. Prolonged-release melatonin improves sleep quality and morning alertness in insomnia patients aged 55 years and older and has no withdrawal effects. *J Sleep Res* 2007;16:372–80.
46. Voshaar RC, Gorgels WJ, Mol AJ, et al. Tapering off long-term benzodiazepine use with or without group cognitive-behavioural therapy: three-condition, randomised controlled trial. *Br J Psychiatry* 2003;182:498–504.
47. Voshaar RC, Couvee JE, van Balkom AJ, Mulder PG, Zitman FG. Strategies for discontinuing long-term benzodiazepine use: meta-analysis. *Br J Psychiatry* 2006;189:213–20.
48. Kunz D, Bineau S, Maman K, Milea D, Toumi M. Benzodiazepine discontinuation with prolonged-release melatonin: hints from a German longitudinal prescription database. *Expert Opin Pharmacother* 2012;13:9–16.
49. Lord SR, Dayhew J, Howland A. Multifocal glasses impair edge-contrast sensitivity and depth perception and increase the risk of falls in older people. *J Am Geriatr Soc* 2002;50:1760–6.
50. Haran MJ, Cameron ID, Ivers RQ, et al. Effect on falls of providing single lens distance vision glasses to multifocal glasses wearers: VISIBLE randomised controlled trial. *BMJ* 2010;340:c2265.
51. Campbell AJ, Robertson MC, La Grow SJ, et al. Randomised controlled trial of prevention of falls in people aged > or =75 with severe visual impairment: the VIP trial. *BMJ* 2005;331:817.
52. Barker AL, Nitz JC, Low Choy NL, Haines T. Measuring fall risk and predicting who will fall: clinimetric properties of four fall risk assessment tools for residential aged care. *J Gerontol A Biol Sci Med Sci* 2009;64:916–24.
53. Flicker L, MacInnis RJ, Stein MS, et al. Should older people in residential care receive vitamin D to prevent falls? Results of a randomized trial. *J Am Geriatr Soc* 2005;53:1881–8.
54. Campbell AJ, Robertson MC. Comprehensive approach to fall prevention on a national level: New Zealand. *Clin Geriatr Med* 2010;26:719–31.
55. Zermansky AG, Alldred DP, Petty DR, et al. Clinical medication review by a pharmacist of elderly people living in care homes – randomised controlled trial. *Age Ageing* 2006;35:586–91.
56. Stafford AC, Alswayan MS, Tenni PC. Inappropriate prescribing in older residents of Australian care homes. *J Clinical Pharm Ther* 2011;36:33–44.
57. Gillespie WJ, Gillespie LD, Parker MJ. Hip protectors for preventing hip fractures in older people. *Cochrane Database Syst Rev* 2010(10):CD001255.
58. Spink MJ, Menz HB, Fotoohabadi MR, et al. Effectiveness of a multifaceted podiatry intervention to prevent falls in community dwelling older people with disabling foot pain: randomised controlled trial. *BMJ* 2011;342:d3411.

correspondence afp@racgp.org.au