



Interventions for reducing falls and harm from falls in older people with cognitive impairment

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Key messages

- There is a lack of high-quality evidence supporting any intervention aimed at reducing falls in those with cognitive impairment.
- Older individuals and their caregivers may not always be open to interventions unless they are presented with understanding and respect, and knowledge of the person and their goals – person-centred, function-focused care is recommended.
- In the community, strength and balance exercises, home safety assessment and modifications, and optimising nutrition show some promise particularly if cohabiting spouses are involved and the intervention is sustained over the long term.
- In long-term care, evidence exists to support the use of hip protectors and a function-focused approach to care that aims to enhance activity levels.
- In hospitals, research literature recommends individual risk assessment and care planning, and a person-centred care with dignity approach that includes close observation and assistance in achieving the patient's goals. Cognitive assessment is recommended to monitor for delirium and consideration should be given to appropriate referrals to facilitate rehabilitation and secondary prevention.
- A bone health assessment and treatment for osteoporosis may be appropriate and guidance on the diagnosis and management of osteoporosis in New Zealand should be followed.
- **All interventions should be tailored to the individual based on an understanding of their functional cognition, with use of appropriate support materials and engagement with family, whānau and caregivers.**

Useful links

Assessing cognition: [Montreal Cognitive Assessment](#); [4AT Assessment](#)

Australian and New Zealand Hip Fracture Registry: [Guideline for Hip Fracture Care](#)

Bay of Plenty District Health Board: [Care Companion Programme workbook](#)

Caplan (2016): [Appropriate care for older people with cognitive impairment in hospital](#)

Close (2016): [Rationale for tailored intervention for those with cognitive impairment](#)

Osteoporosis New Zealand: [Guidance on the Diagnosis and Management of Osteoporosis](#)

1. Introduction

The Health Quality & Safety Commission recognises the importance of preventing falls and reducing harm from falls, and has prepared [10 Topics](#) of information and professional development exercises as well as an [evidence base](#) with this goal in mind.

The 10 Topics note that cognitive impairment is both a risk factor for falls, and also a potential barrier to some interventions. The report below expands on the topic of falls and cognitive impairment, and presents evidence and implementation strategies for interventions to help reduce falls and harm from falls in individuals with cognitive impairment.

Note this report is not a comprehensive report on reducing falls in general (see the 10 Topics for general evidence-based advice). This report supplements the 10 Topics with regard to the sub-population of people with cognitive impairment.

What is cognitive impairment?

With respect to falls risk in older adults, cognitive impairment includes mild cognitive impairment, dementia and delirium and ranges in a spectrum from mild to severe.

- [Mild cognitive impairment](#) is the stage between the expected cognitive decline of normal ageing and the more serious decline of dementia.
- [Dementia](#) describes a group of symptoms characterised by progressive deterioration in multiple higher functions, such as memory, cognition, behaviour, communication and ability to undertake daily activities. Common causes of dementia are Alzheimer's disease, vascular dementia and Lewy Body dementia.
- [Delirium](#) is an acute disturbance of cognitive function resulting in confused thinking and reduced awareness. Delirium is often attributed to a particular cause, such as illness, metabolic balance (such as low sodium), medication, infection, surgery, or alcohol or drug intoxication or withdrawal.

The number of people in New Zealand living with dementia will triple by 2050 ([Deloitte 2017](#)).

Cognitive impairment increases falls and fracture risk

Mild cognitive impairment can impair obstacle negotiation ([Pieruccini et al 2018](#)). Dementia can increase the risk of falling by impairing judgement, gait, perception and hazard recognition ([Peek et al 2018](#)). Agitation and wandering are risk factors for falls ([Sato et al 2018](#)). Co-existing depressive symptoms or additional medical conditions can compound these risks for falling. The result is that people with dementia have twice as many falls as those without cognitive impairment and are commonly admitted to hospital with injury ([Harvey et al 2016](#)).

Despite these risks, older people with cognitive impairment, and their relatives, do not always see falls prevention interventions as relevant to them. Interventions need to be presented with explanation and understanding, and respect for the older person's identity; a focus on maintaining independence or preserving quality of life may increase acceptability ([Peach et al 2017](#)).

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Interventions to reduce harm from falls for all older people

The [10 Topics](#) set out the approach to reducing harm from falls supported by the Health Quality & Safety Commission. Individuals should be [screened for falls risk](#) and those at risk offered an individualised [multifactorial risk factor assessment](#). Any risk factors for falls should then be addressed with an [individualised care plan](#). Key interventions described in the 10 Topics are strength and balance exercises (which may be all that some older adults need), ensuring a safe environment, medication optimisation and ensuring bone health. However, the evidence base supporting interventions that work to reduce falls and harm from falls in older people with cognitive impairment is sparse.

Reviews of the evidence in those with cognitive impairment

For those with dementia, a systematic review with very stringent inclusion criteria and a high bar for compelling evidence concluded that there was insufficient evidence to endorse any intervention to reduce falls for people living with dementia in any setting ([Peek et al 2018](#)).

For those with mild cognitive impairment or early stage dementia, an integrative review of interventions found some potential for exercise and multifactorial interventions, but the evidence was weak and sparse, and few recommendations could be made. Furthermore, adherence to interventions was found to be poor ([Lach et al 2017](#)).

Despite the above, exercise shows some promise. The authors of a 2017 review concluded that exercise as a single intervention showed promising results for community-dwelling older adults with cognitive impairment ([Sherrington et al 2017](#)).

An exploratory meta-analysis found that exercise alone (community-dwelling) and exercise-related multiple and multifactorial interventions (for those in care) were associated with some improved falls outcomes in older adults with cognitive impairment ([Guo et al 2014](#)).

Given that those with dementia have a higher risk of osteoporosis and fracture, and are less likely to receive treatment, bone health and other factors should be addressed. Potentially treatable factors include osteoporosis, physical inactivity, low body mass index (BMI), disturbance in gait and balance, polypharmacy, alcohol and tobacco ([Vun et al 2017](#)).

Overall, the evidence base for preventing falls and reducing harm from falls in those with cognitive impairment is incomplete. Studies are often small, low quality and inconclusive. This underscores the importance of fundamentals of care, patient preferences and clinical judgement.

2. In the community

The vast majority of falls occur in the community. Given that inpatients come from the community, addressing the reasons people fall in the community may subsequently reduce harm from falls in hospital and care facilities. Engagement with cognitively impaired older people and their caregivers, and identification of their needs and preferences, along with provision of information in appropriate ways, enables choice and higher adoption of falls prevention strategies ([Meyer et al 2019](#), [Meyer et al 2015](#)). Furthermore, interventions for fall prevention may be different for individuals in the early stages of dementia than those with more advanced disease, as cognitive abilities and function become more impaired ([Lach et al 2017](#)). The interventions discussed below must be tailored to the individual and the reasons why interventions are important should be discussed with older people and their families, whānau and caregivers.

Exercise

Regular physical exercise helps to improve strength, balance and motor control, and maintains cognitive function. Exercise is likely to have benefits over and above any impact on falls.

A number of reviews have investigated exercise for preventing falls in those with cognitive impairment ([Burton et al 2015](#), [Chan et al 2015](#), [Lewis et al 2017](#), [Peek et al 2018](#), [Sherrington et al 2017](#)). Most reviews indicate some potential benefit of strength and balance exercise programmes devised and run by physiotherapists or occupational therapists, with two to five 60-minute sessions per week in the home or in groups. All studies assessed included exercise, although some reviews included studies that were not solely exercise interventions. The reviews by Burton and Chan, which performed meta-analyses on randomised controlled trials (RCTs) both estimated a 32 percent reduction in falls (across a range of locations, in the home or in care) and Sherrington found a 45 percent reduction. Note that these effect sizes are greater than the 23 percent reduction found in the recent Cochrane Review on exercise for falls in the general older population ([Sherrington et al 2019](#)). However, it is notable that the review of more stringently performed studies by Peek et al found the evidence inconclusive.

Review results are often largely influenced by the FINALEX study in Finland of 210 people with established Alzheimer's disease. This study found that the rate of falls halved with twice weekly, tailored and supervised exercise at home or in a group setting ([Pitkala et al 2013](#)). Across 12 months, participants had a median of 81 sessions at home, or 75 in groups of 10 at a day hospital delivered by a physiotherapist. The effect was mostly seen in those with advanced dementia where falls were reduced by 53 percent ([Ohman et al 2016](#)). Importantly, the intervention duration was one year, and co-resident spouses were included in the intervention. The total cost of health care and social services in the intervention group did not differ from the control group.

It could be appropriate to refer people who are living independently with mild cognitive impairment to a community strength and balance group programme. Considerations should include the size of the class and the ability of the person to take part in a group activity, follow instructions and perform exercises at home. Group training sessions can be tailored to

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individuals with cognitive impairment (and perhaps sessions specifically catering to these individuals could be implemented as part of existing strength and balance programmes). One study ran tailored sessions at an adult day health centre for 45 minutes, twice a week. Sessions typically consisted of massed, constant and blocked practice of functional, relevant activities including repetition. There was always at least one staff member to three participants. Participants were encouraged to remain on their feet for the majority of the session and undertook individually challenging exercises ([Ries et al 2015](#)).

Adherence issues may confound results, but those adhering to at least 70 percent of sessions in one study showed better functional outcomes ([Taylor 2017](#)). The authors of a pilot protocol for a tailored intervention to improve activity speculate that barriers to adherence include not perceiving oneself as being at risk, perceived lack of relevance of exercise, a focus on other priorities, forgetfulness, medical co-morbidities, planning problems and practical support. Strategies to overcome these barriers could include supervision, tailoring, remote feedback, prompts, memory aids, goal-setting and rote-learning habit formation, with a focus on self-motivation. However, it is not clear which strategies might be acceptable and effective for people living with cognitive impairment ([Harwood et al 2018](#)).

Home safety

Home safety assessment and modifications are effective ways to reduce falls in the general population. [Topic 5](#) discusses the approach to home assessment and validated checklists are recommended. For those with cognitive impairment, a review of three RCTs tested the impact of assistive home technologies on 245 people with dementia and found by meta-analysis that the probability of a fall occurring was halved in the intervention group ([Brims et al 2018](#)).

Nutrition

Vitamin D is protective in those who are deficient and people with dementia have a high prevalence of vitamin D deficiency ([Vun et al 2017](#)). Deficiency can be assumed in frail or institutionalised older adults who rarely go outside (since sunlight is required for vitamin D production) and testing vitamin D level is not required. See the Health Quality & Safety Commission's [webpage on vitamin D](#) and [Best Practice Advocacy Centre \(bpac^{nz}\) guidance](#). Also, alcohol can affect balance, gait, mobility and cognitive function and may make falls more likely. With respect to general nutrition, an RCT of 78 people with Alzheimer's disease living with a spouse found that tailored nutritional guidance with home visits significantly reduced the fall rate in the intervention group (0.55 falls per year) compared with the control group (1.39 falls per year) ([Suominen et al 2015](#)).

Bone health

Osteoporosis risk assessment and treatment are important. People with dementia suffer more falls and more fractures than people without dementia. Yet they are under-assessed for falls risk factors and are less likely to receive treatment for osteoporosis. The New Zealand clinical guidance for diagnosis and management of osteoporosis makes no distinction between those with cognitive impairment and those without, and should be considered when assessing all patients with cognitive impairment ([Osteoporosis New Zealand 2017](#)). Estimate the risk of fracture using validated tools such as the [FRAX](#) or

[GARVAN calculators](#). Treatment with bone-sparing medicines must not be delayed in those who have had a low-impact fracture (see '[Secondary prevention](#)' below). Engagement with fracture liaison services (FLS) is recommended ([Osteoporosis New Zealand FLS](#)).

Medication optimisation

[Topic 8](#) explains the relationship between medication and falls. There is a link between medicines, especially those with central nervous system effects, and falls in those with cognitive impairment ([Kanagaratnam et al 2016](#)). However, there appears to be little evidence for effective interventions to address this problem in a way that actually impacts on falls, and some theoretically appropriate interventions, such as person-centred care, did not effectively reduce prescriptions of risky medicines in one setting ([Richter et al 2019](#)).

Refer to the general guidance on medication optimisation contained in Topic 8, and also the 2018 and 2019 'Recent literature of interest' sections in the [evidence base](#). Also refer to the 2018 bpac^{nz} guidance on [stopping medicines in older people](#) for further information.

Implementation in New Zealand

As discussed above, tailored strength and balance exercises, home safety improvement and optimising nutrition may reduce falls in older people with cognitive impairment living in the community.

Involving a spouse, or family and whānau member, where possible, in diet and exercise interventions appears to be a key factor for success. This justifies an approach of trying to make home visits when family, whānau or carers are home. Also, some of the studies with positive results for those with cognitive impairment (eg, the FINALEX study, and the nutrition intervention reported by Suominen et al) involved long-term sustained interventions over 12 months. Sustaining the intervention is likely to be important.

Accident Compensation Corporation (ACC) funding has enabled falls teams to coordinate in-home and community group strength and balance exercises, and these programmes could be considered, where practical, for those with cognitive impairment, with appropriate supervision. Also, those who make community visits can be enabled to use standard assessment tools, which include risk factors for falls (such as a [combined risk assessment tool](#)) through platforms such as TrendCare. The results of these assessments should be available for the entire health care team.

3. In long-term care

There remains a lack of evidence for the effectiveness of most interventions to reduce falls in long-term care. Cochrane reviews have found benefit only from the use of hip protectors (which suffer from adherence issues) and vitamin D supplementation for those who are vitamin D deficient ([Santesso et al 2014](#), [Cameron et al 2018](#)). Given this, the core approach as described in the [10 Topics](#) with emphasis on a [safe environment](#) and [individual risk factors](#) should be applied.

Risk factors for falls in cognitively impaired residents of long-term care facilities include: impaired mobility, indicators of disinhibited behaviour (including agitation and wandering), diabetes, medicines including psychotropics, depression and higher levels of physical activity ([Galik 2018](#), [Kosse et al 2015](#), [Sato 2018](#)). However, 'higher' levels of physical activity in fallers were below the recommended requirements for older adults ([Galik et al 2018](#)), indicating a general lack of physical activity. Furthermore, restraint increases inactivity, worsens deconditioning and increases the number of falls ([Anderson et al 2016](#)).

One review of research on cognitive impairment and falls in long-term care settings, identified exercise-related multiple component and multifactorial interventions as being associated with improved falls outcomes ([Guo et al 2014](#)). Evidence was scant, but when interventions were associated with fewer falls they always included exercise, education and some version of environment or hazard assessment and modifications. However, meta-analyses have in general failed to find evidence supporting the effectiveness of exercise to reduce falls in long-term care and the sub-population of those with cognitive impairment has not been well studied.

Function-focused care

Function-focused, person-centred care emphasises the importance of nurturing, resident comfort and individual preferences as well as optimal physical activity rather than merely completing care tasks. An example of function-focused care might be ensuring a resident walks to dinner, rather than pushing them in a wheelchair. A cluster randomised controlled trial aimed to assess the impact of function-focused care, which included modifications to the physical environment to encourage activity, and increased individualisation and flexibility in care to facilitate activity. The intervention was coordinated at each aged residential care site by a registered research nurse who spent 10 hours a week for six months working at each site with function-focused care champions. The result was that fewer individuals in the intervention group fell and there were fewer falls in the intervention group ([Galik et al 2014](#)).

The intervention described included environmental factors (such as ensuring walking spaces lacked transitions, as well as appropriate bed and chair height for the individual) in addition to activity enhancement, so it is hard to identify the key components. However, we know that both exercise and home safety modifications reduce falls in the community, and although the evidence is insufficient, it seems logical that attention to activity levels and environment hazards are important in long-term care as well. Clinical judgement and an individualised, patient-focused approach are needed.

In another study, a more complex intervention included an assessment of falls risk factors followed by a tailored intervention, which could include dementia care mapping,

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comprehensive geriatric assessment, occupational therapy input and twice-weekly exercise for six months as required to target identified risk factors. This resource-intensive intervention failed to have any impact on falls in a population of 191 residents of long-term care who had cognitive impairment ([Whitney et al 2017](#)).

The take-away message for now is that complex interventions in long-term care are still of unproven efficacy. However, there is possibly some merit in simple approaches to enhance activity and ensure a safe environment.

Bone health

If we are not yet certain how to prevent falls in long-term care, then we must try to minimise the impact of falls. We know residents in long-term care with cognitive impairment are less likely to receive therapy for osteoporosis than those without cognitive impairment ([Zarowitz et al 2015](#)). Again, the [clinical guidance for osteoporosis diagnosis and management](#) in New Zealand should be followed, and alternative treatments considered if the individual has contraindications to oral bisphosphonate medication.

Goals of care for severe dementia

A 2018 editorial in the *American Journal of Geriatric Psychiatry* outlines a strategy for approaching falls prevention for residents with advanced dementia ([Metzger et al 2018](#)). The strategy begins with a discussion about the goals of care and priorities of patient and family. Regular communication with the patient, family, whānau and caregivers is essential, as are environmental measures such as lower beds, padding on the floor (see [Hanger 2017](#) for the possible benefits of safety flooring) and arm supports. Purposeful rounding (structured hourly rounding to check things such as pain, position, comfort, toileting or other needs), and evaluation for reversible risk factors such as medication, infection, dehydration, metabolic derangements and agitation should also be considered. Non-pharmacological approaches include therapeutic activities such as relaxation, massage, music, rocking chairs, the management of pain with heat or cold or massage, and training for family, whānau and caregivers. Pharmacological measures include non-opioid analgesia, and sedation only for severe agitation, to be used in conjunction with non-pharmacological measures. This approach constitutes a person-centred, humanistic approach to care for those with severe dementia.

4. In hospitals

Consider all older adults to be at risk of falls while in hospital, especially those with cognitive impairment. The [10 Topics](#) provide details on how to [ask patients about their history of falls](#), how to [assess risk factors](#) for falling and how to develop an [individualised care plan](#) to reduce the chance of harm from falls. [Topic 5](#) explains how to create a safe environment for an older person in hospital, and [Topic 8](#) explains medication optimisation to reduce the risk of falls. All these fundamental components of falls management apply to older people with cognitive impairment who are in hospital. But it is important to realise that some interventions will need to be specifically tailored to the older person's functional level.

Falls risk assessment can be undertaken as part of a comprehensive risk assessment when the older person is admitted to hospital. Some New Zealand hospitals are using the [Whakataketake risk assessment](#) process deployed in TrendCare, which also provides prompts for fall prevention interventions to consider. Staff may need to be frequently reminded to perform the appropriate risk assessments and referrals. Records of previous inpatient falls or episodes of delirium should be prominent.

Assess cognitive function

Guideline-directed clinical care should be delivered; for older patients who have fractured their hip, this means following the *Australian and New Zealand Guideline for Hip Fracture Care* ([ANZHFR 2014](#)).

This guideline recommends a formal assessment of cognitive function on first arrival, prior to surgery, and reassessment to monitor for delirium. The guideline also recommends an orthogeriatric co-care model of care. The importance of good hip fracture care is also discussed in [Topic 7](#).

Tools that can be used to screen for cognitive function include the quick and simple [4AT tool](#). The [mini mental state examination](#) (MMSE) is an effective tool for detecting dementia, and mild cognitive impairment, and for tracking clinical change (with 1.4 to 3 points change being significant) ([Pottie et al 2016](#)). However, the MMSE is now under licence. The [Montreal Cognitive Assessment](#) (MoCA) is a more nuanced tool for scoring mild cognitive impairment ([Trzepacz et al 2015](#)). Both the MMSE and the MoCA take about 10 minutes to administer.

A care with dignity approach

Health professionals vary in their ability to adapt their practice to meet the needs of people with dementia. Negative attitudes towards dementia, and a lack of knowledge and understanding of dementia prevented some professionals from working in person-centred ways ([Bamford et al 2018](#)). This means that additional training may be required to facilitate care with dignity. Some New Zealand hospitals are providing the required training; examples include the Bay of Plenty DHB '[Care Companion Programme](#)' workbook and the Whanganui DHB '[Close Care with Dignity](#)' training programme.

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Health care staff need to compensate for the person's cognitive impairment in delivering care. This involves ([Bamford et al 2018](#)):

- an understanding of dementia
- adapting communication style
- negotiating meaningful activities
- embedding activities into daily life
- involving carers to support rehabilitation activities.

Two studies involving nurses illustrate the challenges and need for a personal approach. A focus group study of nurses identified perceptions that the standard fall prevention interventions are not effective, and that competing patient priorities are a barrier to effective care of those with dementia. The nurses believed that one-on-one observation was an effective method for preventing falls ([Ayton et al 2017](#)). A second study analysed 23 reflective accounts of fall events and concluded that fall prevention in older people with cognitive impairment is complex. To reduce falls, nurses can involve the family and whānau, and 'know the patient' which can help to predict impulsive behaviours. The authors of this study suggest reconsidering the patient-sitter role (who could be a volunteer) from simple observer to an assistant, focused on ambulation and supporting independence in activities of daily living ([Grealish et al 2018](#)).

The Close Care with Dignity approach ensures that observation and assistance are combined with knowledge of the patient and their goals. Family and whānau will often be able to provide critical background on what causes an older person to fall or remain safe. Programmes to ensure patients are up, dressed and active when possible are also important. This is partly because we know that patients recently discharged from hospital are often deconditioned and at higher risk for falls at home ([Naseri et al 2018](#)).

De-escalation of agitation is fundamental in care for those with dementia. Medication should be used only after non-pharmacologic approaches ([see above](#)) have been tried. Some general guidance on [the role of antipsychotics in the management of patients with dementia](#) has been published by bpac^{nz}.

According to local experience at two DHBs, these Care Companion/Close Care with Dignity approaches, where caregivers observe and help patients to mobilise and achieve their goals are effective, and seem to work best when dedicated staff can deliver them at a single site.

Delirium and essential inpatient care

A summary of [appropriate care for older people with cognitive impairment in hospital](#), covering both delirium and dementia appeared in *The Medical Journal of Australia* (Caplan et al 2016) and conveys comprehensive advice and three case studies in just three pages.

Along with a history of falls, and advanced age, delirium is a primary risk factor for geriatric falls ([Mazur et al 2016](#)). Delirium is more common if it has occurred before, so previous events should be clearly recorded. It is also more common in those with dementia, previous falls, in those taking proton pump inhibitors, and after transfers between wards ([Otremba et al 2016](#)). Older people with dementia are particularly at risk of developing delirium during their hospital stay. Delirium is also associated with increased mortality, accelerated

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functional and cognitive decline, and earlier entry to residential care ([Caplan 2016](#)). A baseline assessment of cognitive function can help confirm the diagnosis of subsequent delirium.

The ANZHFR guideline on hip fracture care recommends adhering to the [NICE clinical guideline for delirium](#), which offers practical guidance on:

- risk factors for delirium
- indicators of delirium
- preventing delirium
- diagnosing delirium
- managing delirium.

In one study a hospital-wide education programme to enhance the identification and documentation of delirium was associated with a decrease in falls, although the study design makes it impossible to say whether this impact was causal ([Babine et al 2018](#)). The education intervention was interprofessional and delivered to doctors, nurses, physiotherapists, social workers and occupational therapists. It included modules on delirium and effective team communication. The study found that the [confusion assessment method](#) (CAM) identified delirium with 76 percent accuracy. This study is not unique and other studies have noted reductions in delirium and falls associated with high-intensity delirium prevention programmes ([Ferguson et al 2018](#), [Malik et al 2016](#)).

Referrals and follow-up

Ensure that those with cognitive impairment are referred to the appropriate rehabilitation and prevention programmes, including physiotherapy, exercise interventions, fracture liaison services and an assessment of bone health.

5. Secondary prevention after a fracture

Ideally, we want to prevent falls from happening, but once an older person falls or has a fracture then they are at increased risk of subsequent falls and fractures. We also know that people with dementia have poorer outcomes after fracturing their hip and receive less comprehensive care ([Harvey et al 2016](#)).

A Cochrane Review of enhanced rehabilitation and care models, following hip fracture surgery, for adults with dementia found very little evidence that different treatment programmes for people with dementia affect how well they recover ([Smith et al 2015](#)). A subsequent systematic review aimed to establish which interventions were effective at improving physical and psychological outcomes following fall-related injuries in individuals with cognitive impairment. Although some interventions showed short-term gains (multidisciplinary care and early mobilisation), only bone-preserving treatment with zoledronic acid provided long-term benefits ([Robalino et al 2018](#)).

Bisphosphonates including zoledronic acid

Secondary fracture prevention involves fall prevention and bone health. Given the lack of evidence for the effectiveness of many fall prevention interventions in those with cognitive impairment, improving bone health seems important. Follow the New Zealand clinical guidance for osteoporosis diagnosis and management ([Osteoporosis New Zealand 2017](#)).

However, individuals with cognitive impairment may have difficulty adhering to the specific administration requirements of oral bisphosphonates. An alternative is intravenous zoledronic acid. A single dose of the bisphosphonate zoledronate improved bone mineral density in frail elderly women ([Greenspan 2015](#)). Furthermore, the HORIZON recurrent fracture RCT showed that an annual infusion of zoledronic acid within 90 days after repair of a low-trauma hip fracture was associated with a reduction in the rate of new clinical fractures. The rates of any new clinical fracture were 8.6 percent in the zoledronic acid group and 13.9 percent in the placebo group, a 35 percent risk reduction with zoledronic acid ([Lyles et al 2007](#)). Further analysis of data from this study suggested the effect was comparable in patients with impaired cognitive status ([Prieto-Alhambra et al 2014](#)). This means that patients with cognitive impairment expected to live longer than six months may benefit from zoledronic acid. Prescription of zoledronic acid must meet [PHARMAC's criteria](#).

In patients for whom zoledronic acid is contraindicated due to creatinine clearance of less than 35 mL/min (or other reasons), PHARMAC has approved the option of [denosumab](#). PHARMAC notes that patients aged 75 years and over who have a history of significant osteoporotic fracture demonstrated radiologically do not require bone mineral density measurement for treatment with denosumab.

6. Possible interventions: Ideas and innovations

The two interventions described in this section are currently the subject of RCTs where the participants have mild cognitive impairment. The interventions have been deduced based on what ought to work, given the existing research literature.

Using the brain for physical gain

Professor Jacqueline Close spoke at the 7th Biennial Australian and New Zealand Falls Prevention Society Conference in 2016 about a complex community-based in-home intervention for fall prevention in people with cognitive impairment ([Close 2016](#)). The intervention for those with mild dementia is founded on the premises that:

- knowledge of functional cognition greatly assists the approach to care
- older people with cognitive impairment can learn habitual actions if we focus on their preserved functions and tailor support materials such as photos or written material
- it is possible to engage older people with dementia and their caregivers to deliver an intervention
- it is possible to impact identified risk factors.

The intervention includes exercise at home and home safety improvements. A pilot study indicated a non-significant 58 percent reduction in falls. The investigators learned that we shouldn't try to do too much over too short a period, and that flexibility in the protocol is important so it can be tailored to individuals. The full-scale RCT is currently ongoing and [full details and rationale can be found here](#).

Activity and safety after a diagnosis of dementia

A UK research team identified that fall prevention interventions are often poorly adapted to the needs of those with cognitive impairment and that falls guidelines recommend cognitive function be assessed, but do not give guidance on how to respond. With these facts in mind, the group has developed a tailored intervention to improve activity and reduce falls in older adults with mild cognitive impairment and mild dementia. A description of [the intervention and its justification can be found here](#). The intervention includes a professional assessment of ability, risk and goals, the use of capability-based tailoring, which involves assessment of neuropsychological impairments, the individual's usual level of physical activity and co-morbidities, and aligns activities to the person's interests and goals ([Harwood et al 2018](#)). This approach has much in common with the approach by Close et al described above.

In summary, there is weak evidence that some interventions to prevent falls and harm from falls in older adults with cognitive impairment can work. These findings are summarised in the [key messages](#) at the top of this report.

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