

Preventing Falls and Harm From Falls in Older People

Best Practice Guidelines
for Australian Residential Aged Care Facilities
2009

AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE



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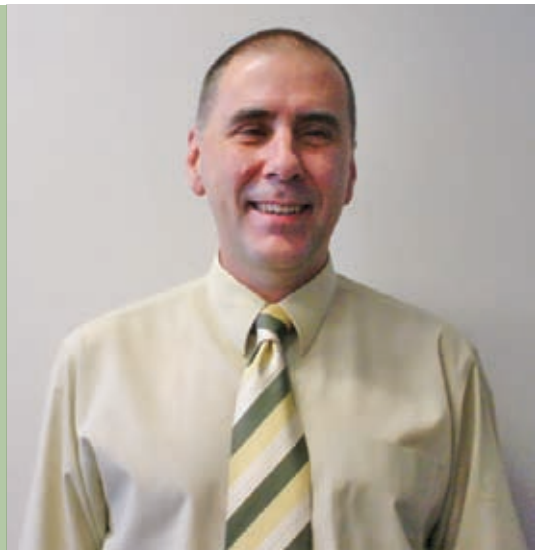
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Copies of this document and further information on the work of ACSQHC can be found at http://www.safetyandquality.gov.au or from the Office of the Australian Commission on Safety and Quality in Health Care on telephone: +61 2 9263 3633 or email to: mail@safetyandquality.gov.au.

Other resources available from http://www.safetyandquality.gov.au:

- *Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Community Care 2009*
- *Guidebook to Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Community Care 2009*
- *Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Hospitals 2009*
- *Guidebook to Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Hospitals 2009*
- *Guidebook to Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Residential Aged Care Facilities 2009*
- *Implementation Guide for Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Hospitals and Residential Aged Care Facilities 2009*
- Fact sheets
  - Falls facts for residents and carers
  - Falls facts for doctors
  - Falls facts for nurses
  - Falls facts for allied health professionals
  - Falls facts for support staff (cleaners, food services and transport staff)
  - Falls facts for health managers

Statement from the chief executive



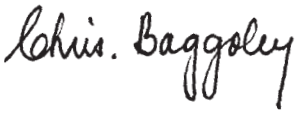
Australians today enjoy a longer life expectancy than previous generations, but for some this is disrupted by falls. As we age, our sure-footedness declines and, at the same time, our bones become increasingly brittle. The comment that 'he fell and broke his hip' is heard all too often — in fact, almost one in three older Australians will suffer a fall each year. Such falls can have extremely serious consequences, including significant disability and even death.

Falls are one of the largest causes of harm in care. Preventing falls and minimising their harmful effects are critical. During care episodes, older people are usually going through a period of intercurrent illness, with the resultant frailty and the uncertainty that brings. They are at their most vulnerable, often in unfamiliar settings, and accordingly attention has been paid to acquiring evidence about what can be done to minimise the occurrence of falls and their harmful effects, and to use these data in the national Falls Guidelines.

These new guidelines consider the evidence and recommend actions in the three main care settings: the community, hospitals and residential aged care facilities. Each of three separate volumes addresses one of these care settings, providing guidance on managing the various risk factors that make older Australians in care vulnerable to falling.

The Australian Commission on Safety and Quality in Health Care is charged with leading and coordinating improvements in the safety and quality of health care for all Australians. These new guidelines are an important part of that work.

The ongoing commitment of staff in community, hospital and residential aged care settings is critical in falls prevention. I commend these guidelines to you.



Professor Chris Baggoley
Chief Executive
Australian Commission on
Safety and Quality in Health Care
August 2009



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Acronyms

ACSQHC	Australian Commission on Safety and Quality in Health Care
ADLs	activities of daily living
BPPV	benign paroxysmal positional vertigo
CI	confidence interval
ICER	incremental cost-effectiveness ratio
NHMRC	National Health and Medical Research Council
OAB	overactive bladder
PBS	Pharmaceutical Benefits Scheme
ProFaNE	Prevention of Falls Network Europe
QALY	quality-adjusted life year
RACF	residential aged care facility
RCT	randomised controlled trial
RDI	recommended daily intake
RMMR	residential medication management review
VR	vestibular rehabilitation

Preface

Falls are a significant cause of harm to older people. The rate, intensity and cost of falls identify them as a national safety and quality issue. The Australian Commission on Safety and Quality in Health Care (ACSQHC) is charged with leading and coordinating improvements in the safety and quality of health care nationally, and has consequently produced these guidelines on preventing falls and harm from falls in older people.

Health care services are provided in a range of settings. Therefore, ACSQHC has developed three separate falls prevention guidelines that address the three main care settings: the community, hospitals and residential aged care facilities. Although there are common elements across the three guidelines, some information and recommendations are specific to each setting. Collectively, the guidelines are referred to as the Falls Guidelines.

This document, *Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Residential Aged Care Facilities 2009*, aims to reduce the number of falls and the harm from falls experienced by older people in residential aged care.

The guidelines and support materials are suitable for residential aged care facilities (RACFs) that:

- do not have a falls prevention program or plan in place
- have recently initiated a falls prevention program or plan
- have a successful falls prevention program or plan in place.

Older people themselves are at the centre of the guidelines. Their participation, to the full extent of their desire and ability, encourages shared responsibility in health care, better assures care quality and focuses accountability.

The guidelines are written to promote resident-centred independence and rehabilitation. RACF care in any form involves some risk for older people. The guidelines do not promote an entirely risk-averse approach to the health care of older people. Some falls are preventable, some are not. However, an excessively custodial and risk-averse approach designed to avoid complaints or litigation from older people and their carers may infringe on a person's autonomy and limit rehabilitation.

Whenever possible, these guidelines are based on research evidence and are written to supplement the clinical knowledge, competence and experience applied by health professionals. However, as with all guidelines and the principles of evidence based practice, their application is intended to be in the context of professional judgment, clinical knowledge, competence and experience of health professionals. The guidelines also acknowledge that the clinical judgment of informed professionals is best practice in the absence of good-quality published evidence. Some flexibility may therefore be required to adapt these guidelines to specific settings, to local circumstances, and to older people's needs, circumstances and wishes.

The following additional materials have been prepared to accompany the guidelines:

- *Guidebook for Preventing Falls and Harm From Falls in Older People: Australian Residential Aged Care Facilities 2009*
- Falls Guidelines — fact sheets.

The guidelines are the result of a review and rewrite of the first edition of the guidelines, *Preventing Falls and Harm from Falls in Older People — Best Practice Guidelines for Australian Hospitals and Residential Aged Care Facilities 2005*,[1] which were developed by the former Australian Council for Safety and Quality in Health Care.

Key messages of the guidelines

- Many falls can be prevented.
- Fall and injury prevention need to be addressed at both point of care and from a multidisciplinary perspective.
- Managing many of the risk factors for falls (eg delirium or balance problems) will have wider benefits beyond merely falls prevention.
- Engaging older people is an integral part of preventing falls and minimising harm from falls.
- Best practice in fall and injury prevention includes implementing standard falls prevention strategies, identifying fall risk and implementing targeted individualised strategies that are resourced adequately, and monitored and reviewed regularly.
- The consequences of falls resulting in minor or no injury are often neglected, but factors such as fear of falling and reduced activity level can profoundly affect function and quality of life, and increase the risk of seriously harmful falls.
- The most effective approach to falls prevention is likely to be one that includes all staff in health care facilities engaged in a multifactorial falls prevention program.
- At a strategic level, there will be a time lag between investment in a falls prevention program and improvements in outcome measures.

Acknowledgments

The Australian Commission on Safety and Quality in Health Care (ACSQHC) acknowledges the authors, reviewers and editors who undertook the work of reviewing, restructuring and writing the guidelines.

ACSQHC acknowledges the significant contribution of the Falls Guidelines Review Expert Advisory Group for their time and expertise in the development of the Falls Guidelines 2009.

ACSQHC also acknowledges the contribution of many health professionals who participated in focus groups, and provided comment and other support to the project. In particular, the National Injury Prevention Working Group, a network of jurisdictional policy staff, played a significant role communicating the review to colleagues and providing advice.

The guidelines build on earlier work by the former Australian Council for Safety and Quality in Health Care and by Queensland Health.

The contributions of the national and international external quality reviewers and the Office of the Australian Commission on Safety and Quality in Health Care are also acknowledged.

ACSQHC funded the preparation of these guidelines. Members of the Falls Guidelines Review Expert Advisory Group have no financial conflict of interest in the recommendations in the guidelines.

A full list of authors, reviewers and contributors is provided in Appendix 1.

ACSQHC gratefully acknowledges the kind permission of St Vincent's and Mater Health Sydney to reproduce many of the images in the guidelines.

Falls Guidelines Review Expert Advisory Group

Chair

Associate Professor Stephen Lord — Principal Research Fellow, Prince of Wales Medical Research Institute, The University of New South Wales

Members

Associate Professor Jacqueline Close — Senior Staff Specialist, Prince of Wales Hospital and Clinical School, The University of New South Wales; Honorary Senior Research Fellow, Prince of Wales Medical Research Institute, The University of New South Wales

Ms Mandy Harden — CNC Aged Care Education/Community Aged Care Services, Hunter New England Area Health Services, NSW Health

Professor Keith Hill — Professor of Allied Health, La Trobe University/Northern Health, Senior Researcher, Preventive and Public Health Division, National Ageing Research Institute

Dr Kirsten Howard — Senior Lecturer, Health Economics, School of Public Health, The University of Sydney

Ms Lorraine Lovitt — Leader, New South Wales Falls Prevention Program, Clinical Excellence Commission

Ms Rozelle Williams — Director of Nursing/Site Manager, Rice Village, Geelong, Victoria, Mercy Health and Aged Care

Project manager

Mr Graham Bedford — Policy Team Manager, ACSQHC

External quality reviewers

Associate Professor Ngaire Kerse — Associate Professor, General Practice and Primary Health Care, School of Population Health, Faculty of Medical and Health Sciences, The University of Auckland, New Zealand

Professor David Oliver — Consultant Physician and Clinical Director, Royal Berkshire Hospital, Reading, United Kingdom; Visiting Professor of Medicine for Older People, School of Community and Health Sciences, City University, London, United Kingdom

Associate Professor Clare Robertson — Research Associate Professor, Department of Medical and Surgical Sciences, Dunedin School of Medicine, University of Otago, New Zealand

Technical writing and editing

Ms Meg Heaslop — Biotext Pty Ltd, Brisbane

Dr Janet Salisbury — Biotext Pty Ltd, Canberra

Summary of recommendations and good practice points

This section contains a summary of the guidelines' recommendations and good practice points. These are also presented at the start of each chapter, with accompanying references and explanations.

Part B Standard falls prevention strategies

Chapter 4 Falls prevention interventions

Recommendations

Intervention

- A multifactorial approach using standard falls prevention interventions should be routine care for all residents of residential aged care facilities. (Level I)[7]
- In addition to a multifactorial approach using standard falls prevention interventions, develop and implement a targeted and individualised falls prevention plan of care based on the findings of a falls screen or assessment. (Level II)[31]
- Provide vitamin D with calcium supplementation to residents with low blood levels of vitamin D, because it works as a single intervention to prevent falls. (Level I)[7]
- Residents should have their medications reviewed by a pharmacist. (Level II)[32]

Chapter 5 Falls risk screening and assessment

Recommendations

Screening and assessment

- If a falls risk screening process is used as a first step, rather than an assessment of all residents on admission, all residents should be screened as soon as practicable thereafter, then regularly (every six months) or when a change in functional status is evident.
- Use separate screening tools for residents who can and cannot stand unaided.
- The introduction of falls risk screens and assessments needs to be supported with education for staff and intermittent reviews to ensure appropriate and consistent use.
- Screens and assessments will only be useful when supported by appropriate interventions related to the risks identified.
- Identifying the presence of cognitive impairment should form part of the falls risk assessment process.

Good practice points

Falls risk screening

- Using a formal screening tool has the benefit of forming part of routine clinical management, and will inform further assessment and care for all residents.
- If a resident is identified as being 'at risk' for any item on a multiple risk factor screen, interventions should be considered for that risk factor even if the person has a low falls risk score overall.

Falls risk assessment

- Conduct falls risk assessments for residents who exceed the threshold of a falls risk screening tool, who suffer a fall, or who move to or reside in a setting where most people are considered to have a high risk of falls (eg high-care facilities, dementia units).
- Interventions delivered as a result of the assessment provide benefit; therefore, it is essential that interventions systematically address the identified risk factors.

Part C Management strategies for common falls risk factors

Chapter 6 Balance and mobility limitations

Recommendations

Intervention

- Use supervised and individualised balance and gait exercises as part of a multifactorial intervention to reduce the risk of falls and fractures in residential aged care facility residents. (Level II)[58]
- Consider using gait, balance and functional coordination exercises as single interventions. (Level II)[59,60]

Good practice points

- Assessment tools can be used to:
  - quantify the extent of balance and mobility limitations and muscle weaknesses
  - guide exercise prescription
  - measure improvements in balance, mobility and strength
  - assess whether residents have a high risk of falling.
- Exercise should be supervised and delivered by appropriately trained personnel.

Chapter 7 Cognitive impairment

Recommendations

Assessment

- Residents with cognitive impairment should have other falls risk factors assessed.

Intervention

- Address identified falls risk factors as part of a multifactorial falls prevention program, and also consider injury minimisation strategies (such as hip protectors or vitamin D and calcium supplementation). (Level I)[7]

Good practice points

- Address all reversible causes of acute or progressive cognitive decline.
- Residents presenting with an acute change in cognitive function should be assessed for delirium and the underlying cause of this change.
- Residents with gradual-onset, progressive cognitive impairment should undergo detailed assessment to determine diagnosis and, where possible, reversible causes of the cognitive decline. Reversible causes of acute or progressive cognitive decline should be treated.
- If a resident with cognitive impairment does fall, reassess their cognitive status, including presence of delirium (eg using the Confusion Assessment Method tool).
- Interventions shown to work in cognitively intact populations should not be withheld from cognitively impaired populations; however, interventions for people with cognitive impairment may need to be modified and supervised as appropriate.

Chapter 8 Continence

Recommendations

Assessment

- Older residents should be offered a continence assessment to check for problems that can be modified or prevented.

Intervention

- ~~All residents should have a urinalysis to screen for urinary tract infections or function. (Level II-*)[112]~~
- Regular, individualised toileting should be in place for residents at risk of falling, as part of multifactorial intervention. (Level II)[60]
- Managing problems associated with urinary tract function is effective as part of a multifactorial approach to care. (Level II-*)[112]

Note: although there is observational evidence of an association between incontinence and falls, there is no direct evidence that interventions to manage incontinence affect the rate of falls.[113]

Chapter 9 Feet and footwear

Recommendations

Assessment

- In addition to standard falls risk assessments, screen residents for ill-fitting or inappropriate footwear.

Intervention

- As part of a multifactorial intervention program, prevent falls by making sure residents have fitted footwear. (Level II)[31]

Good practice points

- Include an assessment of foot problems and footwear as part of an individualised, multifactorial intervention for preventing falls in residents.
- Refer residents to a podiatrist for assessment and treatment of foot conditions as needed.
- Safe footwear characteristics include:
  - *soles:* shoes with thinner, firmer soles appear to improve foot position sense; a tread sole may further prevent slips on slippery surfaces
  - *heels:* a low, square heel improves stability
  - *collar:* shoes with a supporting collar improve stability.

Chapter 10 Syncope

Recommendations

Assessment

- Residents who report unexplained falls or episodes of collapse should be assessed for the underlying cause.

Intervention

- Assessment and management of presyncope, syncope and postural hypotension, and review of medications (including medications associated with presyncope and syncope) should form part of a multifactorial assessment and management plan for preventing falls in residents. (Level I-*)[34]
- Older people with unexplained falls or episodes of collapse who are diagnosed with the cardioinhibitory form of carotid sinus hypersensitivity should be treated with the insertion of a dual-chamber cardiac pacemaker. (Level II-*)[177]

Note: there is no evidence derived specifically from the residential aged care setting relating to syncope and falls prevention. Recommendations have been inferred from community and hospital populations.

Chapter 11 Dizziness and vertigo

Recommendations

Assessment

- Vestibular dysfunction as a cause of dizziness, vertigo and imbalance needs to be identified in residents in the residential care setting. A history of vertigo or a sensation of spinning is highly characteristic of vestibular pathology.
- Use the Dix–Hallpike test to diagnose benign paroxysmal positional vertigo. This is the most common cause of vertigo in older people, and can be identified in the residential aged care setting. This is the only cause of vertigo that can be treated easily.

Note: there is no evidence from randomised controlled trials that treating vestibular disorders will reduce the rate of falls.

Good practice points

- Use vestibular rehabilitation to treat dizziness and balance problems where indicated and available.
- Use the Epley manoeuvre to manage benign paroxysmal positional vertigo.
- Manoeuvres should only be done by an experienced person.

Chapter 12 Medications

Recommendations

Assessment

- Residents of residential aged care facilities should have their medications (prescribed and nonprescribed) reviewed at least yearly by a pharmacist after a fall, or after initiation or escalation in dosage of medication, or if there is multiple drug use.

Intervention

- As part of a multifactorial intervention,[37] or as a single intervention,[32] residents taking psychoactive medication should have their medication reviewed by a pharmacist and, where possible, discontinued gradually to minimise side effects and to reduce their risk of falling. (Level II)
- Limit multiple drug use to reduce side effects and interactions. (Level II-*)[37]

Chapter 13 Vision

Recommendations

Assessment

- Arrange regular eye examinations (every two years) for residents in residential aged care facilities to reduce the incidence of visual impairment, which is associated with an increased risk of falls.

Intervention

- Residents with visual impairment related to cataract should have cataract surgery as soon as practicable. (Level II-*)[237,238]
- Environmental assessment and modification should be undertaken for residents with severe visual impairments (visual acuity worse than 6/24). (Level II-*)[239]
- When correcting other visual impairment (eg prescription of new glasses), explain to the resident and their carers that extra care is needed while the resident gets used to the new visual information. Falls may increase as a result of visual acuity correction. (Level II-*)[240]
- Advise residents with a history of falls or an increased risk of falls to avoid bifocals or multifocals and to use single-lens distance glasses when walking — especially when negotiating steps or walking in unfamiliar surroundings. (Level III-2-*)[241]

Note: there have not been enough studies to form strong, Evidence based recommendations about correcting visual impairment to prevent falls in any setting (community, hospital, residential aged care facility), particularly when used as single interventions. One trial, set in the community, showed an increase in falls as a result of visual acuity assessment and correction.[240] However, correcting visual impairment may improve the health of the older person in other ways (eg by increasing independence). Considerable research has linked falls with visual impairment in the community setting, although no trials have reduced falls by correcting visual impairment, and these results may also apply to the residential aged care setting.

Chapter 14 Environmental considerations

Recommendations

Assessment

- Residents considered to be at a higher risk of falling should be assessed by an occupational therapist and physiotherapist for specific environmental or equipment needs and training to maximise safety.

Intervention

- Environmental review and modification should be considered as part of a multifactorial approach in a falls prevention program. (Level I)[7]

Good practice points

- Residential aged care facility staff should discuss with residents their preferred arrangement for personal belongings and furniture. They should also determine the resident's preferred sleeping arrangements.
- Make sure residents' personal belongings and equipment are easy and safe for them to access.
- Check all aspects of the environment and modify as necessary to reduce the risk of falls (eg furniture, lighting, floor surfaces, clutter and spills, and mobilisation aids).
- Conduct environmental reviews regularly, and consider combining them with occupational health and safety audits.

Recommendations

Intervention

- Include individual observation and surveillance as components of a multifactorial falls prevention program, but take care not to infringe on residents' privacy. (Level III-2-*)[38]
- Falls risk alert cards and symbols can be used to flag high-risk residents as part of a multifactorial falls prevention program, as long as appropriate interventions are used as follow-up. (Level II-*)[185]
- Falls alerts used on their own are ineffective. (Level II)[35]
- Consider using a volunteer sitter program for people who have a high risk of falling, and define the volunteer roles clearly. (Level IV-*)[281,282]
- Residents with dementia should be observed more frequently for their risk of falling, because severe cognitive impairment is predictive of lying on the floor for a long time after a fall. (Level III-2-*)[38]

Note: most falls in residential aged care facilities are unwitnessed.[23] Therefore, as is done in the hospital setting, the key to reducing falls is to improve surveillance, particularly for residents with a high risk of falling.[38]

Good practice points

- Individual observation and surveillance are likely to prevent falls. Many falls happen in the immediate bed or bedside area, or are associated with restlessness, agitation, attempts to transfer and stand, lack of awareness or wandering in people with dementia.
- Residents who have a high risk of falling should be identified and checked regularly.
- A staff member should stay with at-risk residents while they are in the bathroom.
- Although many residents are frail, not all are at a high risk of falling; therefore, surveillance interventions can be targeted to those residents who have the highest risk.
- A range of alarm systems and alert devices are commercially available, including motion sensors, video surveillance and pressure sensors. They should be tested for suitability before purchase, and appropriate training and response mechanisms should be offered to staff. Suppliers of these devices should be located if a facility is considering this intervention. However, there is no evidence that their use in residential aged care facilities reduces falls or improves safety.

Chapter 16 Restraints

Recommendation

Assessment

- Causes of agitation, wandering or other behaviours should be investigated, and reversible causes of these behaviours (eg delirium) should be treated before the use of restraint is considered.

Note: physical restraints should be considered the last option for residents who are at risk of falling[289] because there is no evidence that their use reduces incidents of falls or serious injuries in older people.[290-293] However, there is evidence that they can cause death, injury or infringement of autonomy.[294,295]

Good practice points

- The focus of caring for residents with behavioural issues should be on responding to the resident's behaviour and understanding its cause, rather than attempting to control it.
- All alternatives to restraints should be considered, discussed with family and carers, and trialled for residents with cognitive impairment, including delirium.
- If all alternatives are exhausted, the rationale for using restraint must be documented and an anticipated duration agreed on by the health care team, in consultation with family and carers, and reviewed regularly.
- If drugs are used specifically to restrain a resident, the minimal dose should be used and the resident reviewed and monitored to ensure their safety. Importantly, chemical restraint must not be a substitute for alternative methods of restraint outlined in this chapter.

Part D Minimising injuries from falls

Chapter 17 Hip protectors

Recommendations

Assessment

- When assessing a resident's need for hip protectors in a residential aged care facility (RACF), staff should consider the resident's recent falls history, age, mobility and steadiness of gait, disability status, and whether they have osteoporosis or a low body mass index.
- Assessing the resident's cognition and independence in daily living skills (eg dexterity in dressing) may also help determine whether they will be able to use hip protectors.

Intervention

- Use hip protectors to reduce the risk of fractures for frail, older people in institutional care. (Level I)[302]
- Hip protectors must be worn correctly for any protective effect, and the residential care facility should educate and train staff in the correct application and care of hip protectors. (Level II)[303]
- When using hip protectors as part of a falls prevention strategy, RACF staff should check regularly that the resident is wearing their protectors, that the hip protectors are in the correct position, and that they are comfortable and the resident can put them on easily. (Level I)[302]

Good practice point

- Hip protectors are a personal garment and should not be shared among people.

Chapter 18 Vitamin D and calcium supplementation

Recommendation

Intervention

- Vitamin D and calcium supplementation should be recommended as an intervention strategy to prevent falls in residents of residential aged care facilities. (Level I)[7]

Good practice point

- Assess whether residents are receiving adequate sunlight for vitamin D production.

Chapter 19 Osteoporosis management

Recommendations

Assessment

- Residents with a history of recurrent falls should be considered for a bone health check. Also, residents who sustain a minimal-trauma fracture should be assessed for their risk of falls.

Intervention

- Residents with diagnosed osteoporosis or a history of low-trauma fracture should be offered treatment for which there is evidence of benefit. (Level I)[349]
- Residential aged care facilities should establish protocols to increase the rate of osteoporosis treatment in residents who have sustained their first osteoporotic fracture. (Level IV)[350]

Good practice points

- Strengthening and protecting bones will reduce the risk of injurious falls.
- In the case of recurrent fallers and those sustaining low-trauma fractures, health care professionals and care staff should consider strategies for optimising function, minimising a long lie on the floor, protecting bones, improving environmental safety and prescribing vitamin D.
- When using osteoporosis treatments, residents should be co-prescribed vitamin D with calcium.

Part E Responding to falls

Chapter 20 Post-fall management

Recommendation

Assessment

- Staff of residential aged care facilities should complete a post-fall assessment for every resident who falls.

Good practice points

- Residential aged care facility (RACF) staff should report and document all falls.
- It is better to ask a resident whether they remember the sensation of falling rather than whether they think that they blacked out, because many older people who have syncope are unsure whether they blacked out.
- RACF staff should follow the facility's post-fall protocol or guideline for managing residents immediately after a fall.
- After the immediate follow-up of a fall, review the fall. This should include trying to determine how and why a fall may have occurred, and implementing actions to reduce the risk of another fall.
- An in-depth analysis of the fall event (eg a root-cause analysis) is required if there has been a serious injury following a fall, or if there has been a death from a fall.





Part A
Introduction



1 Background

1.1 About the guidelines

These guidelines aim to improve the safety and quality of care for older people. They are designed for health professionals providing care in Australian residential aged care settings and offer a nationally consistent approach to preventing falls, based on best practice recommendations. The development of these guidelines was funded and managed by the Australian Commission on Safety and Quality in Health Care (ACSQHC).

The guidelines advocate autonomy, independence, enablement and rehabilitation in the context of acceptable risk of falling. A degree of risk is inevitable in promoting autonomy in older people.

Any fall needs to be considered in the context of the care provided relative to best practice for the individual within the specific environment. Some falls may continue to occur even when best practice is followed. In such cases, there remains a need for vigilant monitoring, review of the care plan, and implementation of actions to minimise injury risk.

1.2 Scope of the guidelines

1.2.1 Targeting older Australians

Falls can occur at all ages, but the frequency and severity of falls-related injury increases with age.[2] These guidelines have been developed with older people — defined as people aged 65 years and over — in mind. When considering Indigenous Australians, *older people* commonly refers to people aged over 50 years.[3] These guidelines may also apply to younger people at increased risk of falling, such as those with a history of falls, neurological conditions, cognitive problems, depression, visual impairment or other medical conditions leading to an alteration in functional ability.[4]

1.2.2 Specific to Australian residential aged care facilities

These guidelines have been developed for Australian residential aged care facilities (RACFs) that provide high-level or low-level care. They are not specifically directed at retirement villages, although much of the content is also applicable to this setting. Separate guidelines have been developed for both the hospital and community settings.

1.2.3 Relevant to all residential aged care facility staff

All RACF staff have a role to play in preventing falls in residents. These guidelines have been developed for all those who are involved in the care of residents. This includes support services as well as clinical, management and corporate staff.

1.3 Terminology

1.3.1 Definition of a fall

For a nationally consistent approach to falls prevention within Australian facilities, it is important that a standard definition of a *fall* be used. For the purpose of these guidelines, the following definition applies:

> A fall is an event which results in a person coming to rest inadvertently on the ground or floor or other lower level.[5]

To date, no national data definition for a fall exists in the National Health Data Dictionary (run by the Australian Government's Australian Institute of Health and Welfare).

1.3.2 Definition of an injurious fall

These guidelines use the Prevention of Falls Network Europe (ProFaNE) definition of an *injurious fall*. They consider that the only injuries that could be confirmed accurately using existing data sources are peripheral fractures — defined as any fracture of the limb girdles and of the limbs. Head injuries, maxillo-facial injuries, abdominal, soft tissue and other injuries are not included in the recommendation for a core dataset.†

However, other definitions of an injurious fall include traumatic brain injuries (TBIs) as a falls-related injury, particularly as falls are the leading cause of TBIs in Australia (representing 42% of TBI-related hospitalisations in 2004–05).[6]

1.3.3 Definition of assessment and risk assessment

In these guidelines, *assessment* is defined as an objective evaluation of the resident's functional level by their ability to perform certain tasks and activities of daily living (eg dressing, feeding, grooming, mobilising).

Falls risk assessment is a detailed and systematic process used to identify a person's risk factors of falling. It is used to help identify which interventions to implement. Falls risk assessment tools should be validated prospectively in more than one group or study (see Chapter 5 for more detail).

† http://www.profane.eu.org

1.3.4 Definition of interventions

An intervention is a therapeutic procedure or treatment strategy designed to cure, alleviate or improve a certain condition. Interventions can be in the form of medication, surgery, early detection (screening), dietary supplements, education or minimisation of risk factors.

In falls prevention, interventions can be:

- targeted at single risk factors — *single interventions*
- targeted at multiple risk factors
  - *multiple interventions* — where everyone receives the same, fixed combination of interventions
  - *multifactorial interventions* — where people receive multiple interventions, but the combination of these interventions is tailored to each person, based on an individual assessment.

This classification of interventions targeting multiple risk factors is used by the Cochrane Collaboration (which is based on the ProFaNE classification†).

In general, trials have shown that interventions that target multiple risk factors (that is, both multiple and multifactorial interventions) are more effective than most single interventions for preventing falls and associated injuries for residents in RACFs.[7] However, vitamin D with calcium supplementation appears to be effective as a single intervention for residents who have low blood levels of vitamin D.[7] Part C contains more information about the types of interventions that are available in the RACF setting.

1.3.5 Definition of evidence

These guidelines use a definition of *evidence* based on Health-evidence.ca — a Canadian online resource funded by the Canadian Institutes of Health Research, and run by McMaster University.‡ They define evidence as:

> Knowledge from a variety of sources, including qualitative and quantitative research, program evaluations, client values and preferences, and professional experience.

Furthermore, these guidelines were developed using the principles of *evidence based practice*, which is the process of integrating clinical expertise and resident preferences and values with the results from clinical trials and systematic reviews of the medical literature. This approach also involves avoiding interventions that are shown to be less effective or harmful.

Section 1.4 provides more details on the development of the guidelines using an evidence based approach.

1.4 Development of the guidelines

1.4.1 Expert advisory group

To guide and provide advice to the project, a multidisciplinary expert panel (the Falls Guidelines Review Expert Advisory Group) was established in 2008. This included specialists in the areas of falls prevention research, measurement and monitoring, quality improvement, change management and policy, as well as health care professionals from fields including geriatric medicine, allied health and nursing. Whenever necessary, the expert panel accessed resources outside its membership. An additional external quality reviewer was appointed to review the guidelines from an Australian perspective.

Furthermore, an internationally renowned, independent quality reviewer (with expertise in the RACF setting) reviewed these guidelines.

† http://www.profane.eu.org

‡ http://health-evidence.ca/

1.4.2 Review methods

These guidelines were developed by drawing on:

- the previous version of the guidelines
- a search of the most recent literature for each risk factor or intervention
- the most recent Cochrane review of falls prevention interventions in the RACF setting
- feedback from health professionals and policy staff implementing the previous guidelines
- clinical advice from the expert advisory group
- guidance from external expert reviewers
- guidance from international external expert reviewers
- guidance from specialist groups (such as the Royal Australian College of General Practitioners, Australian Association of Gerontology and Continence Foundation of Australia).

The review methods used were nonsystematic, because a systematic review of each aspect of falls prevention, for each setting (community, hospital and residential aged care), was beyond the capacity and timeframe of this update of the guidelines.

Due to these constraints, it was not possible to follow the National Health and Medical Research Council's (NHMRC) detailed requirements for developing and grading clinical practice guidelines.[8] In particular, search terms and details of study inclusion and exclusion criteria were not recorded, data extraction tables were not compiled for included studies, quality appraisal criteria were not systematically applied and the body of evidence was not graded in the way set out by the NHMRC.

However, the expert group was mindful of the need for a thorough review of the evidence supporting each recommendation. The methods used to review assessment and intervention recommendations are described briefly below.

Assessment

Assessment recommendations were based on information supplied by the clinical experts, supplemented by general literature reviews where relevant. The text of each section describes the supporting information and provides a rationale for each recommendation. As NHMRC methods for reviewing diagnostic questions have not been followed, no attempt has been made to apply levels of evidence or to grade these recommendations.

Interventions

Rapid literature searches were carried out to identify the highest quality information for each intervention (systematic reviews — particularly Cochrane reviews — meta-analyses, and randomised controlled trials). This is in line with recommended methods for evidence based practice where answers to clinical questions are needed quickly, based on rapid identification of the best quality literature.[9] The information retrieved in this way was checked and supplemented by information from the extensive personal research databases of the clinical experts. Each chapter was reviewed by an external, expert reviewer, before whole-of-guideline review by an expert for each setting.

Economic evaluation

A systematic review of published economic evaluations was undertaken. Literature was searched in Medline (1950 to end July 2008), CINAHL (1982 to end July 2008) and EMBASE (1980 to end July 2008). MeSH terms (Economics/; or Economics, Medical/; or Economics, Hospital/; or Technology Assessment, Biomedical/; or Models, economic/) and text words for economic evaluations (cost effectiveness, cost utility, cost benefit, economic evaluation) were combined, together with text words relating to falls or to hip protectors. Reference lists of relevant studies and reviews were also searched, and Australian researchers were contacted.

The search identified 388 abstracts. All abstracts were reviewed; those that did not appear to be economic evaluations of either falls prevention interventions or hip protectors were excluded. Studies that included relevant data or information were retrieved and their full-text versions were analysed and examined for study eligibility. Across all interventions, 27 papers that considered the costs or economic benefits of falls prevention interventions or hip protectors were identified. The methods, results and limitations of these papers are discussed in the relevant intervention sections.

1.4.3 Levels of evidence

Using the NHMRC's six-point rating system for intervention research, each paper was classified according to the strength of evidence that can be derived given the specific methods used in the paper. Table 1.1 lists the six levels of evidence.

Table 1.1 National Health and Medical Research Council levels of evidence

Level	Description
I	Evidence obtained from a systematic review of all relevant randomised controlled trials
II	Evidence obtained from at least one properly designed randomised controlled trial
III-1	Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method)
III-2	Evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case–control studies, or interrupted time series with a control group
III-3	Evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group
IV	Evidence obtained from case series, either post-test, or pretest and post-test

NHMRC = National Health and Medical Research Council
Source: NHMRC[10]

It is possible to have methodologically sound (Level I) evidence about an area of practice that is clinically irrelevant or has such a small effect that it is of little practical importance. These issues were not formally reviewed during this update of the guidelines (see above), but relevant issues are described in the text of each section and were taken into account by the expert group in developing the recommendations.

A particular problem in assessing evidence for falls prevention is that research studies of an intervention have often been carried out in a different setting (eg in a hospital setting but not in a residential aged care setting). In these guidelines, the highest level of evidence for an intervention is reported regardless of the setting; however, when the research setting is not an RACF, an * is added to the level (eg Level I-*). This shows that caution is needed when applying economic implications for that recommendation to the RACF setting.

The guidelines will be reviewed in 2014.

1.5 Consultation

The consultation process involved a call for submissions, an online survey, multiple nationwide workshops (in all state and territory capitals and a number of regional centres), teleconferences and targeted interviews with key stakeholders. An extensive range of useful, high-quality responses to these processes assisted in the development of the guidelines (and subsequent implementation process) as well as in identifying other areas of action.

In addition, specialist groups provided invaluable feedback on previous guidelines and draft versions of this guideline. They included the National Injury Prevention Working Group, the Australian Association of Gerontology, the Royal Australian College of General Practitioners and the Continence Foundation of Australia.

Development of the 2005 guidelines was underpinned by a large consultative process, from which these guidelines benefit.

1.6 Governance of the review of the Australian Falls Guidelines

The Falls Guidelines development project was directed by ACSQHC in conjunction with its Inter-Jurisdictional, Private Hospital Sector and Primary Care committees. It was managed by the Office of the Commission on the advice of the Falls Guidelines Review Expert Advisory Group, which recommended the final guidelines for endorsement to the commission.

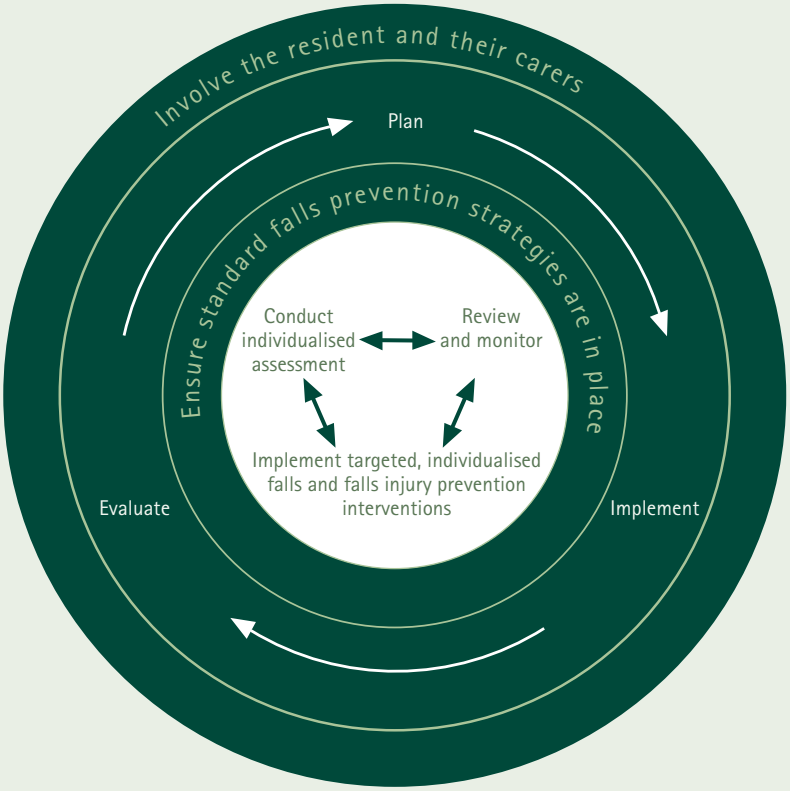
1.7 How to use the guidelines

1.7.1 Overview

Figure 1 is a diagrammatic representation providing a step-by-step overview of how to use the guidelines to prevent falls and falls injuries in residents in Australian RACFs, in the context of consumer involvement. It is split into two linked sections:

- The bold arrows in the outer circle represent the strategic level. This is a 15-step approach in three sections
  - plan a falls and falls injuries prevention program
  - implement a falls and falls injuries prevention program
  - evaluate a falls and falls injuries prevention program.
- The inner circle represents interventions that can be applied at the point of care (that is, the site of patient care). A best practice approach of individualised assessment followed by targeted, individualised interventions is presented in Parts B to D of the guidelines *(Standard falls prevention strategies, Management strategies for common falls risk factors* and *Minimising injuries from falls)*.





Plan

Plan for implementation

Step 1: Identify teams
Step 2: Identify, consult, analyse and engage key stakeholders
Step 3: Assess organisational readiness
Step 4: Analyse falls

Plan for evaluation

Step 5: Establish a baseline

Plan for quality improvement

Step 6: Review current clinical practice

Implement

Step 7: Decide on implementation approaches
Step 8: Determine process for implementation
Step 9: Conduct trial
Step 10: Learn from trial
Step 11: Proceed to widespread implementation for improvement
Step 12: Sustain implementation

Evaluate

Step 13: Measure process
Step 14: Measure outcomes
Step 15: Report and respond to results

Figure 1.1 Using the guidelines to prevent falls in Australia

1.7.2 How the guidelines are presented

The guidelines are presented in five parts, as follows:

- Part A — Introduction
- Part B — Standard falls prevention strategies
  - single and multiple falls prevention interventions
  - falls risk screening and assessment
- Part C — Management strategies for common falls risk factors
  - strategies for managing common risk factors
  - 11 specific assessments and interventions
- Part D — Minimising injuries from falls
  - hip protectors
  - vitamin D and calcium supplementation
  - osteoporosis management
- Part E — Responding to falls.

For ease of reference, Parts C and D consider each falls risk factor and assessment or intervention in separate chapters. However, these interventions are generally most successful when used in combination. Interventions and assessments to minimise falls risk factors are discussed first (Part C), followed by interventions to minimise harm from falls (Part D). This does not imply importance of one chapter over another.

Health care professionals and carers should consider the advantages and risks of using injury-prevention strategies, as outlined in Part D, to give residents in the RACF setting extra protection from falls and related injury. These strategies can be used after a fall or applied systematically to the population at risk.

Chapters on intrinsic and extrinsic risk factors in Parts C and D begin with a set of evidence based recommendations (assessment or intervention, or both, as appropriate). The supporting information for these recommendations is presented in the remainder of the chapter, which is organised into:

- background information — contains an overview of the risk factor or intervention, and a summary of the relevant literature on clinical trials
- principles of care — explains how to implement the intervention of interest
- special considerations — provides information relevant to specific groups (eg Indigenous and culturally and linguistically diverse groups, rural and remote populations, people with cognitive impairment)
- economic evaluation — summarises the relevant literature on health economics.

The guidelines contain text boxes for important information, as outlined below.



Evidence based recommendations

- Evidence based recommendations are presented in boxes at the start of each section, accompanied by references. They were selected based on the best evidence and accepted by the project's expert advisory group and external quality reviewers.
- Where possible, separate recommendations for assessment and interventions are given. Assessment recommendations have been developed by the expert group based on current practice and a review of the literature discussed in the text of each section.
- Intervention recommendations are based on a review of the research on the use of the intervention. Each recommendation is accompanied by a reference to the highest quality study upon which it is based, as well as a level of evidence (see Section 1.4.3 for an explanation of levels of evidence).

Recommendations based on evidence nearer the I end of the scale should be implemented, whereas recommendations based on evidence nearer the IV end of the scale should be considered for implementation on a case-by-case basis, taking into account the individual circumstances of the resident.



Good practice points

- Good practice points have been developed for practice where there have not been any studies; for example, where there are no studies assessing a particular intervention, or where there are no studies specific to a particular setting. In these cases, good practice is based on clinical experience or expert consensus.



Point of interest

These boxes indicate points of interest. Most points of interest were revealed by the Australia-wide consultation process or from grey literature (conference proceedings, etc).



Case study

These boxes indicate case studies. These case studies provide information on likely scenarios and are used as illustrative examples.

Boxes containing additional information, such as useful websites, organisations or resources, are also provided. References are listed at the end of the guidelines.



2 Falls and falls injuries in Australia

A brief summary of the background information derived from the literature about falls in residential aged care facilities (RACFs) follows. Specific literature related to risk factors for falling is outlined in the relevant sections.

2.1 Incidence of falls

Falls-related injury is one of the leading causes of morbidity and mortality in older Australians.[11] Residents in an RACF experienced an incidence of falls nearly five times more than people of the same age in their own home.[12] These falls required hospitalisation. In 2005–06, 21% of serious falls occurred in RACFs, and RACFs are one of the most frequent places to fall.[12] The peak age for falls in an RACF is 85–89 years.[12]

2.2 Fall rates in older people

Injuries requiring hospitalisation increase with age (beginning at 65 years) and falls are the biggest reason for these injuries.[13] Every year, approximately 30% of Australians older than 65 years fall, with 10% of these falls leading to injury.[11] Along with cognitive impairment and incontinence, falls are one of the major factors in precipitating admission to RACFs.[14] The proportion of falls-related overnight admissions that do not go home is 80%, as opposed to 4.5% of other admissions.[15]

An increase in falling as people get older is associated with decreased muscle tone, strength and fitness as a result of physical inactivity. Medications can contribute to an increased risk of falling. Alcohol consumption can also lead to more falls, particularly if the alcohol interacts with certain medications.[13] Impaired vision also contributes to falls.[13]

In RACFs, fall rates vary according to case mix, so that the fall and injury rates are likely to be different for mobile people with dementia compared with dependent people in high-level care. Fall rates in RACFs vary from 4 to 10 falls per 1000 resident bed days,[16,17] while rates between one and five falls per resident per year have also been reported. This means up to half of all residents experience one or more falls in a 12-month period.[2]

Fall injury rates in RACFs in people aged 65 years and older were approximately 7200 falls per 100 000 people[12] in 2005–06, which is an increase from 2003–04. Most falls requiring hospitalisation occurred in the home (49%), followed by falls in an RACF (22%).[13]

The potential for falls multiplies once older people enter health care facilities. Even with high rates of falls, there may still be under-reporting of events.[18]

2.3 Impact of falls

The hip and thigh are the most common injured areas in both men and women sustaining falls.[12] Femur fractures from falls have been decreasing since 1999–2000,[12] by 1.3% per year for men and 2.2% for women. Head injuries are also common (more so for men) and indicate that injury-prevention mechanisms for the head should be considered as well as for the hip and thighs.[12]

Hip fractures are one of the most common reasons for hospital admissions, with the majority (91%) caused by falls.[13] Hip fractures impose heavily on the community due to increased death and morbidity, decreased independence, increased burden on family members and carers, increased costs due to rehabilitation and increased admittance into RACFs.[13] In people older than 65 years of age, 3.6% of falls-related hospital admissions result in death.[15]

Falls also result in wrist fractures, when people put their arms out to break the fall.[13]

Falls may increase the risk of complications, including the likelihood of developing a fear of falling or loss of confidence in walking, extending the length of stay in a hospital or other facility, additional diagnostic procedures or surgery, and litigation.[2] Additionally, falls may result in caregiver stress and fear of litigation among clinical and administrative staff.[2]

2.4 Cost of falls

In addition to injuries, the effects of falls are costly to the individual — in terms of function and quality of life[2] — and to the community. Research across all settings identifies that, in the face of an ageing population, if nothing more is done to prevent falls by 2051:

- the total estimated health cost attributable to falls-related injury will increase almost threefold from A$498.2 million in 2001 to A$1375 million per year in 2051
- 3320 additional RACF places will be required.

To maintain the current health costs, there will need to be a 66% reduction in the incidence of falls-related hospitalisations by 2051.[19]

2.5 Economic considerations in falls prevention programs

In health care, resources are limited — there are insufficient resources to provide all programs to all people. Therefore, health care providers and funders need to choose programs to ensure they are getting good value for money. This means that it is no longer enough to demonstrate that an intervention is effective — it should also be a good use of scarce health care resources. Individual and organisational components of programs for preventing falls should be selected by weighing up the costs and the benefits (health outcomes). Health care providers must decide how they can facilitate improvements in health outcomes with finite resources, choosing the most effective intervention they can afford.

Economic evaluation of falls prevention programs is an important element of the overall decision-making process when comparing different options for falls prevention. An economic evaluation (often called a cost-effectiveness analysis) compares both costs and health outcomes of alternative health care programs. Health outcomes from a falls prevention intervention can be counted in 'natural units', such as falls prevented, fractures prevented, deaths prevented and survival — often expressed as 'life years saved' (LYS) — or as multidimensional health outcomes, which include both survival and quality of life in a single composite measure (such as a 'quality-adjusted life years' — QALYs).

The cost effectiveness of a new program is assessed by comparing the costs and health outcomes of the new program with the costs and health outcomes of an alternative program (often current clinical practice or usual care) by calculating an 'incremental cost effectiveness ratio' (ICER). The ICER represents the extra cost for each additional unit of health outcome, and is a measure of value for money. Programs with lower ICERs offer better value for money (they are most cost effective) than programs with higher ICERs.

2.6 Characteristics of falls

The literature contains numerous studies reporting on the epidemiology of falls. These include the characteristics and circumstances of older people who fall, such as the time and place of the fall and resultant injury.[12]

Falls most commonly seen in RACFs are due to tripping, slipping and stumbling (21.6%).[12] Falling down stairs is relatively uncommon in RACFs (0.7% of all falls).[12]

Falls are associated with a number of factors, such as environmental obstacles, dementia, delirium, incontinence and medications. Falls data[20-22] reveal the following consistent information:[23-25]

- The bedside is the most common place for falls to occur, while the bathroom is frequently mentioned.
- A high percentage of falls are associated with elimination and toileting.
- The incidence of falls occurs across all age groups, but there is an increasing prevalence of falls in older people.
- A high percentage of falls are unwitnessed.

There is little difference between the types of fall experienced by older men and women.[12] However, women have more falls in RACFs (23.6%) than men (17.5%).[12] Falls-related follow-up care admissions identified femur fractures as the most common fracture in both men and women (45.3% and 47.8% respectively) after a fall.[12]

2.7 Risk factors for falling

There are a number of risk factors for falling among residents in RACF settings.

A person's risk of falling increases as their number of risk factors accumulates.[26] Risk factors may be intrinsic (those related to a person's behaviour or condition) or extrinsic (those related to a person's environment or their interaction with the environment). Table 2.1 summarises the intrinsic and extrinsic risk factors for falling in RACFs.

Table 2.1 Risk factors for falling in residential aged care facilities

Intrinsic risk factors	Extrinsic risk factors
Increased age	Relocation between settings
Acute health status	Environmental hazards
History of previous falls	
Wandering behaviour	
Cognitive impairment	
Maximal drop in postprandial (after eating) systolic blood pressure of at least 20 mm Hg, and in diastolic blood pressure of at least 10 mm Hg within three minutes of standing	
Deterioration in performance of activities of daily living	
Reduced lower extremity strength or balance	
Unsteady gait or use of a mobility aid	
Independent transfers or wheelchair mobility	
Use of antidepressant medication, multiple drug use, or drug side effects	
Impaired vision	
Diabetes mellitus	

Source: National Ageing and Research Institute[2]

Best practice for preventing falls in RACFs includes four components:

- implementing standard falls prevention strategies
- identifying falls risks
- implementing interventions targeting these risks to prevent falls
- preventing injury to those people who do fall.

While the body of knowledge about the risks of falls and how to reduce these risks is continually growing, it appears that most interventions are effective when used as part of a multifactorial approach. However, in the RACF setting, there is also evidence that certain single interventions, such as hip protectors, vitamin D and calcium supplementation, or pharmacist review of medications, prevent fractures or reduce the risk of falls in some residents.[7,27]

Implicit in this multifactorial approach is the engagement of the resident and their carers as the centre of any falls prevention program.



3 Involving residents in falls prevention

Consumer participation in health is central to high-quality and accountable health services. It also encourages shared responsibility in health care. Consumers can help facilitate change in health care practices.

Health care professionals and care staff should consider the following things to encourage residents of residential aged care facilities to participate in falls prevention:

- Make sure the falls prevention message is presented within the context of staying independent for longer.[28]
- Be aware that the term 'falls prevention' could be unfamiliar and the concept difficult to understand for many residents in this older age group.[28]
- Provide relevant and usable information to allow residents and their carers to take part in discussions and decisions about preventing falls[29] (see the fact sheets on preventing falls).
- Find out what changes a resident is willing to make to prevent falls, so that appropriate and acceptable recommendations can be made.[29]
- Offer information in languages other than English where appropriate;[29] however, do not assume literacy in their native language.
- Explore the potential barriers that may prevent residents from taking action to prevent falls (such as low self-efficacy and fear of falling) and support residents to overcome these barriers.[29]
- Develop falls prevention programs that are flexible enough to accommodate the resident's needs, circumstances and interests.[29]
- Place falls prevention posters in the residential aged care facility and in common areas used by residents and family members.
- Ask family members to assist in falls prevention strategies.
- Trial a range of interventions with the resident.[30]



Part B
Standard falls prevention strategies



4 Falls prevention interventions

Recommendations

Intervention

- A multifactorial approach using standard falls prevention interventions should be routine care for all residents of residential aged care facilities. (Level I)[7]
- In addition to a multifactorial approach using standard falls prevention interventions, develop and implement a targeted and individualised falls prevention plan of care based on the findings of a falls screen or assessment. (Level II)[31]
- Provide vitamin D with calcium supplementation to residents with low blood levels of vitamin D, because it works as a single intervention to prevent falls. (Level I)[7]
- Residents should have their medications reviewed by a pharmacist. (Level II)[32]

4.1 Background and evidence

In these guidelines, the term *standard falls prevention interventions* refers to routine care. This section outlines evidence, interventions and resources to address specific falls risk factors. Most of these interventions have been components of multifactorial programs shown to be successful for reducing falls or the number of people who fall in the residential aged care facility (RACF) setting. The successful interventions all required considerable human resources and expertise to complete the intervention packages. Without additional resources, the success of falls prevention interventions is not guaranteed, and this should be kept in mind when designing and implementing interventions. However, there is also evidence that certain single interventions, such as hip protectors or vitamin D and calcium supplementation, prevent fractures or reduce the risk of falls in some residents of RACFs.[7,27]

The causes of falls are often complex, and people with multiple risk factors have a higher rate of falls than those with fewer risk factors.[4] To prevent falls, residents of RACFs should first be assessed for their falls risk, and then a range of standard precautionary strategies should be put into place.[7,27,31,33] After the assessment process has been completed and standard falls prevention strategies are in place, those factors that are identified as contributing to a resident's risk of falling can be addressed with an individualised plan for daily care, focused on preventing falls.

Where possible, these guidelines provide suggestions on how these strategies could be implemented, by whom, and at what point in time. However, given the unique features of each RACF, the health care team will need to make local decisions about how best to integrate falls prevention actions into a resident's plan for daily care. Each resident has a unique set of falls risk factors and personal preferences, and these require an individualised plan of action to minimise falls and harm from falls.

4.2 Choosing falls prevention interventions

All RACF staff members (including support, clinical, administrative and managerial staff), as well as the resident and their carers (where appropriate), have a role to play in falls prevention, as outlined below.

4.2.1 Multifactorial interventions

Multifactorial interventions have been the most studied form of falls prevention strategies for residential aged care. A draft Cochrane review has pooled the results for seven multifactorial studies.[34] This analysis showed that overall the number of fallers in the intervention arms of the studies was reduced by 10% (risk ratio = 0.90; 95%CI 0.82 to 0.98). Subgroup analyses indicated that multidisciplinary team interventions and those involving comprehensive geriatric assessment were the most effective for reducing the number of fallers, whereas nurse-led interventions that did not include exercise were not effective. The findings of one study suggested low-intensity interventions may be worse than usual care.[35]

Key components from the successful trials included:

- multidisciplinary team interventions[31,33]
- comprehensive geriatric assessment[31,36]
- staff education[31,33]
- balance exercises (see Chapter 6)
- medication review (see Chapter 12)
- environmental adaptations (see Chapter 14)
- hip protectors (for preventing hip fractures) (see Chapter 17)
- post-fall management (see Chapter 20).

One trial that reduced recurrent falls and was not included in the Cochrane analysis due to its cluster-randomised design used an individual assessment with subsequent individual treatment plans.[37] Interventions comprised many of the key interventions listed above, including medication review, environmental adaptations, transfer and mobility assistance, and staff education.

As with interventions in hospitals,[38] there is perhaps a necessity for intensive and sustained falls prevention programs with a focus on cognitive impairment and a whole-system approach to facility-based falls prevention (with associated work practice change) led by facility staff. Ongoing evaluation of prevention strategies with monitoring of falls using standard definitions (see Section 1.3) is crucial for determining the effectiveness of prevention strategies.

4.2.2 Single interventions

Some interventions used in multifactorial interventions have prevented falls and fractures as single interventions. These include:

- medication review[32]
- vitamin D with calcium supplementation in people with low blood levels of vitamin D (to prevent falls and fractures)[7,39-41]
- hip protectors (to reduce hip fractures).[27]



Multifactorial case study: decreasing the number of risk factors can reduce the risk of falling[4]

Mrs R is a 79-year-old woman who was transferred by ambulance to hospital from her residential aged care facility (RACF) after fracturing her left inferior pubic ramus (pelvis). This injury was the result of a fall onto the floor while she was rushing to the toilet.

The orthopaedic team admitted Mrs R from the emergency department and, because the fracture was stable, they decided that she would be allowed to walk and weight bear as pain permitted. From the outset, nursing staff implemented standard strategies for falls prevention and, because Mrs R was admitted as the result of a fall, staff completed a falls risk assessment rather than a less detailed falls risk screen.

Information from the falls risk assessment and the accompanying transfer letter from Mrs R's RACF revealed that she had multiple risk factors for falling, which included that she:

- is older than 65 years
- has fallen three times in the previous year
- is taking five different medications, including a sleeping tablet and diuretic
- on last attempt (a month previously), was only able to complete the Timed Up and Go Test (TUG) in 19 seconds with her wheelie walker, while the mean time for healthy 71–79-year-old people is 15 seconds[42,43]
- is frequently incontinent of urine at night and regularly rushes to the toilet
- had a Mini-Mental State Examination (MMSE) score of 22/30 before falling and was frequently agitated (a score of less than 24 indicates cognitive impairment)
- has left foot pain as the result of severe hallux valgus
- wears bifocal glasses for all activities, despite having a second pair of distance glasses for walking
- does not like to venture outdoors and receives no direct sunlight.

When Mrs R returned home to the RACF, in addition to standard falls prevention strategies and in response to the risk assessment, staff implemented targeted, individualised interventions to reduce Mrs R's risk of falling. These interventions included a medication review and advice by the medical officer on the importance of getting enough sunlight for vitamin D, advice from the occupational therapist about wearing well-fitting shoes with nonslip soles and some simple exercises for strengthening core body muscles for better balance, demonstrated by the physiotherapist.

As a result of these multifactorial interventions, Mrs R:

- has a minimised risk of medication interactions and adverse medicine events
- has a more restful sleep due to physical exertion throughout the day
- has better management of her urinary incontinence
- experiences fewer episodes of agitation
- has less pain in her left foot from her hallux valgus
- is able to clearly see the floor in front of her while walking
- has improved the condition of her muscles and bones.

The health care teams at both the hospital and the RACF were all made aware of changes to Mrs R's care through chart entries, case conferences and appropriate discharge correspondence. Mrs R and her family were made aware of the changes to her care through a scheduled meeting with the health care team.

4.3 Special considerations

4.3.1 Cognitive impairment

The national consultation process that informed the first edition of these guidelines indicated that falls and cognitive impairment are key concerns for residents and health care workers alike. Consequently, cognitive impairment continues to have a dedicated chapter (Chapter 7) as well as being included as a special consideration within most sections.

For residents who are suffering from delirium or cognitive impairment, where it is unsafe for them to move or be transferred without help, individual observation and surveillance must be increased, and help with transfers provided as required.

4.3.2 Rural and remote settings

A common problem in rural and remote settings is a shortage of some health professionals. Where this is the case, options to support available expertise include communicating by telephone and videoconferencing with experts or facilities with advanced programs in place in other regions. In instances where this approach is used, local staff should:

- ensure they have standard strategies in place before calling for support from external specialist staff
- complete necessary screening, assessments and identification of appropriate interventions so that the basic assessments and interventions are in place by the time they are linked with the external support.

4.3.3 Indigenous and culturally and linguistically diverse groups

The risk of falls may be greater if people from Indigenous and culturally and linguistically diverse groups cannot read signs or understand information given by staff,[2] or be adequately assessed due to language difficulties.

There is some evidence that falls prevention strategies may work differently among culturally and linguistically diverse groups (eg cultural differences in exercise preferences and dietary intake of calcium from dairy products).[44]

General points to consider when conveying falls prevention messages to Indigenous and culturally and linguistically diverse groups include:

- the importance of interpreters
- the use of communication and translation boards
- seeking and using written information in the appropriate language and cultural context
- learning some basic words from the person's first language.

4.4 Economic evaluation

An economic evaluation compares the costs and health outcomes of a falls prevention program with the costs and health outcomes of an alternative (often current clinical practice or usual care). Results of economic evaluations of specific falls prevention interventions are presented in the relevant intervention chapters.

5 Falls risk screening and assessment

Recommendations

Screening and assessment

- If a falls risk screening process is used as a first step, rather than an assessment of all residents on admission, all residents should be screened as soon as practicable thereafter, then regularly (every six months) or when a change in functional status is evident.
- Use separate screening tools for residents who can and cannot stand unaided.
- The introduction of falls risk screens and assessments needs to be supported with education for staff and intermittent reviews to ensure appropriate and consistent use.
- Screens and assessments will only be useful when supported by appropriate interventions related to the risks identified.
- Identifying the presence of cognitive impairment should form part of the falls risk assessment process.

Good practice points

Falls risk screening

- Using a formal screening tool has the benefit of forming part of routine clinical management, and will inform further assessment and care for all residents.
- If a resident is identified as being 'at risk' for any item on a multiple risk factor screen, interventions should be considered for that risk factor even if the person has a low falls risk score overall.

Falls risk assessment

- Conduct falls risk assessments for residents who exceed the threshold of a falls risk screening tool, who suffer a fall, or who move to or reside in a setting where most people are considered to have a high risk of falls (eg high-care facilities, dementia units).
- Interventions delivered as a result of the assessment provide benefit; therefore, it is essential that interventions systematically address the identified risk factors.

5.1 Background and evidence

The terms *falls risk screening* and *falls risk assessment* are sometimes used interchangeably; however, there are some clear differences, and in these guidelines they are considered separate but related processes. Screening is a process that primarily aims to identify people at increased risk. In the residential aged care facility (RACF) setting, a falls risk screen can be used to identify people who require a high level of supervision and a more detailed falls risk assessment.[7] Falls risk assessments aim to identify those factors that increase falls risks and that may be amenable to intervention.

Many falls risk screening and assessment tools have been developed for use in RACFs. However, only some of these have been evaluated for reliability and predictive validity in prospective studies, and only some have a reasonable sensitivity and specificity. That is, they have acceptably high accuracy in predicting fallers who do fall in the follow-up period; and high accuracy for predicting non-fallers who do not fall in the follow-up period. Most have also been validated only in one RACF — usually the facility where the tool was developed. While this provides some useful information, risk screening and assessment tools have reduced validity (eg ability to distinguish between fallers and non-fallers) when used outside the original research setting.[45] From a research perspective, further testing is needed of risk assessment tools in a variety of clinical settings to establish their validity and reliability for general use.[46] Screening and assessment are not stand-alone actions in falls prevention. Screening and assessment need to be linked to an action plan to address any modifiable falls risk factors they identify. Even where risk factors for falling cannot be reversed, alternative strategies can be implemented to minimise the risk of falling or to prevent injury.

5.1.1 Falls risk screening

Falls risk screening is a brief process of estimating a person's risk of falling and classifying people as being at either low or increased risk. People with a high risk may then be referred for a more detailed falls risk assessment. Falls risk screening usually involves reviewing only a few items. Positive screening on certain screen items can also provide information about intervention strategies.

In many RACF settings, more than half the residents would be considered to have an increased risk of falling;[31,47] therefore, the falls risk screening process may be of limited value. In these facilities, it may be beneficial to skip the screening process and implement a full falls risk assessment of all residents. The introduction of a falls risk screen needs to be supported with education for staff and regular reviews to ensure appropriate and consistent use.

The simplest falls risk screen that can be incorporated easily into routine care should record the resident's history of falls. However, a prospective cohort study concluded that staff judgment of residents' falls risks, as well as previous falls, were both superior to the performance-based Timed Up and Go and Modified Get Up and Go tests.[42] Another study that compared four different risk screening and assessment tools found that the question of whether or not the resident had fallen in the previous 12 months had the greatest predictive accuracy for identifying future fallers.[48]

Despite these results, one potential benefit of using a screening tool rather than clinical judgment as a screen is that a screening tool can form part of routine clinical management that should inform further assessment and care for residents. In contrast, clinical judgment depends on a staff member's judgment of falls risk in the context of a range of other medical problems, rather than depending on consideration of the falls risk in isolation.

If a formal falls risk screen is used, it is important that it is reliable and valid for the RACF setting. Unfortunately, falls in RACFs are not easy to predict and most falls risk screening tools have predictive values of less than 70% sensitivity and specificity, meaning that more than 30% of cases are misclassified either as fallers when they are not, or not as fallers when they are.[48] Alternative methods have been investigated; for example, one study used a 'mobility interaction fall chart' to discriminate between older people with and without a high risk of falling.[47] However, a subsequent validation study could not replicate the results.[49]

An Australian study developed screening tools for predicting falls over a six-month period in 2005 residents from 80 nursing homes and 50 intermediate-care hostels.[50] This study concluded that two different falls risk screening tools are required in RACFs: one for people who can stand unaided and one for those who cannot.[50] Importantly, the validity of the screening tools was assessed with split-half analyses (ie assessing whether the falls screens developed from half the RACFs were predictive of falls in the other half), providing confidence that the screens would be predictive beyond the research study sites.

5.1.2 Falls risk assessment

Falls risk assessment is a more detailed process than screening and is used to identify underlying risk factors for falling. Many falls risk assessments also classify people into low and high falls risk groups. Several studies have used specific falls risk assessments to identify falls risk factors,[33,35,37,51] such as gait and balance,[52] exercise capacity[53,54] and medication use.[32] Falls risk assessment tools vary in the number of risk factors they include and how each risk factor is assessed. Relatively few falls risk assessment tools have been investigated for their reliability and predictive validity, and results have been reasonable for those that have been evaluated.[48]

5.2 Principles of care

5.2.1 Falls risk screening

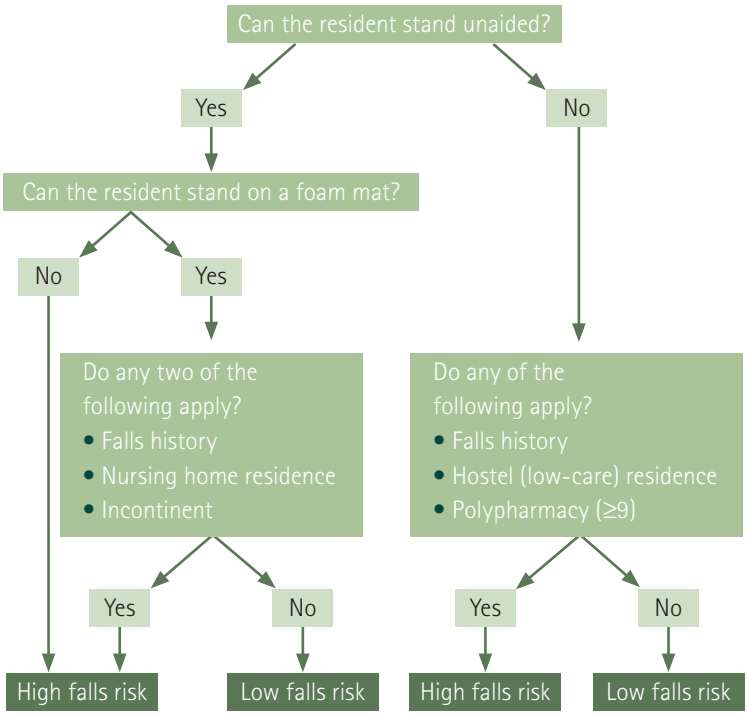
Most residents of RACFs have an increased risk of falling.[31] While some facilities may prefer to use a screening tool to identify those at increased risk who require a falls risk assessment, other facilities may decide to administer falls risk assessments for all residents.[4]

If an RACF is using a screening process as part of a multifactorial intervention to identify residents who need a falls risk assessment, rather than conducting a falls risk assessment on all residents, then:

- all older people who are admitted to RACFs should be screened for their falls risk, and this screening should be done as soon as practicable after they are admitted
- a falls risk screen should be undertaken regularly (every six months) and when a change in functional status is evident.

Falls risk screening can be done by a member of the multidisciplinary health care team who understands the process, and can administer the tool, interpret the results and make referrals where indicated. A resident's risk of falling can change quickly; therefore, a falls risk screen should be done when changes are noted in a resident's health or functional status, as well as when there is a change in environment. Additionally, a falls risk screen should be undertaken regularly (ie every six months).

In residents who can stand unaided, having either poor balance or two of the following risk factors — a previous fall, high level of care or urinary incontinence — increases the risk of falling threefold in the following six months (sensitivity = 73%, specificity = 55%). In residents who cannot stand unaided, having one of the following risk factors — a previous fall, low level of care or using nine or more medications — increases the risk of falling twofold (sensitivity = 87%, specificity = 29%). A separate screening test should be used for residents who cannot stand unaided.[50] Figure 5.1 is an algorithm for classifying the falls risk of RACF residents.



Source: Delbaere[50]

Figure 5.1 Algorithm summarising classification of residents as high or low falls risk

The outcomes of the screen need to be documented, as well as discussed with the resident. When the threshold score of a screening tool is:

- *exceeded*, a falls risk assessment should be conducted as soon as practicable
- *not exceeded*, the person is considered at low risk of falling and standard falls prevention strategies apply.

If any item on a multiple risk factor screen is identified as being 'at risk', interventions should be considered for that risk factor — even if the resident has a low falls risk score overall. For example, if a resident can stand unaided, does not have a recent history of falls and is residing in a hostel (low-level care), but does have incontinence, this would place them at a low overall falls risk. However, a preventive approach would include assessment and implementation of an intervention to address the incontinence at this time.

5.2.2 Falls risk assessment

Assessing falls risk in RACFs typically involves the use of multifactorial assessment tools that cover a wide range of falls risk factors. When identifying the cause of a fall, it is also important to remember that most falls occur as a result of an interaction between intrinsic and extrinsic factors, and that multiple factors increase the risk of falls.[55] Many diseases that are more common in older people increase the risk of falls — mainly through impairing cognitive functioning and postural stability. Most assessment tools focus only on intrinsic falls risk factors, so a separate environmental assessment may be indicated to identify extrinsic falls risk factors (see Chapter 14).

Falls risk should be assessed for those people who exceed the threshold of a falls risk screening tool, who suffer a fall, or who move to or reside in a setting where most people are considered to have a high risk of falls (eg dementia units).

Relatively few general falls risk assessment tools have been developed for use in RACFs. Validated tools should be used, rather than developing a new tool. The health care team should be careful if adapting an assessment tool to their particular setting, because this limits the applicability of any previous validation studies. When a falls risk assessment is introduced, it needs to be supported by education for staff and regular reviews to ensure its appropriate and consistent use.[4] Usually in the RACF setting, nursing staff are primarily responsible for completing falls risk assessments and consulting with medical and other health care professionals as indicated and possible.

So far, there is no consensus on which falls risk factors should be included in a falls risk assessment tool. Table 5.1 summarises the Peninsula Health Falls Risk Assessment Tool (FRAT), which is useful for assessing falls risk because of its applicability to Australian health care facilities. Further details of FRAT are provided in Appendix 2.

Table 5.1 Peninsula Health Falls Risk Assessment Tool (FRAT)

Description	The FRAT has three sections: Part 1 — falls risk status, Part 2 — risk factor checklist and Part 3 — action plan. The complete tool (including the instructions for use) is a full falls risk assessment tool. However, Part 1 can be used as a falls risk screen.
Time needed	Approximately 15–20 minutes
Criterion	Medium risk: score of 12–15 High risk: score of 16–20

Source: Stapleton[56]

The outcomes of the falls risk assessment, together with the recommended strategies to address identified risk factors, need to be documented, as well as reported to other health care staff, and discussed with the resident and their carer(s) (where applicable). Assessment tools provide detailed information on the underlying deficits contributing to overall risk and should be linked to intervention and management. Interventions delivered as a result of the assessment provide benefit; therefore, it is essential that interventions to address the risks identified are applied systematically.

More specific assessments may be indicated for some risk factors (see Table 5.2). Descriptions of these assessments are provided in the respective chapters, as indicated in the table.

Table 5.2 Specific risk-factor assessments

Characteristic/ feature	Functional measure	Assessment	Description
Impaired balance			
Impaired balance	Ability to stand on floor or foam mat unaided		Chapter 6
	Reduced mobility	Mobility interaction fall chart, Six-Metre Walk Test, Timed Up and Go Test	
	Muscle weakness	Sit-to-Stand Test	
Cognitive impairment			
Dementia or delirium	Psychogeriatric Assessment Scale (PAS) Folstein Mini-Mental State Examination (MMSE); Rowland Universal Dementia Scale (RUDAS); Confusion Assessment Method (CAM)		Chapter 7
Incontinence	Urinary and fecal	Questionnaires, assessment, physical examination	Chapter 8
Feet and footwear	Footwear analysis Foot problems (ie bunions, corns) and deformities	Safe shoe checklist Podiatrist assessment	Chapter 9 and Appendix 4

Characteristic/ feature	Functional measure	Assessment	Description
Syncope	Postural hypotension	Lying and standing blood pressure measurements	Chapter 10
	Carotid sinus hypersensitivity	Carotid sinus massage by a medical specialist	
Dizziness and vertigo	Benign paroxysmal positional vertigo	Dix–Hallpike test	Chapter 11
	Peripheral vestibular function	Halmagyi head thrust test	
Medications	Benzodiazepines	Medication review	Chapter 12
	Specific serotonin reuptake inhibitors and tricyclic antidepressants	Medication review	
	Antiepileptic drugs and drugs that lower blood pressure	Medication review	
	Some cardiovascular medications	Medication review	
Vision	Visual acuity	Snellen eye chart, pictorial vision tests	Chapter 13
Environment	Impaired mobility, visual impairment	General environmental checklist	Chapter 14 and Appendix 5
Individual surveillance and observation	Impaired mobility, high falls risk	Flagging, sitter programs, response systems, review and monitoring	Chapter 15
Restraints	Delirium, short-term elevated falls risk	Restraint policy	Chapter 16

Case study

Mr D, who lives in a low-level aged care facility, recently slipped and fell. He had substantial bruising, but no broken bones. As part of the facility's routine policy after a fall, a falls risk assessment was undertaken to determine if there were any risk factors contributing to this fall. This assessment documented that Mr D had recently started taking sleeping tablets, had increasing unsteadiness in his walking and balance, and had increasing frequency of incontinence. A review by the general practitioner resulted in trialling a nonmedication approach to improving sleep (including stopping afternoon naps and having his last coffee at lunchtime). The physiotherapist introduced a supervised exercise program to improve balance, and also provided Mr D with a walking stick to improve steadiness during walking. Finally, a continence assessment identified strategies to improve Mr D's continence, and these were implemented. Four months later, Mr D had regained his previous mobility and confidence, and had no further falls.

5.3 Special considerations

5.3.1 Cognitive impairment

Identifying the presence of cognitive impairment should form part of the falls risk assessment process. The presence of cognitive impairment may mean that desired falls prevention interventions need to be modified to make sure they are suitable for the individual; often RACF staff will also play an important role in implementing falls prevention actions.

A randomised controlled trial of a multifactorial intervention for falls and related injuries included residents with cognitive impairment in the study group of residents in RACFs.[31] The multifactorial intervention included staff education, environmental modification, exercise, supply and repair of aids, medication review, hip protectors, post-fall case conference and staff guidance. The trial used a falls risk assessment as a key element to guide interventions (although the falls risk assessment itself was not tested as part of the intervention). A subanalysis of residents with cognitive impairment found that this group had a significant reduction in falls-related injuries after the intervention was implemented.[57]

5.3.2 Rural and remote settings

Falls risk assessments can usually be performed by any trained member of the health care team. With medical, nursing and health professional shortages in some rural and remote settings, flexibility and up-skilling of team members may be required for assessments and interventions to be implemented.

5.3.3 Indigenous and culturally and linguistically diverse groups

To assess adequately the falls risk of people from Indigenous and culturally and linguistically diverse groups, RACF staff need to consider assessing the person in their primary language and in a culturally appropriate manner. This may require using a translation and interpretation service.

5.3.4 People with limited mobility

The FREE study showed that risk factors for falls in people in RACFs who could not stand unaided were different from risk factors for falls for people with good standing ability.[50] Important risk factors for falls in people who cannot stand unaided are a previous fall, low level of care and using nine or more medications. These factors should be included in falls risk screens for this group.



Part C
Management strategies for common falls risk factors



6 Balance and mobility limitations

Recommendations

Intervention

- Use supervised and individualised balance and gait exercises as part of a multifactorial intervention to reduce the risk of falls and fractures in residential aged care facility residents. (Level II)[58]
- Consider using gait, balance and functional coordination exercises as single interventions. (Level II)[59,60]

Good practice points

- Assessment tools can be used to:
  - quantify the extent of balance and mobility limitations and muscle weaknesses
  - guide exercise prescription
  - measure improvements in balance, mobility and strength
  - assess whether residents have a high risk of falling.
- Exercise should be supervised and delivered by appropriately trained personnel.

6.1 Background and evidence

Balance is a highly complex skill in which the body's centre of mass is controlled within the limits of stability. This requires integration of accurate sensory information (such as vision and proprioception) and a well-functioning musculoskeletal system (eg not adversely affected by muscle weakness, pain or contracture) to execute appropriate movements. Different combinations of muscle actions are required to maintain balance (ie prevent falling) during the wide range of everyday mobility tasks (eg standing, reaching, walking, climbing stairs). Increasing age, inactivity, disease processes and muscle weakness can impair balance.[61]

Residents of residential aged care facilities (RACFs) have a particularly high risk of falling.[16,62] Residents who are able to stand have an even higher risk of falling than those who are unable to stand. An Australian study of 1000 RACF residents found that 81% of residents who were able to rise from a chair but could not stand unaided fell during the follow-up period (which lasted for an average of 15 months); conversely, 48% of residents who could neither stand from a chair nor stand unaided fell.[63] RACF staff and the rest of the health care team should consider these differences when designing and evaluating exercise interventions.

In three randomised controlled trials (RCTs) in RACFs, exercise prevented falls.[59,60,64] The impact of exercise (as a single intervention) on falls has not been as well investigated in RACFs as it has in community settings. Many of the 14 randomised trials that have investigated exercise-only interventions in RACFs have been small and have looked at a range of exercise programs.[58] Multifactorial interventions including exercise have the potential to prevent falls and fractures in RACF residents.[7] Table 6.1 provides a summary of the methods and results from randomised trials involving large study samples that included exercise interventions for the prevention of falls.

Table 6.1 Summary of falls prevention interventions that included an exercise component used in residential aged care facility settings

Author	Sample size	Intervention description	Frequency (times/week)	Session duration	Program duration	Intervention effect on falls/ fallers[34]
Becker et al[33]	981	• Exercise: group-based, supervised, progressive balance and resistance exercises delivered by exercise instructors. Resistance exercises individually tailored and included the use of ankle weights and dumbbells. • Other: hip protectors, environmental modification, walking aid check, staff and resident education.	2 days/week	75 minutes	12 months	Falls: rate ratio=0.55 (95%CI 0.41 to 0.73) Fallers: risk ratio=0.75 (95%CI 0.57 to 0.98) Significant reduction in falls and fallers
Dyer[65]	196	• Exercise: group or individually supervised gait, balance, flexibility, strength and endurance exercises that were linked to functional lifestyle tasks where possible, such as safe transfers, dressing and the use of walking aids. Exercises were progressed with weights and thera-bands and were delivered by exercise assistants supported by physiotherapists. • Other: medical screening and referral to optometrist or podiatrist, occupational therapist assessment of environmental hazards, staff education.	3 days/week	40 minutes	3 months	Falls: rate ratio=0.54 (95%CI 0.42 to 0.69) Fallers: risk ratio=1.03 (95%CI 0.59 to 1.80) Significant reduction in falls
Faber et al[53]	238	• Exercise: group-based 'functional walking' (FW) exercises compared with 'in-balance' (IB) exercises. FW included 10 exercises focusing on gait, balance, coordination and transfers, including: – sit-to-stand (with and without use of arms) – trunk and upper limb movements while standing with minimal support – moving objects between two tables – heel and toe standing and walking – walking along a straight line forwards, backwards and sideways – stepping up, down and over a step – stair ascent and descent with reducing support – tandem standing and walking – one-legged stance.	1 day/week for 4 weeks, then 2 days/week for 16 weeks	90 minutes	20 weeks	Falls: rate ratio=1.32 (95%CI 1.09 to 1.60) Significant increase in risk IB: rate ratio=0.96 (95%CI 0.78 to 1.18) No significant effect Fallers: FW: risk ratio=1.31 (95%CI 0.86 to 1.99) Nonsignificant increased risk

Author	Sample size	Intervention description	Frequency (times/week)	Session duration	Program duration	Intervention effect on falls/ fallers[34]
Faber et al[53]	238	• IB exercises included 7 elements of tai chi: – relaxation exercises in standing position involving trunk rotation, arm swinging and weight transfer – stretch and relax exercises involving arm movements and weight shifting – pelvis exercises involving pelvic rotation while seated and standing – seated foot and ankle exercises – seated and standing leg strengthening, starting with knee extensions and progressing to squats – balance exercises starting with seated sensory lower limb stimulation and progressing to walking in slow motion – balance dance — a simplified form of tai chi, which combines all the previous exercises. • Functional exercises including standing up from a chair and bed, standing on the floor, and walking with an emphasis on correct posture.	1 day/week for 4 weeks, then 2 days/week for 16 weeks	90 minutes	20 weeks	IB: rate ratio=1.18 (95%CI 0.78 to 1.77) No significant effect
Jensen et al[31]	384	• Exercise: physiotherapist-supervised exercises focused on gait, balance, strength and safe transfers that were progressed to challenge individual capacity. • Other: medication review, modification of environmental hazards, supply or repair of walking aids, hip protectors, staff education.	2–3 days/week	Not specified	11 weeks	Falls: rate ratio=0.75 (95%CI 0.51 to 1.10) Fallers: risk ratio=0.71 (95%CI 0.54 to 0.94) Significant reduction in fallers
Lord et al[59]	551	• Exercise: group exercise delivered by exercise instructors: – weight-bearing balance exercises including tandem foot standing, heel–toe walking, line walking, standing on one leg, altering the base of support, weight transfers (from one leg to another), rocking back and forth onto toes and heels, rotating on the spot, lateral movement challenges, reaching and stretching movements away from the centre of gravity (forwards, laterally and upwards) – muscle strengthening – coordination.	2 days/week	1 hour	12 months	Falls: rate ratio=0.78 (95%CI 0.62 to 0.99)[a] Significant reduction in falls

Author	Sample size	Intervention description	Frequency (times/week)	Session duration	Program duration	Intervention effect on falls/ fallers[34]
McMurdo et al[51]	133	• Exercise: supervised, seated exercise aimed at improving balance, strength and flexibility. • Other: medication review, optometrist review (if required), review of lighting levels.	2 days/week	30 minutes	6 months	Falls: rate ratio=0.78 (95%CI 0.49 to 1.24) Fallers: risk ratio=0.66 (95%CI 0.37 to 1.18) Nonsignificant reduction
Mulrow et al[52]	194	• Exercise: physiotherapist-delivered, individually tailored and supervised exercises focused on improving gait, balance, functional mobility, flexibility and strength. Resistance was progressed with the use of weights or elastic bands.	3 days/week	30–45 minutes	4 months	Falls: rate ratio=0.82 (95%CI 0.94 to 1.84) Fallers: risk ratio=1.16 (95%CI 0.83 to 1.61) Nonsignificant increase in falls and fallers
Sakamoto[66]	553	• Exercise: single-leg stance practice with eyes open. Supervised by physiotherapist or similar professional.	3 times/day	1 minute each leg/ repetition	6 months	Falls: rate ratio=0.82 (95%CI 0.64 to 1.04) Fallers: risk ratio=0.90 (95%CI 0.65 to 1.23) Nonsignificant reduction
Schnelle et al[60]	190	• Exercise: individually tailored and supervised by research staff. Walking or wheelchair ambulation, sit-to-stand, upper body resistance training (arm curls or arm raises). • Other: incontinence management (toileting every 2 hours) and offering fluids every 2 hours.	5 days/week, up to 4 times/ day	Not specified	8 months	Falls: rate ratio=0.62 (95%CI 0.38 to 1.0) Significant reduction in falls Fallers: risk ratio=0.62 (95%CI 0.37 to 1.06) Nonsignificant reduction in fallers

CI = confidence interval
a Data obtained from Sherrington et al[58]

6.1.1 Risk factors for falling

Balance and mobility are often poor in RACF residents. Balance and mobility are likely to further deteriorate if the resident becomes less active and is not encouraged to perform activities of daily living themselves, with assistance only when required.

Assessing balance or mobility as a single risk factor is unlikely to be the best way of establishing which RACF residents are more likely to fall. Rather, multiple risk factors for falls in residential care have been identified, including cognitive impairment, psychoactive medication use, multiple medication use, urinary incontinence and falls history.[50,62,63,67] The United Kingdom National Institute of Clinical Excellence concluded that the key risk factors for falling in RACFs are:[68]

- a history of falls
- gait deficit
- balance deficit
- visual impairment
- cognitive impairment.

6.1.2 Improving balance and mobility with exercise

Systematic reviews have found that well-designed exercise programs can benefit older residents of RACFs. Specifically, rehabilitation interventions can reduce disability in long-term residents with few adverse effects,[69] and physical training can improve strength and mobility.[70] Therefore, these interventions have the potential to prevent falls.

6.1.3 Exercise for preventing falls

In two trials in RACFs, exercise prevented falls.[59,60,64] However, because other studies have had conflicting results, the role of exercise as a single intervention needs to be further investigated before firm conclusions can be reached regarding its effectiveness. A meta-analysis of the effects of exercise as a single intervention on falls did not find exercise to have a lesser effect in studies conducted in residential care settings than in community settings.[58]

One RCT in Australian hostels and retirement villages found 22% fewer falls among residents who attended weekly group exercise classes compared with those who did not (incident rate ratio = 0.78, 95%CI 0.62 to 0.99).[59] The exercise program was conducted in weight-bearing positions, and aimed to improve the ability of participants to undertake activities of daily living by including exercises that presented a high challenge to balance (eg single-leg standing) and that emulated the requirements of everyday activities.

In a nursing home setting, another RCT[59,60,64] involved residents being seen by a research assistant up to four times a day for eight months. At each visit, residents were given a continence prompt, given a supervised walk, asked to sit-to-stand eight times and encouraged to drink fluids. Additional upper limb resistance training was provided at tailored intensity, walking distance was gradually increased if possible, and sit-to-stand exercise was encouraged with minimal use of upper limbs for support. This program resulted in improved or maintained functional abilities among the participants who exercised, while the abilities of the control group deteriorated (between-group differences for 14 of 15 outcome measures). Additional analyses found that this intervention also decreased the rate of falls by 38% (incident rate ratio = 0.62, 95%CI 0.38 to 0.98).[58]

While the evidence is not conclusive, exercise that includes a high challenge to balance seems to have an effect on falls in residents of RACFs. When the results of two small randomised trials were pooled,[71,72] the results showed a reduction in the rate of falls (rate ratio = 0.45, 95%CI 0.24 to 0.85) but not in the number of fallers (risk ratio = 0.72, 95%CI 0.43 to 1.19). These interventions involved exercises aimed at improving gait, balance and coordination using a mechanical apparatus to disturb balance. However, due to the small sample sizes, these results should be viewed as preliminary. Furthermore, interventions that depend on complex equipment may not be practicable for the RACF setting. A simple method for challenging balance with a single-leg stance intervention[66] may be an effective alternative.

There may also be a role for seated exercise for use with frail RACF residents.[51] However, not all trials that have implemented exercise aimed at improving gait, balance and mobility have led to favourable outcomes.[52,53] This indicates a need for further investigation in this area.

6.1.4 Exercise as part of a multifactorial intervention

Multifactorial interventions including exercise have the potential to prevent falls and fractures in RACF residents.[7] However, these interventions need to be implemented carefully, because some approaches have not been found to prevent falls. Key features of successful interventions are yet to be identified.

A meta-analysis of various multifactorial trials found a pooled effect of a 22% reduction in the number of falls (although this was not statistically significant: rate ratio = 0.78, 95%CI 0.57 to 1.07), a statistically significant 10% reduction in the proportion of people having one or more falls (risk ratio = 0.90, 95%CI 0.82 to 0.98) and a statistically significant 52% reduction in the risk of fractures (risk ratio = 0.48, 95%CI 0.24 to 0.98).[7] One well-designed RCT, which used a falls risk management approach with existing resources, found increased fall rates in the intervention group.[35]

It is not yet clear whether there are key features of multifactorial falls prevention programs in residential care. However, several RCTs that have had positive effects have included a greater emphasis on delivery of additional exercise. For example, the intervention program designed by Becker et al[33] decreased falls rates by 45% (rate ratio = 0.55, 95%CI 0.41 to 0.73). This program involved staff training and feedback, information and education for residents, environmental adaptations, hip protectors and twice-weekly exercise in groups of six to eight people, delivered by exercise instructors. Exercises included progressive balance exercises and progressive, individually tailored resistance training with ankle weights and dumbbells. Similarly, the multidisciplinary program tested by Jensen et al[31] reduced falls rates by 40% (incidence rate ratio = 0.60, 95%CI 0.50 to 0.73) and also included exercise. In this RCT, exercise sessions were run two to three times a week and were delivered by physiotherapists.

6.2 Principles of care

6.2.1 Assessing balance, mobility and strength

Many measurement tools have been developed to assess balance, mobility and strength in older RACF residents; the choice of tool will depend on the time and equipment available.

An expanding field of research is evaluating different properties of measurement tools. These tools are evaluated according to their reliability (whether the tool is consistent when used by different people at different times), validity (whether the tool measures what it aims to measure) and responsiveness to change (how much change is required before it is certain that the change reflects improved performance rather than measurement variability, and how well the tool can detect meaningful changes).

A study assessing the Physical Mobility Scale (a tool for assessing the mobility of RACF residents) demonstrated good inter-user agreement and internal construct validity.[48] The authors concluded that the tool may be suited to a range of clinical and research applications in RACF settings. Some preliminary work has also developed methods for evaluating balance-assessment tools in falls prevention programs.[73]

Table 6.2 summarises other clinical assessment tools that may be helpful for measuring risk and assessing progress in residents. The criteria and ratings are derived from people living in the community setting.

Table 6.2 Clinical assessments for measuring balance, mobility and strength

Balance	
Functional reach (FR)[74]	
Description	FR is a measure of balance and is the difference between a person's arm length and maximal forward reach, using a fixed base of support. FR is a simple and easy-to-use clinical measure that has predictive validity in identifying recurrent falls.
Time needed	1–2 minutes
Criterion	≤6 inches: fourfold risk ≤10 inches: twofold risk
Rating	76% sensitivity; 34% specificity[75]

Mobility	
Six-Metre Walk Test (SMW)[76]	
Description	SMW measures a person's gait speed in seconds along a corridor (over a distance of six metres) at their normal walking speed.
Time needed	1–2 minutes
Criterion	6 seconds
Rating	50% sensitivity; 68% specificity[76]
Timed Up and Go Test (TUG)[77]	
Description	TUG measures the time taken for a person to rise from a chair, walk three metres at normal pace and with their usual assistive device, turn, return to the chair and sit down.
Time needed	1–2 minutes
Criterion	15 seconds
Rating	76% sensitivity; 34% specificity[78]

Strength	
Sit-to-Stand Test (STS)[79]	
Description	STS is a measure of lower limb strength and is the time needed to stand from a seated position on a chair five consecutive times.
Time needed	1–2 minutes
Criterion	12 seconds
Rating	66% sensitivity; 55% specificity[76]
Spring balance[80]	
Description	As part of the Physiological Profile Assessment, the strength of three leg muscle groups (knee flexors and extensors and ankle dorsiflexors) is measured while participants are seated. In each test, there are three trials and the greatest force is recorded.
Time needed	5 minutes
Criterion	Computer software program compares an individual's performance to a normative database compiled from population studies.
Rating	75% accuracy for predicting falls over a 12-month period in community and institutional settings; reliability coefficients within clinically expected range (0.5–0.7).[80]

Composite scales	
Berg Balance Scale[81]	
Description	The Berg Balance Scale is a 14-item scale designed to measure balance of the older person in a clinical setting, with a maximum total score of 56 points (see http://www.chcr.brown.edu/geriatric_assessment_tool_kit.pdf).
Time needed	15–20 minutes
Criterion	A score of ≤20 = high risk of falls A score of ≤40 = moderate risk of falls (potential ceiling effect with less frail people)
Rating	High reliability (R=0.97); low sensitivity – an 8-point change needed to reveal genuine changes in function.[82]

Composite scales	
Tinetti Performance-Oriented Mobility Assessment Tool (POMA)[83]	
Description	POMA measures a person's gait and balance. It is scored on the person's ability to perform specific tasks, with a maximum total score of 28 points.
Time needed	10–15 minutes
Criterion	A score of <19 = high risk of falls A score of <24 = moderate risk of falls
Rating	High test–retest reliability for POMA-T and POMA-B (R=0.74–0.93), lower test–retest reliability for POMA-G (R=0.72–0.89). POMA-T sensitivity (62%) and specificity (66.1%) indicate poor accuracy in falls prediction.[53,84]

Confidence and falls efficacy scale	
Falls Efficacy Scale International (FES-I)[85]	
Description	FES-I provides information on the level of concern on a four-point scale (1 = not at all concerned to 4 = very concerned) across 16 activities of daily living (eg cleaning the house, simple shopping, walking on uneven surfaces).
Time needed	5 minutes
Criterion	A score of ≤22 = low to moderate level of concern A score of ≥23 = high level of concern[50]
Rating	High test–retest reliability (R=0.96)[85]

Case study

Mr K is 88 years old and returned to his residential aged care facility after being in hospital for pneumonia. The hospital discharge summary noted that Mr K could no longer stand up from his bed without help. As part of a multifactorial falls prevention program, the physiotherapist reviewed his balance, mobility and strength, and designed a program of supervised exercises that could be carried out with the nursing staff or family. As a result, Mr K can now stand without help and is more stable when walking, and his family are more confident about helping him when required.

6.3 Special considerations

6.3.1 Cognitive impairment

Risk factors for falls (eg gait and balance problems) are more prevalent in older people with cognitive impairment than in those without cognitive impairment.[86] People with cognitive impairment should therefore have their falls risk investigated comprehensively.

Interventions shown to work in cognitively intact populations should not be withheld from cognitively impaired populations, unless there is a problem with ability to follow or comply with instructions (see Chapter 7 on cognitive impairment). Simplifying instructions and using picture boards and demonstrations are strategies that may improve the quality of exercise for people with cognitive impairment. Family, carers and other volunteers may be able to help in supervising and motivating people who are undertaking exercise programs.

6.3.2 Rural and remote settings

Ideally, exercise interventions for residents of RACFs would be prescribed by a physiotherapist after individualised assessment. However, in rural and remote settings this may need to be done by other staff with appropriate guidance from a physiotherapist to ensure programs are challenging, yet safe.

6.3.3 Indigenous and culturally and linguistically diverse groups

When developing exercise programs for Indigenous and culturally and linguistically diverse groups, RACF staff should ensure they are informed about requirements specific to that cultural group that may affect the intervention. For example, some cultural groups require single-sex exercise classes. Staff should consider using interpreters and other communication strategies, as necessary.

6.4 Economic evaluation

Only one economic evaluation of exercise in an RACF setting was identified.[87] This was a modelled analysis, but the effectiveness of this intervention in a residential care setting is unclear.

Wilson et al[87] conducted a simplistic modelled economic evaluation of tai chi for preventing fractures in a nursing home population, compared with usual care, assuming a relative risk of falling of 0.525, and 70% adherence. The analysis considered costs (in 2000US$) and health outcomes (falls, hip fractures) over a one-year period. Modelled total costs of the program (including the tai chi plus falls-related costs) over one year were US$27 517 compared with falls-related costs in the intervention arm of US$28 321, while the program prevented 0.49 falls per person, on average. Sensitivity analyses indicated that the intervention was no longer cost saving if the intervention cost per participant was greater than US$95, or if the relative risk of falling was greater than 0.566, and was sensitive to the baseline risk of fracture in the population.

Some community interventions have been successful in preventing falls and cost effective; however, it is unclear whether the results are applicable to the RACF setting, given these interventions are mainly home-based exercise programs. See Chapter 6 in the community guidelines for more information.



Additional information

The Physiotherapy Evidence Database (PEDro) provides evidence based information from randomised controlled trials, systematic reviews and evidence based guidelines in physiotherapy:
http://www.pedro.org.au/

The following organisations, manuals, exercise programs and resources are available:

- Chartered Society of Physiotherapy (United Kingdom) outcome measures online database: http://www.csp.org.uk/director/members/practice/clinicalresources/outcomemeasures/searchabledatabase.cfm
- Fitness Australia: http://www.fitnessaustralia.com.au
- Hill KD, Miller K, Denisenko S, Clements T and Batchelor F (2005). *Manual for Clinical Outcome Measurement in Adult Neurological Physiotherapy*, 3rd edition, APA Neurology Special Group (Vic). Available from the Australian Physiotherapy Association for A$30 for students, A$60 for group members and A$75 for others: http://www.physiotherapy.asn.au
- Otago Exercise Programme — this program is aimed at preventing falls in community–dwelling older people, but it is also relevant for the aged care setting. The manual can be purchased for NZ$60 from the website: http://www.acc.co.nz/injury-prevention/home-safety/older-adults/otago-exercise-programme/index.htm

7 Cognitive impairment

Recommendations

Assessment

- Residents with cognitive impairment should have other falls risk factors assessed.

Intervention

- Address identified falls risk factors as part of a multifactorial falls prevention program, and also consider injury minimisation strategies (such as hip protectors or vitamin D and calcium supplementation). (Level I)[7]

Good practice points

- Address all reversible causes of acute or progressive cognitive decline.
- Residents presenting with an acute change in cognitive function should be assessed for delirium and the underlying cause of this change.
- Residents with gradual-onset, progressive cognitive impairment should undergo detailed assessment to determine diagnosis and, where possible, reversible causes of the cognitive decline. Reversible causes of acute or progressive cognitive decline should be treated.
- If a resident with cognitive impairment does fall, reassess their cognitive status, including presence of delirium (eg using the Confusion Assessment Method tool).
- Interventions shown to work in cognitively intact populations should not be withheld from cognitively impaired populations; however, interventions for people with cognitive impairment may need to be modified and supervised as appropriate.

7.1 Background and evidence

Cognitive impairment is commonly experienced by residents in residential aged care settings. Although cognitive impairment is most commonly associated with increasing age, it is a complex area that may exist in all age groups due to acquired brain injury, mental health conditions and other pre-existing conditions. Cognitive impairment implies a deficit in one or more cognitive domains (eg memory, visuospatial skills or executive function), but is not synonymous with dementia.

Dementia and delirium are the two most common forms of cognitive impairment in older people:

- *Dementia* is a syndrome of progressive decline in more than one cognitive domain that affects a person's ability to function. There is a high prevalence (50–70%) of residents with dementia in residential aged care facilities (RACFs).[88] Dementia has a gradual onset and usually involves a progressive decline in a range of cognitive abilities (such as memory, orientation, learning, judgment and comprehension), and is often accompanied by changes in personality and behaviour.[89]
- *Delirium* is a syndrome characterised by the rapid onset of variable and fluctuating changes in mental status. While there are relatively few studies of the prevalence of delirium in RACFs, it is estimated that delirium occurs in 60% of residents in nursing homes at some time.[90] Delirium is a medical emergency that frequently requires a period of hospitalisation to deal with both the underlying precipitant and the manifestations of the delirium. Delirium usually develops over hours or days and has a fluctuating course that can involve changes in a range of cognitive abilities, such as orientation, mood, perceptions, psychomotor activity and the sleep–wake cycle.[90]

Differentiating between dementia and delirium can be difficult, and they can coexist in many older people. Older people with existing cognitive impairments are more likely to develop a delirium from an acute event.[90]

7.1.1 Cognitive impairment associated with increased falls risk

Older people with cognitive impairment have an increased risk of falls, and risk factors for falls are more prevalent in older people with cognitive impairment than in people without cognitive impairment. For example, impairments of gait and balance are worse,[86] psychoactive medications are more commonly prescribed,[91,92] and orthostatic hypotension and hypotension are more prevalent.[93]

Cognitive impairment may increase the risk of falling by directly influencing the older person's ability to understand and manage environmental hazards, through a tendency to increased wandering,[94] and through altered gait patterns and impaired postural stability.[95] Examples of the different behaviours that contribute to increased falls risk in people with cognitive impairment are agitation, lack of awareness of environmental hazards while wandering, impaired ability to problem solve and impulsiveness.[96,97] Any changes in the environment can increase confusion and agitation, and may also increase the risk of falls; for example, transfers between hospital and a RACF, or transfers within or between rooms within a facility.

Some types of cognitive impairment are more strongly associated with falls than others. For example, delirium is associated with acute medical illness, metabolic disturbance, drugs and sepsis,[90] which may lead to poor balance, postural hypotension and muscle weakness. Some forms of dementia (eg Lewy body disease or vascular dementia) may be associated with gait instability and a higher incidence of orthostatic hypotension.[98]

7.1.2 Cognitive impairment and falls prevention

All successful multifactorial falls prevention programs in RACF settings have included in their samples residents with and without cognitive impairment.[31,33,37,60] One randomised controlled trial (RCT) showed that people who benefited from the intervention were those with more marked cognitive impairment.[33] However, another RCT reported subgroup analysis based on levels of cognitive impairment and found that a multifactorial falls and injury prevention program was effective in residents with higher levels of cognition, but not in residents with impaired cognition.[57]

Possible explanations for lack of effectiveness of falls prevention in people with cognitive impairment or dementia include different underlying mechanisms for falls risk factors and possibly other additional risk factors.[99] Some studies have shown that interventions can modify certain risk factors for falls in older people with cognitive impairment, such as gait performance,[36] balance[36,100] and mobility.[36]

Delirium is almost always due to a treatable underlying cause and should be addressed as soon as possible. People with pre-existing dementia are more susceptible to delirium from events such as constipation, urinary tract infections, chest infections and pain.[90] People are also more likely to develop delirium if they have visual or auditory impairment, are older, are malnourished, are physically restrained, have a urinary catheter in place or take more than three medications.[90]

7.2 Principles of care

7.2.1 Assessing cognitive impairment

One of the most important initial steps in preventing falls in older people is to assess for cognitive impairment. This should include the following strategies:

- Check repeatedly and regularly for the presence of dementia or delirium and treat possible medical conditions that may contribute to an alteration in cognitive status. Rapid diagnosis and treatment of a delirium and its underlying precipitant (eg infection, dehydration, constipation, pain) are crucial.[101]
- Residents with a progressive decline in cognition should undergo detailed assessment to determine diagnosis and, where possible, treat reversible causes of the cognitive decline.[89]
- Residents with cognitive impairment should have falls risk factors assessed, as discussed in other chapters, and have interventions offered to modify risk. Some interventions (eg exercise) require the resident to be able to follow instructions or comply with a program. Where there is doubt about a resident's ability to follow instructions safely, the health care team should conduct an individualised assessment and develop a falls prevention plan using the information from the assessment on their behalf.[27]
- Generally, in an RACF, the registered nurse is responsible for assessing the resident's cognitive status, and can supervise the collection of information on which the assessment is based. This information can include baseline observations, ~~urinalysis,~~ changes in medication, pain, blood sugar level, constipation, dehydration, etc. Each RACF should have a delirium protocol for collecting this baseline information.

Many tools can be used to assess cognitive status, some of which are summarised in Table 7.1. Chapter 5 contains more information on assessing falls risk.

Table 7.1 Tools for assessing cognitive status

Psychogeriatric Assessment Scales (PAS)[102]	
Description	PAS assesses the clinical changes seen in dementia and depression. Three scales are derived from a face-to-face interview with the participant or resident (cognitive impairment, depression, stroke), and three scales are derived from a face-to-face interview with an informant, such as a carer (cognitive decline, behaviour change, stroke). The PAS is easy to administer and score and can be used by lay interviewers. The PAS-Cognitive Impairment Scale (PAS-CIS) must be completed for Australian Government funding under the Aged Care Funding Instrument. See http://www.mhri.edu.au/pas
Time needed	20 minutes (for PAS-CIS)
Criterion	A score of 0–3: no or minimal cognitive impairment A score of 4–9: mild cognitive impairment A score of 10–15: moderate cognitive impairment A score of 16–21: severe cognitive impairment

Folstein Mini-Mental State Examination (MMSE)[103]	
Description	MMSE is a widely used method for assessing cognitive mental status. It is an 11-question measure that tests five areas of cognitive function: orientation, registration, attention and calculation, recall and language. The maximum score is 30.
Time needed	5–10 minutes
Criterion	A score ≤23 indicates mild cognitive impairment A score ≤18 indicates severe cognitive impairment

Rowland Universal Dementia Scale (RUDAS)[104,105]	
Description	RUDAS is a simple method for detecting cognitive impairment. RUDAS is valid across cultures, portable and administered easily by primary health care professionals. The test uses six items to assess multiple cognitive domains, including memory, praxis, language, judgment, drawing and body orientation.
Time needed	10 minutes
Criterion	Cut-point of 23 (maximum score of 30)
Accuracy	89% sensitivity; 98% specificity

Confusion Assessment Method (CAM)[106]	
Description	CAM is a comprehensive assessment instrument that screens for four clinical features of delirium: • an onset of mental status changes or a fluctuating course • inattention • disorganised thinking • an altered level of consciousness (ie other than alert).
Time needed	5 minutes
Criterion	Resident is diagnosed as delirious if they have both the first two features, and either the third or fourth feature.
Accuracy	94% sensitivity; 90% specificity[107]

7.2.2 Providing interventions

Identified falls risk factors should be addressed as part of a multifactorial falls prevention program, and injury minimisation strategies (such as using hip protectors or vitamin D and calcium supplementation) could be instituted.

Other interventions that may also prevent falls (as part of a multifactorial program) include the following:

- Educate and discuss falls prevention risks and strategies with all staff[31,33,37,108] and residents.[33] Holding post-fall case conferences with staff can also be helpful.[31]
- Encourage all residents to participate in exercise classes to improve muscle strength, balance, gait, safe transfers and use of walking aids.[31,33,60]
- Implement strategies to ensure that mobile residents can walk around safely, such as
  - ensuring walking aids and other assistive devices are appropriate, and repairing them as needed[31,37]
  - modifying the environment to maximise safety[31,33,37]
  - being cautious when using hip protectors (some trials in nursing homes have found that hip protectors, if worn, prevent hip fractures;[31,33] however, poor adherence is a major issue limiting the effectiveness of this intervention).
- Review prescribed medications for conditions that the resident no longer has (eg antidepressants, antipsychotics, antihypertensives, antianginals).[31,37]
- Assess and develop a plan of care for people with urinary incontinence.[60]
- Treat orthostatic hypotension as required (orthostatic hypotension is common in residents with dementia).[99]
- Avoid using restraint or immobilising equipment (including indwelling catheters).[27]
- Provide supervision and assistance to ensure that residents with delirium or cognitive impairment who are not capable of standing and walking safely receive help with all transfers.[99]
- Use fall-alarm devices (sometimes called movement alarms) to alert staff that residents with cognitive impairment are attempting to mobilise.[27]

The symptoms of cognitive impairment and delirium should be managed by addressing agitation, wandering and impulsive behaviour as follows (note that these are general care principles and are not directly aimed at preventing falls):[90,109]

- Identify and reduce or eliminate the causes of agitation, wandering and residents' impulsive behaviour.
- Avoid the risk of dehydration by having fluids available and within a resident's reach, and by offering fluids regularly.
- Avoid extremes of sensory input (eg too much or too little light, too much or too little noise).
- Promote exercise and activity programs. Activity programming may need to be intensified in the late afternoon or early evening to redirect agitated behaviours (eg pacing may be redirected into walking or dancing; noises may be redirected into singing or playing music).
- Promote companionship if appropriate.
- Establish orientation programs using environmental cues and supports (including having personal or familiar items available). Repeat orientation and safety instructions on a regular basis, keeping instructions clear and consistent.
- Develop a schedule for the resident (eg regular eating times, regular activity times, regular toileting regime). Where possible, base this schedule on established individual routines. Make sure that staff know about the schedule so that procedures, routines and the resident's environment can be kept consistent.
- Encourage sleep without the use of medication, and promote and support uninterrupted sleep patterns by maintaining a bedtime routine, reducing noise and minimising disturbance.
- Encourage residents in activities that avoid excessive daytime napping.
- Ensure personal needs are met on a regular and timely basis.
- When communicating with cognitively impaired residents, try to instil feelings of trust, confidence and respect (thereby minimising the risk of an aggressive response). This can be achieved by approaching the resident slowly, calmly and from the front; respecting personal space; addressing the resident by name and introducing yourself; using eye contact (only if culturally appropriate); and speaking clearly. Gentle touch and gestures, as well as auditory, pictorial and visual cues used appropriately, may also help with communication. It is important that the resident understands what is being said; this can be helped by using repetition and paraphrasing, and allowing time for them to process the information.



Point of interest: strategies for maintaining hydration in older people

Older people with cognitive impairment may become dehydrated easily, which can lead to delirium. An Australian study used strategies developed by the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES)[110] to maintain oral hydration in residents of aged care facilities.[111] Although adherence was problematic, the following strategies recommended by the JBI-PACES may be beneficial:

- Drinks (cordial, juice and water, but not caffeinated drinks) were offered by staff every 1.5 hours (as well as morning tea, afternoon tea and supper).
- Residents with cognitive impairment were either helped or prompted to drink.
- An accessible water fountain was set up with a supply of cups.
- Filled jugs of water were placed on all tables, with cups.
- Drinks were always given with medication.
- Icy poles, jellies and ice-cream were offered throughout the day as snacks and enjoyable treats.
- Fruit with a high water content (eg grapes, peeled mandarins) was placed on kitchen tables for easy access and picking.
- Light broths were given with meals.
- Happy hour was introduced twice a week with nonalcoholic wines, mocktails, soft drinks and nibbles.
- Warm milk drinks were given to help residents settle at night.

Case study

Mrs A is a 79-year-old resident of an aged care facility. She had been diagnosed with Alzheimer's disease. Mrs A was admitted to the facility recently when her family was no longer able to care for her at home. Mrs A often wanders off and gets lost in the facility. Staff have been instructed to repeat orientation and safety instructions on a regular basis, keeping instructions clear and consistent. The family was asked to bring some personal and familiar items from home to have in her room. Mrs A was vitamin D deficient and was given both calcium and vitamin D supplementation. Finally, to reduce her risk of suffering an injury, Mrs A was fitted with soft-shield hip protectors. Staff members are checking adherence with the hip protectors daily.

7.3 Special considerations

7.3.1 Indigenous and culturally and linguistically diverse groups

The Folstein Mini-Mental State Examination (MMSE) is the most widely used screening tool for dementia in Australia; however, it has significant limitations in multicultural and poorly educated populations. The Rowland Universal Dementia Scale (RUDAS) is designed to overcome these limitations, but with the advantage of being simpler to use in a multicultural population.[104,105]

A study funded by the National Health and Medical Research Council — the Kimberley Indigenous Cognitive Assessment† — investigated the validity of a new assessment of cognitive function developed specifically for Indigenous Australians.

7.4 Economic evaluation

No economic evaluations were found that examined the cost effectiveness of a program related to identifying and managing cognitive impairment in the RACF setting.

Additional information

A range of resources are available from the following associations and websites:

- Alzheimer's Australia can provide further information, counselling and support for people with dementia, their families and carers: http://www.alzheimers.org.au
- *Living with Dementia — A Guide for Veterans and their Families*: http://www.dva.gov.au/aboutDVA/publications/health/dementia/Pages/index.aspx

† http://www.nari.unimelb.edu.au/research/dementia.htm

8 Continence

Recommendations

Assessment

- Older residents should be offered a continence assessment to check for problems that can be modified or prevented.

Intervention

- ~~All residents should have a urinalysis to screen for urinary tract infections or function. (Level II-*)~~[112]
- Regular, individualised toileting should be in place for residents at risk of falling, as part of multifactorial intervention. (Level II)[60]
- Managing problems associated with urinary tract function is effective as part of a multifactorial approach to care. (Level II-*)[112]

Note: although there is observational evidence of an association between incontinence and falls, there is no direct evidence that interventions to manage incontinence affect the rate of falls.[113]

8.1 Background and evidence

Up to two-thirds of residents in residential aged care facilities (RACFs) experience urinary incontinence.[114,115] About 66% of Australians in RACFs require at least some support for bladder management, while 72% require some support for bowel management.[116]

While urinary and fecal incontinence affect both males and females, they are not usually considered to be part of the normal ageing process.[117] However, age-related changes within the urinary tract do predispose older people towards urinary incontinence.[118]

Urinary incontinence in the frail elderly is universally multifactorial. Likewise, the relationship between incontinence and falls is likely to be confounded by impairment of mobility and cognition. Although there is observational evidence of an association between incontinence and falls, there is no direct evidence that interventions to manage incontinence affect the rate of falls.[113] However, it is likely that a multiple intervention approach is necessary to prevent falls.[119]

8.1.1 Incontinence associated with increased falls risk

Incontinence, urinary frequency and assisted toileting have been identified as risk factors for falls in RACFs.[16] Additionally, urinary incontinence has been identified as a significant independent falls risk factor in residents who are not able to stand unaided.[50] People will make extraordinary efforts to avoid an incontinent episode, including placing themselves at increased risk of falling. Incontinence, assisted toileting[120,121] and symptoms of overactive bladder (OAB) [122,123] have been identified as risk factors for falls in the community.

Different types of bladder and bowel symptoms and their relationship with falls are as follows:

- *Bladder dysfunction* is common in older women, as a result of deficiencies in the pelvic floor muscles and connective tissue supporting the urethra and the urethral sphincter mechanism.[124] A decline in oestrogen levels after menopause can lead to atrophic changes affecting the vagina and urethra, and can increase a woman's susceptibility to urinary tract infections. Symptoms include urinary frequency, stress and urge incontinence.[125]
- *Constipation* is a common problem in older people and is related to decreased mobility, reduced fluid intake and the use of a number of high-risk medications. Urinary incontinence is significantly associated with self-report of constipation in older, community-dwelling Australian women.[126] Constipation may cause delirium and agitation, which in turn may cause falls. Straining during defecation may also shunt blood away from the cerebral circulation, leading to dizziness or syncope (temporary loss of consciousness) due to the vasovagal phenomenon.[127] Relieving constipation improves lower urinary tract symptoms, including urinary incontinence.[128]
- *Diarrhoea* may cause agitation as well as metabolic disturbance, which may in turn cause falls.
- *Frequency* is defined as the complaint by the resident who considers that they void too often during the day.[129]
- *Nocturia* is defined as being woken at night by the desire to void.[124] Nocturia is common and is significantly associated with falls in ambulatory older people who live in the community.[130] It can be particularly problematic when lighting is poor or when the older person is not fully awake. Nocturia is one of the most common causes of poor sleep and carries with it a higher risk of falling and fractures in older people.[130]
- *OAB syndrome* is defined as 'urgency with or without urge incontinence, usually with frequency and nocturia'.[129] A systematic review of studies related to urinary incontinence and falls revealed a significant association between falls and urge incontinence symptoms of OAB.[131]
- *Stress incontinence* is defined as leaking urine associated with rises in abdominal pressure during physical activity.[129] While this is a common symptom in younger women, institutionalised elderly women are more likely to have mixed symptoms of stress incontinence and OAB.[132] A systematic review of studies related to urinary incontinence and falls revealed no association between falls and stress incontinence.[131]
- *Urge (urinary) incontinence* is defined as involuntary urine leakage accompanied or immediately preceded by urgency.[124] It has been suggested that urge incontinence increases the risk of a person falling and fracturing bones.[123] This is presumably because urge incontinence (as opposed to stress incontinence) is associated with frequent rushed trips to the toilet to avoid incontinent episodes. Additionally, performing a secondary task, such as walking and concentrating on getting to the toilet, may compromise walking stability.

- *Urgency* is defined as 'the sudden compelling desire to void, which is difficult to defer'.[129] The symptoms of urgency may be suffered without any associated loss of urine.[133]
- *Urinary dysfunction* in men, caused by benign prostatic hyperplasia (noncancerous enlargement of the prostate) is common in older men. It affects 50% of 60-year-old men and 90% of men over 85 years of age. Symptoms include urinary frequency, nocturia, urgency, poor stream, hesitancy, straining to void and a sensation of incomplete bladder emptying and post-void dribbling.[134]



Definitions

A comprehensive list of definitions of the symptoms, signs, urodynamics, observations and conditions associated with lower urinary tract dysfunction and urodynamics studies, for use in all age groups, is provided by Abrams et al.[124] Further explanations of recommended terminology are provided by Abrams.[129]

While numerous falls in RACFs occur when going to or returning from the toilet,[135] causal factors associated with falls in older people with and without cognitive impairment are many and varied.[108] The close associations reported between incontinence, dementia, depression, falls and level of mobility suggest that these 'geriatric syndromes' may have shared risk factors rather than causal connections.[120]

Other mechanisms by which urinary and fecal incontinence can increase falls risk include the following:

- An incontinence episode increases the risk of a slip on the soiled or wet floor surface.[113]
- Urinary incontinence is a significant risk factor for falls in residents who cannot stand unaided.[50]
- The residents most at risk of falling are those who need to use an assistive device for walking and are incontinent at night, with most of the falls occurring in the early hours of the morning.[136]
- Urinary tract infections can cause delirium, drowsiness, hypotension, pain, urinary frequency and urinary urgency.
- Medications used to treat incontinence (eg anticholinergics or alpha-blockers) can themselves cause postural hypotension and falls; anticholinergics can also cause delirium.
- Drugs, such as diuretics, used predominantly to manage heart failure, can potentially increase risk of falls through increased urinary frequency or through hypovolaemia (low blood volume).
- Deteriorating vision, a common condition in the elderly, is strongly associated with falls;[113] it may also increase the likelihood of falls that are associated with getting out of bed at night, and nocturia.

8.1.2 Incontinence and falls interventions in residential aged care facilities

Older people are often reluctant to discuss issues around urinary and fecal continence. Health care professionals and care staff should be encouraged to enquire routinely about continence rather than rely on the resident to mention it during a consultation.

Toileting-assistance programs are an important and practical approach to maintaining continence for many residents, and may also reduce the risk of falls.[60] The three types of toileting-assistance programs (timed voiding, habit retraining and prompted voiding) are discussed in Section 8.2. Cochrane Collaboration systematic reviews on these interventions found limited evidence on their effectiveness; further studies are needed.[137-139]

One randomised controlled trial found that an intervention that combines low-intensity exercise with an active toileting-management plan can improve functional outcomes and urinary and fecal continence.[60] Regular toileting regimes are important in RACFs to reduce the risk of falls.

A Cochrane systematic review showed pelvic floor muscle training can be used to treat women with mixed incontinence, and less commonly to treat urge incontinence. However, limitations of the data make it difficult to judge whether pelvic floor muscle training was better or worse than other treatments in managing OAB symptoms.[140] There is evidence from a systematic review to support conservative management of fecal incontinence.[141]

8.2 Principles of care

8.2.1 Screening continence

The cause of incontinence should be established through a thorough assessment. Older people may have more than one type of urinary incontinence, which can make assessment findings difficult to interpret.[142] Otherwise, the following strategies can be used to assess the resident's continence status:

- Obtain a continence history from the resident to help with assessment and diagnosis. This may include a bladder chart (a frequency/volume chart) or continence diary, which could be used to record continence for a minimum of two days. Sometimes a bowel assessment is required, and the resident's normal bowel habits and any significant change must be determined, because constipation can considerably affect bladder function.
- The suitability of diagnostic physical investigations should be addressed on an individual basis. Consent must be obtained from the resident before the physical examination, which should be done by a suitably qualified health professional.
- Post-void residuals should always be checked in incontinent residents.
- Falls risk factors related to incontinence need to be considered along with the symptoms and signs of bladder and bowel dysfunction.
- Functional considerations, such as reduced dexterity or mobility, can affect toileting, and should be assessed and addressed.
- Consideration should be given to the toilet environment itself; this includes accessibility (especially if the resident uses a walking aid), proximity, height and the number of household members using the same toilet.

8.2.2 Providing strategies to promote continence

Appropriate management of incontinence may improve overall care. However, it is difficult to make strong recommendations, because specific continence-promotion strategies have not been part of successful falls prevention programs in the RACF setting.[113] A practical, stepwise management approach for mobile and nonmobile residents, as well as residents with and without cognitive impairment, should be considered. Such an approach could be based on the United States Government recommendations about quality management of urinary incontinence in RACFs.[143]

The following strategies, adapted from those recommended by the Third International Consultation on Incontinence,[144] can be used to promote continence:

- Make sure the resident has access to a comprehensive and individualised continence assessment that identifies and treats reversible causes, including constipation and medication side effects.
- Use an adequate trial of conservative therapy as the first line of management.
- Establish treatment strategies as soon as incontinence has been diagnosed. The aim of managing urinary incontinence is to alter those factors causing incontinence and to improve the continence status of the resident. Management of incontinence is a multidisciplinary task that ideally involves doctors, nurse continence advisers, physiotherapists, occupational therapists and other suitably qualified health professionals and care staff.
- Address all comorbidities that can be modified.
- Encourage habit training, prompted voiding or timed voiding programs to help improve the resident's control over their toileting regime, and reduce the likelihood of incontinence episodes
  - timed voiding is characterised by a fixed schedule of toileting
  - habit retraining is based on identifying a pattern of voiding and tailoring the toileting schedule to the resident
  - prompted voiding aims to increase continence by increasing the resident's ability to assess their own continence status and to respond appropriately.

- Minimise environmental risk factors as follows
  - keep the pathway to the toilet obstacle free and leave a light on in the toilet at night
  - ensure the resident is wearing suitable clothes that can be easily removed or undone
  - recommend appropriate footwear to reduce slipping in urine
  - consider using a nonslip mat on the floor beside the bed for residents who experience incontinence on rising from the bed, particularly if on a noncarpeted floor in the bedroom (care must be taken when using mats to ensure the resident does not trip on the mat)
  - check the height of the toilet and the need for rails to help the resident when sitting and standing from the toilet (reduced range of motion in hip joints, which is common after total hip replacement or surgery for fractured neck of femur, might mean the height of the toilet seat should be raised).
- Where possible, consult a continence adviser if usual continence-management methods as described above are not working, or if the resident is keen to learn simple exercises to improve their bladder or bowel control. Some men are resistant to the idea of doing pelvic floor exercises. This should be recognised and the benefits explained.
- Consider the use of continence aids as a trial management strategy.



Case study

Mr W lives in a low-care residential aged care facility. He cannot stand and adjust his clothes when going to the toilet without losing his balance and wetting his clothes. He cannot manage a urinal without having similar incidents. Staff implemented a toileting strategy where Mr W was prompted to go to the toilet every two hours and was changed if he was wet. This has resulted in no wet clothes and he now goes to the toilet safely. A detailed assessment and management of his continence is to be undertaken.

8.3 Special considerations

8.3.1 Cognitive impairment

Acute delirium can be caused by both urinary and gastrointestinal problems. Cognitive impairment and dementia can also lead to problems with both urinary and fecal continence. Regular toileting is recommended for residents with cognitive impairment. Residents with cognitive impairment may benefit from prompted voiding,[137] scheduled toileting and attention to behaviour signals indicating the desire to void. Aim to identify each resident's specific toileting times and prompt them to go around those times. Residents with severe dementia may need to be reminded where the bathroom is.

8.3.2 Rural and remote settings

It is important that the strategies outlined above are also in place in rural and remote locations. If access to specialist continence assessment and advice is difficult, additional strategies such as teleconferencing may support health professionals in implementing best practice. Resources (such as leaflets) providing advice on managing incontinence are available.

8.3.3 Indigenous and culturally and linguistically diverse groups

RACF staff need to be aware of cultural and religious requirements with respect to toileting. Generic signage for toileting facilities and requirements could be used. In some cultures, incontinence is a taboo topic. Specific information on dealing with these issues may be obtained from the person, their carers or from the Continence Foundation of Australia.†

Incontinence is not a condition that is well understood by Indigenous Australians and it causes shame for many. When discussing incontinence it is important to be aware that Indigenous men will frequently discuss this matter only with a male health worker and women only with a female health worker.

Specific Indigenous resources may be accessed from the Continence Foundation of Australia.

† http://www.continence.org.au

8.4 Economic evaluation

No economic evaluations were found that examined the cost effectiveness of continence management in the RACF setting.

Additional information

- The Continence Foundation of Australia (CFA) and the National Continence Helpline have leaflets and booklets on different continence-related topics, Indigenous-specific resources and information leaflets translated into 14 community languages:
  http://www.continence.org.au
- The CFA manages the National Continence Helpline on behalf of the Australian Government. This free service, staffed by nurse continence advisers, provides confidential information on incontinence, continence products and local services.
  National Continence Helpline: 1800 330 066
- The National Public Toilet Map gives information on toilet facilities along travel routes throughout Australia. Access the map via their website, or by contacting the National Continence Helpline, who can mail out copies of toilets along your planned journey:
  http://www.toiletmap.gov.au
- The fact sheet, Continence: caring for someone with dementia, can be found on the Alzheimer's Australia website:
  http://www.alzheimers.org.au/content.cfm?infopageid=83#co
- The National Institute for Health and Clinical Excellence (NICE), based in the United Kingdom, provides guidance on promoting good health and preventing and treating ill health. See their evidence based guidelines on managing urinary incontinence:
  http://www.nice.org.uk



9 Feet and footwear

Recommendations

Assessment

- In addition to standard falls risk assessments, screen residents for ill-fitting or inappropriate footwear.

Intervention

- As part of a multifactorial intervention program, prevent falls by making sure residents have fitted footwear. (Level II)[31]

Good practice points

- Include an assessment of foot problems and footwear as part of an individualised, multifactorial intervention for preventing falls in residents.
- Refer residents to a podiatrist for assessment and treatment of foot conditions as needed.
- Safe footwear characteristics include:
  - *soles:* shoes with thinner, firmer soles appear to improve foot position sense; a tread sole may further prevent slips on slippery surfaces
  - *heels:* a low, square heel improves stability
  - *collar:* shoes with a supporting collar improve stability.

9.1 Background and evidence

9.1.1 Footwear associated with increased falls risk

Footwear is a contributing factor to falls[145] and fractures in older people.[146] Studies (of differing design and quality) have reported the following results:

- Poorly fitting footwear or footwear inappropriate for the environmental conditions impairs foot position sense in both younger and older men.[147]
- Wearing shoes with inadequate fixation (ie shoes without laces, buckles or velcro fastening) is associated with an increased risk of tripping.[146]
- Wearing high-heeled shoes impairs balance compared with low-heeled shoes or being barefoot.[148]
- Medium–high heeled shoes and shoes with a narrow heel significantly increase the likelihood of sustaining all types of fracture, while slip-on shoes and sandals increase the risk of foot fractures as a result of a fall.[149]
- Slippers are often the indoor footwear of choice for many older people, but are associated with an increased risk of injurious falls.[150]
- Walking barefoot or in socks is associated with a 10–13-fold increased risk of falling, with athletic shoes being associated with the lowest risk.[149]

A retrospective, observational study showed that three-quarters of people who have suffered a falls-related hip fracture in the community were wearing footwear with at least one suboptimal feature at the time of the fall.[146] Older people should wear appropriately fitted shoes, both inside and outside the house. However, many older people wearing inappropriate footwear believe them to be adequate.[151] A review of the best footwear for preventing falls identified the following shoe characteristics as safe for older people:[152]

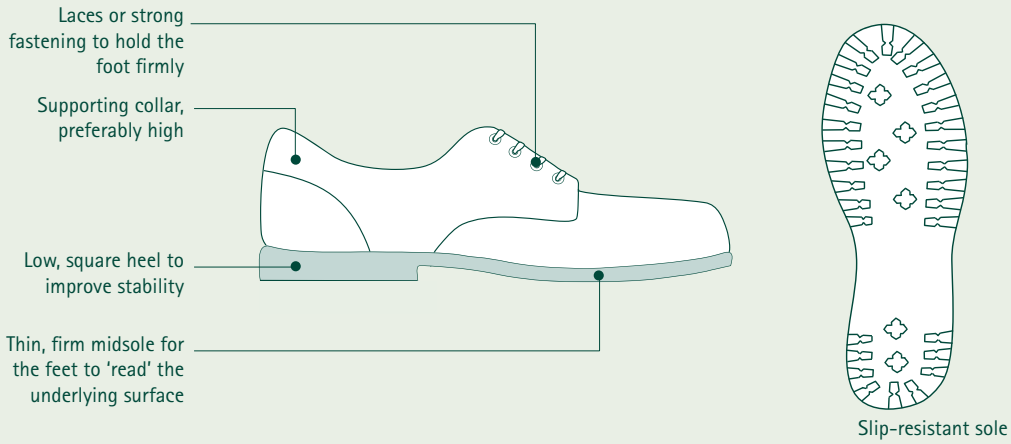
- *soles:* shoes with thinner, firmer soles appear to improve foot position sense; a tread sole may further prevent slips on slippery surfaces
- *heels:* a low, square heel improves balance
- *collar:* shoes with a supporting collar improve balance.

Some studies, held specifically in residential aged care facilities (RACFs), have investigated the effects of footwear assessments. However, only one of these studies[153] was a randomised controlled trial (and therefore of a high quality):

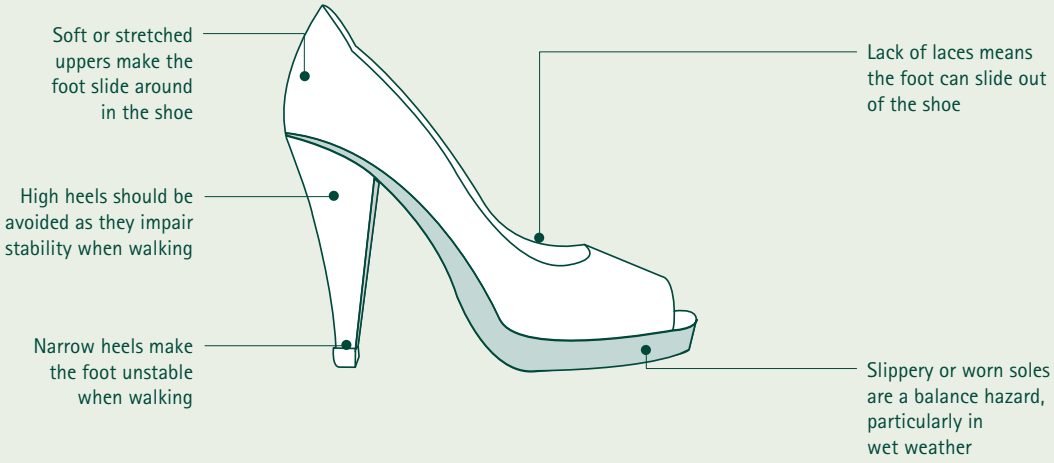
- Footwear assessment is a common falls prevention strategy used in RACFs; for example, it is used by 80% of RACFs in New Zealand.[154]
- Wearing soft-soled shoes is associated with a reduced risk of falls compared with slippers, so residents should be encouraged to wear shoes rather than slippers.[150]
- A reduction in falls also occurred in a dementia-specific setting when RACF staff provided special socks, incorporating a tread, to residents on retiring for the night.[155] This protocol was adopted to reduce the risk of residents slipping in urine. The slipper socks were a terry cloth with rubber antislip treads.
- Finally, a significant reduction in falls was observed when appropriate footwear was incorporated as part of a multifactorial falls prevention intervention.[31]

Figure 9.1 represents an optimal 'safe' shoe, and an 'unsafe' shoe.

What makes a shoe safe?



What makes a shoe unsafe?



Source: Lord[113]

Figure 9.1 The theoretical optimal 'safe' shoe, and 'unsafe' shoe

9.1.2 Foot problems

Foot problems are common in older people, affecting 60–80% of older people who live in the community.[156,157] Women report a higher prevalence of foot problems than men, which might be influenced by fashion footwear.[158] The most commonly reported foot problems are:[156,159,160]

- pain from corns, calluses and bunions
- foot deformities, such as hallux valgus, hammer toes and nail conditions.

Foot problems are well recognised as a contributing factor to mobility impairment in older people. Older people with foot pain walk more slowly and have more difficulty performing daily tasks than those without pain.[157] The presence of foot problems, such as pain, toe deformities, toe muscle weakness and reduced ankle flexibility, can alter the pressure distribution beneath the feet, impairing balance and functional ability.[161,162] Additionally, these foot problems are associated with increased falls risk,[163] and this risk rises as the number of foot problems increases.[164]

Ageing is associated with reduced peripheral sensation, and several prospective studies have found that participants who experience falls perform worse in tests of lower limb proprioception,[165] vibration sense[166] and tactile sensitivity.[167] Reduced plantar tactile sensitivity has also been mentioned as a risk factor for falls,[162] because it might influence the person's ability to maintain postural control when walking, particularly on irregular surfaces.[167] This is particularly relevant in people with diabetes:[168] people with diabetic neuropathy have impaired standing stability[153] and are at increased risk for falls and fractures.[169] Podiatry may help manage these conditions.[170-172]

9.2 Principles of care

9.2.1 Assessing feet and footwear

RACF staff should arrange for the resident's feet and footwear to be assessed as part of pre-admission screening or upon admission. As part of a multifactorial falls prevention program, a health professional skilled in the assessment of feet and footwear, such as a podiatrist, should make this assessment — although a podiatrist will usually only make this assessment if the registered nurse has identified the need for a referral. The following components of the assessment are most relevant:

- *Footwear:* the safe shoe checklist is a reliable tool for evaluating specific shoe features that could potentially improve postural stability in residents[173] (see Appendix 4).
- *Foot problems:* staff should assess foot pain and other foot problems regularly. A resident with an undiagnosed peripheral neuropathy should be assessed for potentially reversible or modifiable causes of the neuropathy. Some of the more common causes of a peripheral neuropathy include diabetes, vitamin B-12 deficiency, peripheral vascular disease, alcohol misuse and adverse effects of some drugs.[174]
- Refer the resident to a health professional skilled in the assessment of feet and footwear (eg a podiatrist) for additional investigations and management as required.[175]

A detailed assessment by a podiatrist for a falls-specific feet and footwear examination should include:[176]

- *fall history:* including foot pain and footwear
- *dermatological assessment:* skin and nail problems, infection
- *vascular assessment:* peripheral vascular status
- *neurological assessment:* proprioception; balance and stability; sensory, motor and autonomic function
- *biomechanical assessment:* posture, foot and lower limb joint range of motion testing, evaluation of foot deformity (eg hallux valgus), gait analysis
- *footwear assessment:* stability and balance features; prescription of footwear, footwear modifications, or foot orthoses based on assessment of gait in shoes
- *education:* foot care and footwear, link between footwear or foot problems and falls risk.

9.2.2 *Improving foot condition and footwear*

All health care professionals can play an important role in:

- identifying ill-fitting or inappropriate footwear using the safe shoe checklist as a guide
- providing residents and carers (where appropriate) with information about footwear, as well as a shopping guide
- ensuring shoes are repaired when needed, and cleaned regularly
- recognising that residents who have a shuffling gait may be at higher risk of falling if they wear nonslip shoes on some carpeted floors
- ensuring that residents with urinary incontinence have dry, clean footwear
- ensuring residents have more than one pair of shoes in case shoes are soiled or damaged
- discouraging walking while wearing slippery socks and stockings
- discouraging the use of talcum powder, which may make floors slippery
- screening residents for foot pain or foot problems
- educating residents and carers (where appropriate) about basic foot care
- referring residents to a podiatrist for further assessment and management, as appropriate, if any of the following conditions or clinical signs are evident
  - foot pain
  - foot problems, such as swelling, arthritis, bunions, toe deformities, skin and nail problems (especially corns and calluses) or other foot abnormalities (eg collapsed arches or a high-arched foot)
  - conditions affecting balance, posture or proprioception in the lower limbs, such as diabetes, peripheral neuropathy or peripheral vascular disease
  - unsteady or abnormal gait
  - inappropriate or ill-fitting footwear, or a requirement for foot orthoses.



Case study

Mrs V, who lives in a nursing home, has difficulty with her balance and wears loose-fitting slippers. The nurse discussed the benefits of wearing well-fitting footwear, and with Mrs V's consent ordered a new pair of fitted footwear from their local provider. As part of a multifactorial approach to reduce Mrs V's risk of having another fall, she was also referred to the supervised exercise classes. After one month, Mrs V reports a considerable improvement in her balance and an increase in her walking.

9.3 Special considerations

9.3.1 *Cognitive impairment*

Residents with cognitive impairment may not report discomfort reliably. Therefore, when they have their footwear checked, their general practitioner or other member of the health care team should check their feet for lesions, deformity and pressure areas. Footwear and foot care issues should also be discussed in detail with carers.

9.3.2 *Rural and remote settings*

Contact the Australasian Podiatry Council† in your state or territory for details of practitioners visiting rural and remote areas. In areas where podiatry services are infrequent or unavailable, other health care providers will need to screen feet and footwear. Services for Australian Rural and Remote Allied Health (SARRAH) is developing resources that may assist rural and remote practitioners.‡

† http://www.apodc.com.au

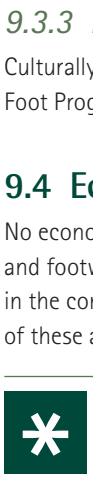
‡ http://www.sarrah.org.au

9.3.3 Indigenous and culturally and linguistically diverse groups

Culturally appropriate resources are currently being developed by SARRAH as part of an Indigenous Diabetic Foot Program (see the additional information box below).

9.4 Economic evaluation

No economic evaluations were found that examined the cost effectiveness of a program related to feet and footwear assessment in the RACF setting. Some multiple intervention approaches to falls prevention in the community have included feet and footwear assessments; however, it is unclear whether the results of these analyses are applicable to RACFs (see Section 4.4 in the community guidelines).



Additional information

- Australasian Podiatry Council: http://www.apodc.com.au
- Queensland Government 'Stay on Your Feet' falls prevention resources: http://www.health.qld.gov.au/stayonyourfeet
- Safe shoe checklist (See Appendix 4)
- American Podiatric Medical Association: contains brochures, fact sheets and other information on topics such as ageing feet: http://www.apma.org/
- Indigenous Diabetic Foot Program, Services for Australian Rural and Remote Allied Health: http://www.sarrah.org.au/site/index.cfm?display=65940
- Society of Chiropodists and Podiatrists: http://www.feetforlife.org



10 Syncope

Recommendations

Assessment

- Residents who report unexplained falls or episodes of collapse should be assessed for the underlying cause.

Intervention

- Assessment and management of presyncope, syncope and postural hypotension, and review of medications (including medications associated with presyncope and syncope) should form part of a multifactorial assessment and management plan for preventing falls in residents. (Level I-*)[34]
- Older people with unexplained falls or episodes of collapse who are diagnosed with the cardioinhibitory form of carotid sinus hypersensitivity should be treated with the insertion of a dual chamber cardiac pacemaker. (Level II-*)[177]

Note: there is no evidence derived specifically from the residential aged care setting relating to syncope and falls prevention. Recommendations have been inferred from community and hospital populations.

10.1 Background and evidence

Syncope is defined as a transient and self-limiting loss of consciousness. It is commonly described as *blacking out* or *fainting*. Presyncope describes the sensation of feeling faint or dizzy and can precede an episode of loss of consciousness. While a number of conditions can present with syncope, all share the final common pathway of cerebral hypoperfusion leading to an alteration in consciousness. Older people are more predisposed to syncopal events due to age-related physiological changes that affect their ability to adapt to changes in cerebral perfusion.

The overall incidence of syncope in older people who live in the community has been reported as 6.2 per 1000 person years.[178] Equivalent figures for residents living in residential age care facilities (RACFs) do not exist. Some of the more common causes of syncope in older people include vasovagal syncope, orthostatic hypotension, carotid sinus hypersensitivity, cardiac arrhythmias, aortic stenosis and transient ischaemic events. Epilepsy may present as a syncopal-like event. Less common causes of syncope include micturition, defecation, cough and postprandial syncope.

10.1.1 Vasovagal syncope

Vasovagal syncope (usually described as fainting) is the most common cause of syncope and has been reported to be the cause of up to 66% of syncopal episodes presenting to an emergency department.[178] Vasovagal syncope is often preceded by pallor, sweatiness, dizziness and abdominal discomfort, although these features are not always seen in the older person.[178] Commonly reported precipitants of vasovagal syncope include prolonged standing (particularly in hot or confined conditions), fasting, dehydration, fatigue, drinking alcohol, acute febrile illnesses, pain, venepuncture and hyperventilation.

The diagnosis of vasovagal syncope is usually made clinically, although formal assessment with noninvasive cardiac monitoring and prolonged tilting is possible.

Treatment is largely nonpharmacological and is targeted at avoiding the cause. This may include avoiding prolonged standing in hot weather and ensuring that the older person drinks enough to maintain hydration. People also need to be reassured that vasovagal syncope is a benign condition.

10.1.2 Orthostatic hypotension (postural hypotension)

Orthostatic hypotension (also called postural hypotension) refers to a drop in blood pressure on standing, from either the sitting or lying position. The drop in blood pressure can be enough to cause symptoms of dizziness or precipitate a syncopal event.[179,180] Postural (orthostatic) hypotension is associated with an increased risk of falls.[178,180]

A formal diagnosis of postural hypotension is made by recording a drop in systolic blood pressure of at least 20 mm Hg or a drop in diastolic blood pressure of at least 10 mm Hg within three minutes of standing. The person should be lying still for at least five minutes before measuring blood pressure (while the person remains lying down).

Medications and volume depletion are the two most common causes of postural hypotension in older people. Medications commonly associated with postural hypotension include the antihypertensive agents, antianginals, antidepressants, antipsychotics and antiparkinsonian medications and diuretics. Diuretics can have a direct effect on blood pressure and can also cause volume depletion, which in itself can cause postural hypotension. Certain diseases (such as Parkinson's disease, stroke and diabetes) can also have a direct impact on autonomic function and interfere with blood pressure regulation. Prolonged periods of immobility can disrupt postural control of blood pressure.

Treatment involves identifying the precipitating cause and modifying medications, where possible. Maintaining adequate hydration, particularly during hot weather, is important for the older person (see the point of interest box on maintaining hydration in Section 7.2.2). Pharmacological intervention is needed in a small number of cases to treat postural hypotension. Drugs that might be used include fludrocortisone or midodrine (an alpha-agonist), but only for autonomic postural hypotension after all other treatments have been trialled.

10.1.3 Carotid sinus hypersensitivity

Carotid sinus hypersensitivity (CSH) is an abnormal haemodynamic response to carotid sinus stimulation. When associated with symptoms, it is referred to as a carotid sinus syndrome.

CSH may occur when the head is rotated or turned, or when pressure is placed on the carotid sinus. Triggers may include carotid massage, shaving, wearing tight collars or neckwear, or tumour compression.[181]

Three abnormal responses can be noted on direct massage of the carotid sinus. A cardioinhibitory response is defined as a three-second period of asystole following massage of the carotid sinus. The vasodepressor response is defined by a 50 mm Hg drop in blood pressure in the absence of significant cardioinhibition. A combination of the vasodepressor and cardioinhibitory response defines the mixed form of CSH.

While carotid sinus hypersensitivity is the cause of a small percentage of falls in older people, it is potentially amenable to intervention.[177,182-184] One randomised controlled trial showed that detailed cardiovascular assessment (including carotid sinus massage, tilt-table examination, echocardiogram and 24-hour Holter monitoring) of 24 251 older people presenting to an emergency department after an unexplained fall with injury identified 257 people with cardioinhibitory carotid sinus hypersensitivity, and this led to a subsequent reduction in further falls.[177]

10.1.4 Cardiac arrhythmias

Abnormal rhythms of the heart can lead to dizziness and syncope. Sick sinus syndrome is an abnormal slowing of the heart caused by degeneration of the cardiac conducting system, and is associated with advanced age. Sick sinus syndrome is managed with the insertion of a cardiac pacemaker. Slowing of the heart rate can also be associated with certain medications (beta-blockers and digoxin); treatment is reducing or stopping these medications.

Rapid heart rates from abnormal cardiac rhythms can also cause dizziness and syncope. Diagnosis of an abnormal heart rate requires a person being monitored at the time of the abnormal heart rate and can often be challenging. Treatment depends on the nature of the abnormal rhythm.

10.2 Principles of care

Residents reporting presyncope or syncope should have appropriate assessment and intervention. Their symptoms should be reported to their general practitioner, and a number of tests and further investigations may be warranted, depending on the history and results of the clinical examination. Further tests may include an electrocardiogram (ECG), echocardiography, Holter monitoring, tilt-table testing, and carotid sinus massage or insertion of an implantable loop recorder. The European Taskforce on Syncope has produced a simple algorithm for investigating syncope (see the additional information box).[179]

Permanent cardiac pacing is successful in treating certain types of syncope. Pacemakers prevent falls by 70% in people with accurately diagnosed cardioinhibitory carotid sinus hypersensitivity.[177] A number of successful multifactorial falls prevention strategies in the community and hospital settings have included assessments of blood pressure and orthostatic hypotension, and medication review and modification.[112,119,185-188]

The symptoms of orthostatic hypotension can be reduced using the following strategies:

- Ensure good hydration is maintained, particularly in hot weather.[4,189,190]
- Encourage the resident to sit up slowly from lying, stand up slowly from sitting and wait a short time before walking.[189,190]
- Minimise exposure to high temperatures or other conditions that cause peripheral vasodilation, including hot baths.[190]
- Minimise periods of prolonged bed rest and immobilisation.
- Encourage residents to rest with the head of the bed raised.
- Increase salt intake in the diet if not contraindicated.
- Where possible, avoid prescribing medications that may cause hypotension.
- Identify any need for using appropriate peripheral compression devices, such as antiembolic stockings.[190]
- Monitor and record postural blood pressure.[4]

Case study

Mrs B is an 89-year-old woman living in a residential aged care facility (RACF). She has hypertension and has had a stroke, which left her with speech impairment and the need for help with activities of daily living. Carers reported to nursing staff that, when they helped Mrs B out of bed to go to the bathroom, her legs had given way. The carers felt that if they had not supported her, she would have fallen to the floor. Staff measured Mrs B's lying and standing blood pressures and found that her blood pressure on standing dropped more than 20 mm Hg (systolic). They reported this to her general practitioner who reviewed Mrs B's medications, including her antihypertensive agent. The dose of her antihypertensive was reduced. In addition, staff were encouraged to ensure that Mrs B's fluid intake was sufficient and that she was provided with the necessary assistance to drink on a regular basis throughout the day.

The RACF nurse manager requested staff to initiate a medical review if a person was identified as having light-headedness or dizziness related to postural hypotension. Staff are now careful to assess for hypotension if people are dizzy. The staff have implemented several new strategies to assist residents to maintain their hydration, such as ensuring all residents have a full glass of fluid with medications, and regular drinks breaks.

10.3 Special considerations

10.3.1 Cognitive impairment

Some disease states that are possible causes of postural hypotension are associated with cognitive impairment. Cognitively impaired people may be unable to articulate feelings of dizziness, light-headedness or faintness. Intermittent monitoring of lying and standing blood pressure is recommended for people with cognitive impairment.

10.4 Economic evaluation

No economic evaluations were found that examined the cost effectiveness of interventions for syncope in the RACF setting.

Additional information

The following reference may be useful:

- Task Force on Syncope, European Society of Cardiology (2004). Guidelines on management (diagnosis and treatment) of syncope — Update 2004. *European Heart Journal* 25(22):2054–2072. Also available at: http://eurheartj.oxfordjournals.org/cgi/content/full/25/22/2054

11 Dizziness and vertigo

Recommendations

Assessment

- Vestibular dysfunction as a cause of dizziness, vertigo and imbalance needs to be identified in residents in the residential care setting. A history of vertigo or a sensation of spinning is highly characteristic of vestibular pathology.
- Use the Dix–Hallpike test to diagnose benign paroxysmal positional vertigo. This is the most common cause of vertigo in older people, and can be identified in the residential aged care setting. This is the only cause of vertigo that can be treated easily.

Note: there is no evidence from randomised controlled trials that treating vestibular disorders will reduce the rate of falls.

Good practice points

- Use vestibular rehabilitation to treat dizziness and balance problems where indicated and available.
- Use the Epley manoeuvre to manage benign paroxysmal positional vertigo.
- Manoeuvres should only be done by an experienced person.

11.1 Background and evidence

Dizziness and vertigo are common in all age groups, but the prevalence increases markedly with age.[191] On questioning, one in three older people who lived in the community reported symptoms of dizziness.[192] Although there are no equivalent studies in the residential aged care setting, these figures are likely to be similar, if not higher, due to advanced age.

Dizziness in older people often represents a difficult diagnostic problem, because it is a subjective sensation that may result from impairment or disease in multiple systems.[193] The underlying cause of dizziness is unknown in 20–40% of people reporting symptoms of dizziness.[194] Vestibular dysfunction has been indicated in approximately 50% of people older than 70 years who have been referred to a dizziness or balance clinic for evaluation,[195] with the single most common diagnosis being benign paroxysmal positional vertigo (BPPV).

When residents describe being 'dizzy', 'giddy', or 'faint', this may mean anything from an anxiety or fear of falling to postural dysequilibrium, vertigo or presyncope; a detailed history is crucial.

11.1.1 Vestibular disorders associated with an increased risk of falling

Vestibular dysfunction is a common cause of dizziness in the older population;[195] however, the association between vestibular dysfunction and falls remains unclear.[196] Age-related changes in the vestibular system can be identified in people older than 70 years.[197] These changes include asymmetrical degenerative changes, which may contribute to falls and falls injury by providing inaccurate information about the direction and magnitude of head or body movements, and impairing balance control. A study of 66 adults found that older people who lived in the community and who had sustained wrist fractures as a result of an accidental fall were more likely to have vestibular asymmetry on testing than an age-matched group of non-fallers.[198]

People with BPPV often have balance problems; however, more research is needed to identify whether there is an association between BPPV and falling in older people.[199] A cross-sectional study of 100 people found that 1 in 10 older people presenting to an outpatient clinic with a range of chronic medical conditions had undiagnosed BPPV, and these people were more likely to have sustained a fall in the previous three months.[180]

11.2 Principles of care

11.2.1 Assessing vestibular function

An important step in minimising the risk from falls associated with dizziness is to assess vestibular function. This can be done in the residential aged care facility (RACF) setting using the following steps and tests (these tests should only be done by an experienced person):

- Ask the resident about their symptoms. *Dizziness* is a general term that is used to describe a range of symptoms that imply a sense of disorientation.[197] Dizziness may be used to describe poor balance. *Vertigo*, a subtype of dizziness, is highly characteristic of vestibular dysfunction and is generally described as a sensation of spinning.[198]
- Assess peripheral vestibular function using the Halmagyi head thrust test.[200] It only has good sensitivity if the vestibular dysfunction is severe or complete.[201]
- Use audiology testing to quantify the degree of hearing loss. The auditory and vestibular systems are closely connected; therefore, auditory symptoms (hearing loss, tinnitus) commonly occur in conjunction with symptoms of dizziness and vertigo.[202]
- If clinically indicated, request computed tomography or magnetic resonance imaging to identify an acoustic neuroma or central pathology.[191]
- Use the Dix–Hallpike manoeuvre to diagnose BPPV. This test is included in a diagnostic protocol in general practice for evaluating dizziness in older people[202] and is considered mandatory in all people with dizziness and vertigo after head trauma.[203] BPPV should be strongly considered as part of the differential diagnosis in older people who report symptoms of dizziness or vertigo after a fall that involved some degree of head trauma.

- Use vestibular function tests to evaluate the integrity of the peripheral (inner ear) and central vestibular structures. These tests are available at some specialised audiology clinics and may be recommended if symptoms persist.[204]
- Refer the resident to a specialist, such as an ear, nose and throat specialist or a neurologist, if required.[191]

11.2.2 Choosing interventions to reduce symptoms of dizziness

The following strategies can be used in the RACF setting to treat dizziness and balance problems caused by vestibular dysfunction. They can be used as part of a multifactorial falls prevention program to reduce the risk of falls related to dizziness.

Medical management

Based on clinical experience, treatment with antiemetics and vestibular suppression medication may be required to treat the unpleasant associated symptoms of nausea and vomiting. These medications should only be used for a short time (one to two weeks) because they adversely affect the process of central compensation after acute vestibular disease.[204]

Treating benign paroxysmal positional vertigo

The literature describes a range of options for treating BPPV, including:

- Brandt and Daroff exercises — these can be done regularly at home[205]
- the Epley manoeuvre — involves taking the resident slowly through a range of positions that aim to move the freely mobile otoconia back into the vestibule.[206] A meta-analysis showed that this manoeuvre is highly successful for treating BPPV.[207]

Older people with diagnosed BPPV respond as well to treatment as the general population; therefore, no special approaches are needed in this group.[207] However, it is important to diagnose and treat BPPV as soon as possible, because treatment improves dizziness and general wellbeing.[208] This is particularly true in the RACF setting.

Vestibular rehabilitation

Vestibular rehabilitation (VR) is a multidisciplinary approach to treating stable vestibular dysfunction. The physiotherapy intervention component focuses on minimising a person's complaints of dizziness and balance problems through a series of exercises, which are modified to suit each person.[192] The occupational therapy intervention component involves incorporating the movements required to do these exercises into daily activities,[209] and the psychology input addresses the emotional impact of vestibular dysfunction.[210]

The literature emphasises the following characteristics of VR:

- VR is highly successful in treating stable vestibular problems in people of all ages.[211]
- Starting VR early is recommended in the community and hospital settings. Delayed initiation of VR is a significant factor in predicting unsuccessful outcomes over time.[212]
- Age does not significantly affect outcomes following a program of VR in older people who live in the community,[213] although cognitive impairment may influence ability to comply with the exercise program.
- A supervised program of VR can be provided in RACFs to address safety and cognitive issues specific to this setting. Successful outcomes have been demonstrated with supervised VR provided once a week,[214] as well as three to five times per week.[215]
- VR can improve measures of balance performance in people older than 65 years who live in the community.[194,216] However, a study of people with multisensory dizziness showed that the prevalence of falls over a 12-month period did not differ between those receiving VR and a control group.[217]

Regular training courses in VR are held across Australia, and increasing numbers of physiotherapists working in acute and subacute hospital systems are now trained to assess and manage dizziness. These physiotherapists can be found by contacting the Australian Physiotherapy Association† or the Australian Vestibular Association.‡

† http://members.physiotherapy.asn.au

‡ http://www.dizzyday.com/avesta.html

Case study

Mrs P is an 87-year-old woman who lives in a residential aged care facility. She requires help with personal care activities, such as showering and dressing, and has had several recent falls. Mrs P dislikes lying flat in bed and now sleeps with the head of her bed elevated. She avoids rolling over and requires light assistance to get out of bed in the morning. Her visiting general practitioner requested that Mrs P be tested for benign paroxysmal positional vertigo (BPPV). Dix–Hallpike testing identified this condition in her right inner ear. Following treatment using an Epley manoeuvre, Mrs P reported that she feels more stable on her feet and uses only two pillows at night. She has had no further falls since having her BPPV treated.

11.3 Special considerations

Dix–Hallpike testing should not be done on people with an unstable cardiac condition or a history of severe neck disease,[218] but can be modified in older people with other comorbidities.[219]

Older people with symptoms of dizziness should be medically reviewed before starting a rehabilitation program as outlined above.

11.4 Economic evaluation

No economic evaluations were found that examined the cost effectiveness of interventions for dizziness in the RACF setting.



Additional information

The following references may be useful:

- Herdman S (2007). *Vestibular Rehabilitation (Contemporary Perspectives in Rehabilitation)*, FA Davis Company, Philadelphia.
- Maarsingh OR, Dros J, van Weert HC, Schellevis FG, Bindels PJ and van der Horst HE (2009). Development of a diagnostic protocol for dizziness in elderly patients in general practice: a Delphi procedure. *BMC Family Practice* 10:12.

More information on noncardiac dizziness and a video demonstration of the Dix–Hallpike manoeuvre can be found at the ProFaNE website:
http://www.profane.eu.org/CAT

12 Medications

Recommendations

Assessment

- Residents of residential aged care facilities should have their medications (prescribed and nonprescribed) reviewed at least yearly by a pharmacist after a fall, or after initiation or escalation in dosage of medication, or if there is multiple drug use.

Intervention

- As part of a multifactorial intervention,[37] or as a single intervention,[32] residents taking psychoactive medication should have their medication reviewed by a pharmacist and, where possible, discontinued gradually to minimise side effects and to reduce their risk of falling. (Level II)
- Limit multiple drug use to reduce side effects and interactions. (Level II-*)[37]

12.1 Background and evidence

A number of epidemiological studies have shown an association between medication use and falls in older people.[186,188,220,221] The risk of falls can be increased by medication interaction, unwanted side effects (such as dizziness) and even the desired effects of medications (such as sedation). It is important that staff of residential aged care facilities (RACFs) and the whole health care team recognise that pharmacological changes with ageing can lead to potentially avoidable events in older people, including falls and fractures.

Medication use in RACFs is commonplace: 98% of residents take at least one form of medication and 63% take four or more medications.[222] A study in 51 nursing homes in the central Sydney health area found that 47% of RACF residents took one or more psychoactive drugs regularly, 11% took hypnotics regularly and 21% took antidepressants regularly.[223]

12.1.1 Medication use and increased falls risk

A number of factors affect an older person's ability to deal with and respond to medications, which can lead to an increased risk of falls:[113]

- The ageing process, as well as disease, can result in changes in pharmacokinetics (the time course by which the body absorbs, distributes, metabolises and excretes drugs) and pharmacodynamics (the effect of drugs on cellular and organ function).
- Nonadherence with drug therapy, including medication misuse and overuse, and inappropriate prescribing can increase the risk of adverse effects.

Certain classes of medication are more likely to increase the risk of falls in older people:

- Central nervous system drugs, especially psychoactive medications (eg benzodiazepines), are associated with an increased risk of falling while taking these drugs, compared with not taking them, of between 1.25 (25%) and 1.9 (90%).[224]
- Benzodiazepine use is a consistently reported risk factor for falls and fractures in older people, both after a new prescription and over the long term. They affect cognition, gait and balance.[224]
- Antidepressants are associated with higher falls risk,[225] in particular specific serotonin reuptake inhibitors (SSRIs) and tricyclic antidepressants (TCAs).[224]
- Antiepileptic drugs and drugs that lower blood pressure are weakly associated with an increased risk of falls.[224]
- Some cardiovascular medications (diuretics, digoxin and type IQ anti-arrhythmic drugs) are weakly associated with an increased risk of falls.[226]

Other types of cardiac drugs, and analgesic agents, are not associated with an increased risk of falls.[226]

Taking more than one medication is associated with an increased risk of falls.[186,220,224] This may be a result of adverse reactions to one or more of the medications, detrimental drug interactions, increased comorbidity requiring multiple medications or incorrect use of some or all of the medications. According to one study, the relative risk of falling for people using only one medication (compared with people not taking any medication) is 1.4, increasing to 2.2 for people using two medications and to 2.4 for people using three or more medications.[220]

For each drug, the potential falls risk modification should be balanced against the benefit of the drug.

12.1.2 Evidence for interventions

A medication review should be a core part of the assessment of RACF residents[32,227] and should be done regularly for those who have repeat prescriptions. The focus should be on appropriate prescribing — that is, checking that medications are used safely and effectively, and that other forms of treatment or management are considered as alternatives, if possible (see the National Medicines Policy from the Australian Government Department of Health and Ageing — the website is provided in the box containing additional information, below).

Two published studies have looked at medication review by a pharmacist as a single intervention in RACFs.[32,228] In one study, the rate of falls in the intervention groups was lowered significantly compared with the control group (0.8 falls per participant in the intervention group, compared with 1.3 falls per participant in the control group; $P < 0.0001$).[32] In a second study looking specifically at the transition period between the hospital and RACF, a pharmacist transition coordinator was found to be effective in terms of quality of prescribing, but was not effective in reducing falls. The study did not use falls as an endpoint.[228]

Two other studies reviewed medications as part of a multifactorial falls intervention in residential aged care.[31,37] The use of suspect medications (including benzodiazepines, antidepressants, diuretics and neuroleptics) and multiple medication use were evaluated, and adjusted to minimise adverse effects. One of the studies found a significant reduction in recurrent fallers;[37] the other study found a reduction in falls in people with a Mini-Mental State Examination (MMSE) score of greater than 19 (see Chapter 7 on cognitive impairment for more information).

A randomised controlled trial of 93 older people who lived in the community looked at the effectiveness of different falls prevention interventions — the results of which may be applied with caution to the RACF setting. The trial assessed the effectiveness of gradually withdrawing psychoactive medication (compared with not withdrawing medication).[229] After about 11 weeks, the study group had a significant reduction (66%) in falls compared with the control group. The preferred approach would therefore be to avoid prescribing psychoactive drugs if clinically possible. However, due to the small sample size, these results should be interpreted with caution — particularly because withdrawal from psychoactive drugs is difficult. The trial did not report adverse effects from medication withdrawal.

12.2 Principles of care

12.2.1 Reviewing medications

Medication review in RACFs should include:

- reviewing the resident's medications on admission[227,230-232]
- reviewing medications annually, after a fall, or after initiation or escalation in dosage of medications[230]
- using a pharmacist to reduce the number of medications taken by residents with dementia,[32] delirium or a change in health status.

Residential medication management reviews (RMMRs) are available to all permanent residents of a facility in which residential care services are provided, as defined in the *Aged Care Act 1997*. An RMMR involves collaboration between the resident's general practitioner and a pharmacist. An RMMR reviews the resident's medications, which are then discussed by the pharmacist and the referring general practitioner. The key outcome of the process is a new or revised medication management plan that is agreed between the general practitioner and the resident or their carer. For more details, see the Australian Government Department of Health and Ageing website.†

Health care professionals and care staff can use the following checklist to help decide whether a resident requires a medication review from a pharmacist or doctor. A review is needed if the resident:[230]

- is taking more than 12 doses of medication a day
- is taking one or more psychoactive medications
- is taking four or more different types of medications
- has multiple medical conditions
- is suspected of not adhering to their medication regime
- has symptoms that suggest an adverse medication reaction (eg confusion, dizziness, reduced balance).

New residents are entitled to an RMMR on admission. Current residents can have an RMMR at the request of their medical practitioner. For instance, an RMMR may be needed because of a significant change in the resident's medical condition or medication regimen.

The need for a new RMMR is indicated by:

- discharge from an acute care facility in the previous four weeks
- significant changes to the medication regimen in the past three months
- change in medical conditions or abilities (including falls, cognition, physical function)
- prescription of medication with a narrow therapeutic index or requiring therapeutic monitoring
- presentation of symptoms suggestive of an adverse drug reaction
- subtherapeutic response to treatment
- suspected nonadherence or problems with managing drug-related therapeutic devices
- risk of inability to continue managing own medications (eg due to changes with dexterity, confusion or impaired sight).

† http://www.health.gov.au/internet/main/publishing.nsf/Content/health-epc-dmmrqa.htm

12.2.2 Providing interventions

The following interventions can be used as part of a multifactorial falls risk prevention program:

- Withdraw psychoactive medication gradually and under appropriate supervision to reduce the risk of falls significantly.[229] The National Prescribing Service has guidelines on withdrawing benzodiazepines.†
- Drugs that act on the central nervous system, especially psychoactive drugs, are associated with an increased risk of falls; therefore, they should be used with caution and only after weighing up their risks and benefits.[31]
- Alternatives to drugs that act on the central nervous system (eg psychosocial treatments) to manage sleep disorders, anxiety and depression should be tried before pharmacological treatment. One study in an RACF found that group education and relaxation training can successfully reduce benzodiazepine use for sleep disturbance.[233]
- If centrally acting medications such as benzodiazepines are prescribed, increase surveillance and support mechanisms for residents during the first few weeks of taking these drugs, because the risk of falling is greatest during this period.[234]
- Limit multiple drug use to reduce side effects and interactions, and a tendency towards proliferation of medication use.[37]

In addition, the following strategies help to ensure quality use of medicines, and are good practice for minimising falls:

- Review medications as part of a comprehensive assessment of a resident's risk of falling.
- Prescribe the lowest effective dosage of a medication specific to the symptoms.
- Provide support and reassurance to residents who are gradually stopping the use of psychoactive medication(s).
- If the resident needs to take medications known to be implicated in increasing the risk of falls, try to minimise the adverse effects (ie drowsiness, dizziness, confusion and gait disturbance).
- Provide the resident and their carer with explanations of newly prescribed medications or changes to prescriptions.
- Educate the whole multidisciplinary team, residents and their carers to improve their awareness of the medications associated with an increased risk of falls.
- Document information when implementing, evaluating, intervening, reviewing, educating and making recommendations about medication use.



Case study

Mr F is an 80-year-old man whose behaviour had become unmanageable, with outbursts of violence towards staff and fellow residents of his residential aged care facility (RACF). His gait and posture had changed and he had become notably drowsy. The nurse in charge at his RACF suspected that constipation could be the main cause of his behavioural change. As part of an evaluation, the nurse initiated a residential medication management review. After pharmaceutical review, it was found that recent medication changes had increased Mr F's prescription of haloperidol (an antipsychotic drug) in response to his behavioural change. A revised medication management plan was agreed, which addressed Mr F's constipation, and gradually reduced and then discontinued the haloperidol. He was prescribed vitamin D and calcium to reduce fracture risk. RACF staff engaged Mr F in a walking and group balance program to further reduce his risk of falls.

† http://www.nps.org.au/__data/assets/pdf_file/0004/16915/ppr04.pdf

12.3 Special considerations

12.3.1 Cognitive impairment

Neyens et al[235] investigated the effectiveness of a multifactorial intervention in preventing falls in psychogeriatric RACF residents. Intervention components included anticipating circumstances and precursors of falls, reviewing and modifying medication, providing individualised exercise programs and assessing the residents' need for protective aids. A significantly lower incidence rate of falls was observed in the intervention group.

Zermansky et al[32] included people with dementia in their randomised controlled trial with residents of care homes. The intervention was a clinical medication review by a pharmacist. Residents in the intervention group experienced fewer falls than those who received usual care (0.8 falls versus 1.3). Nearly 33% of drugs that were discontinued were central nervous system drugs, and close to 60% of medications initiated were calcium or vitamin D.

12.3.2 Rural and remote settings

Staff of remote RACFs may need to seek further professional advice about managing medications. The websites of the National Prescribing Service,† specifically, the Therapeutic Advice and Information Service,‡ may be useful.

12.4 Economic evaluation

A retrospective observational study examined the clinical and cost impact of a falls-focused pharmaceutical intervention program.[236] The study compared people who fell during a one-year period before the program was introduced with those who fell during the year after the program was introduced. The program was run in a United States rehabilitation facility and consisted of a consultant pharmacist making recommendations about monitoring and altering residents' drug therapy. The authors reported that the intervention resulted in a 47% reduction in falls, and estimated that the program would save US$7.74 per resident per day in avoided falls costs.[236] The study did not include a full cost effectiveness analysis.

Some community interventions have been found to be effective and cost effective; however, it is unclear whether the results are applicable to the RACF setting (see Chapter 12 in the community guidelines for more information).

† http://www.nps.org.au/

‡ http://www.nps.org.au/health_professionals/consult_a_drug_information_pharmacist

Additional information

Physician and pharmacist roles in assessment and evaluation procedures are governed by the relevant professional practice standards and guidelines:

- Australian Pharmaceutical Formulary (APF)
- Pharmaceutical Society of Australia (PSA):
  http://www.psa.org.au
- The Society of Hospital Pharmacists of Australia (SHPA):
  http://www.shpa.org.au

Useful resources for staff

- *Australian Medicines Handbook*, 10th edition (2009), produced by Australian Health Consumers Forum and the Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists (ASCEPT), the Pharmaceutical Society of Australia (PSA) and the Royal Australian College of General Practitioners (RACGP).
- *Australian Medicines Handbook Drug Choice Companion: Aged Care*, 2nd edition (2006); includes a falls prevention section.
- Australian Pharmaceutical Advisory Council (APAC):
  http://www.health.gov.au/internet/main/publishing.nsf/Content/nmp-advisory-apac_mem.htm
- *Australian Pharmaceutical Formulary and Handbook*, 21st edition (2009), published by the Pharmaceutical Society of Australia (PSA), includes guidelines and practice standards for medication management review:
  http://www.psa.org.au
- *Medical Care of Older Persons in Residential Aged Care Facilities*, 4th edition of (2006), published by the Royal Australian College of General Practitioners, provides general practitioners and other health care professionals with advice on how to deliver quality care in residential aged care facilities:
  http://www.racgp.org.au/guidelines/silverbook
- MIMS medicines database, which includes full and abbreviated information and over-the-counter information
  Contact: CMPMedica Australia
  Phone 02 9902 7700
  http://www.mims.com.au
- National Medicines Policy:
  http://www.health.gov.au/internet/main/publishing.nsf/Content/National+Medicines+Policy-1
- National Prescribing Service (NPS); incorporates drug information service for health professionals:
  http://www.nps.org.au

  The Therapeutic Advice and Information Service (TAIS) can be contacted on 1300 138 677.
- National Strategy for Quality Use of Medicines:
  http://www.health.gov.au/internet/main/publishing.nsf/Content/nmp-pdf-natstrateng-cnt.htm
- Pharmaceutical Health and Rational Use of Medicines (PHARM) Committee:
  http://www.health.gov.au/internet/main/publishing.nsf/Content/nmp-advisory-apac-pharm
- Residential Medication Management Review (RMMR):
  http://www.health.gov.au/internet/main/publishing.nsf/Content/health-epc-dmmrqa.htm
- SHPA Committee of Speciality Practice in Drug Use Evaluation (2004). SHPA standards of practice for drug use evaluation in Australian hospitals. *Journal of Pharmacy Practice* 34(3):220–223.
- Relevant state and territory drug information centres.
- Relevant state and territory pharmaceutical advisory services.

Useful resources for residents

- Adverse Medicine Events Line
  Phone: 1300 134 237
- Consumer Medicine Information (CMI):
  http://www.health.gov.au/internet/main/Publishing.nsf/Content/nmp-consumers-cmi.htm
- National Prescribing Service (NPS), which incorporates drug information service on the Medicines Line
  Phone: 1300 888 763
- Pharmaceutical Society of Australia (PSA) — self-care health information cards entitled *Preventing Falls* and *Wise Use of Medicines*; available from the PSA, local pharmacy or at http://www.psa.org.au
- Pharmacy Guild of Australia
  Phone: 02 6270 1888
  Fax: 02 6270 1800
  Email: guild.nat@guild.org.au
  http://www.guild.org.au/index.asp


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13 Vision

Recommendations

Assessment

- Arrange regular eye examinations (every two years) for residents in residential aged care facilities to reduce the incidence of visual impairment, which is associated with an increased risk of falls.

Intervention

- Residents with visual impairment related to cataract should have cataract surgery as soon as practicable. (Level II-*)[237,238]
- Environmental assessment and modification should be undertaken for residents with severe visual impairments (visual acuity worse than 6/24). (Level II-*)[239]
- When correcting other visual impairment (eg prescription of new glasses), explain to the resident and their carers that extra care is needed while the resident gets used to the new visual information. Falls may increase as a result of visual acuity correction. (Level II-*)[240]
- Advise residents with a history of falls or an increased risk of falls to avoid bifocals or multifocals and to use single-lens distance glasses when walking – especially when negotiating steps or walking in unfamiliar surroundings. (Level III-2-*)[241]

Note: there have not been enough studies to form strong, evidence based recommendations about correcting visual impairment to prevent falls in any setting (community, hospital, residential aged care facility), particularly when used as single interventions. One trial, set in the community, showed an increase in falls as a result of visual acuity assessment and correction.[240] However, correcting visual impairment may improve the health of the older person in other ways (eg by increasing independence). Considerable research has linked falls with visual impairment in the community setting, although no trials have reduced falls by correcting visual impairment, and these results may also apply to the residential aged care setting.

13.1 Background and evidence

Residents of residential aged care facilities (RACFs) often have more significant visual impairment than the general population.[242,243] The leading causes of visual impairment for residents are cataracts (which are potentially reversible), followed by age-related macular degeneration (which is irreversible).[242,244]

Much of the information in this chapter is based on research undertaken in the community setting. In most cases, the findings and recommendations can be extrapolated to the RACF setting; however, recommendations should be followed with caution.

13.1.1 Visual functions associated with increased falls risk

Studies have shown that reduced visual acuity is an important risk factor for falls in high-care RACFs.[245] In the presence of ocular disease, reduced visual acuity is an independent risk factor for recurrent falls.[246] A retrospective study showed that the risk of multiple falls increases 2.6 times if visual acuity is worse than 6/7.5.[247] Similarly, a prospective study showed that visual acuity of 6/15 or worse nearly doubles the risk of hip fracture, and this risk is greater with even lower visual acuity levels.[248]

Some prospective studies show that other visual functions have also been associated with an increased risk of falling. These visual functions include reduced contrast sensitivity,[180,249] poor depth perception[250,251] and reduced visual field size.[247,252-255]

Having a visual impairment may increase the relative falls risk by an average of 2.7 times in RACF residents.[256] Some research in low-care RACFs shows that residents who fall have reduced contrast sensitivity compared with residents who do not fall.[250]

A 2004 Cochrane review found that there were not enough data to make recommendations about correcting visual impairment to prevent falls in any setting (community, hospital, RACFs).[34]

Despite this, considerable research in the community setting has linked reduced vision with an increased risk of falls or fractures. These findings may be applicable to the RACF setting and are highly relevant to this high-risk group, given the group's higher rate of visual impairment and increased frailty. This section outlines interventions that can be considered good practice, despite a lack of data on their effectiveness when used in isolation.

13.1.2 Eye diseases associated with an increased risk of falling

Visual changes resulting from cataracts (see Figure 13.2) are associated with postural instability[257] and an increased falls risk in older people who live in the community.[258] People with glaucoma can present with a range of loss of peripheral visual fields (side vision) depending on disease severity (see Figure 13.3); this affects a person's postural stability[259] and ability to detect obstacles and navigate through cluttered environments.[253,260] Macular degeneration can cause loss of central vision depending upon disease severity (see Figure 13.4) and is associated with impaired balance[261] and increased risk of falls.[262]

Figure 13.1 shows normal vision, as a comparison.



Source: Courtesy of Vision 2020 Australia

Figure 13.1 Normal vision



Source: Courtesy of Vision 2020 Australia

Figure 13.2 Visual changes resulting from cataracts



Source: Courtesy of Vision 2020 Australia

Figure 13.3 Visual changes resulting from glaucoma



Source: Courtesy of Vision 2020 Australia

Figure 13.4 Visual changes resulting from macular degeneration

13.2 Principles of care

13.2.1 Screening vision

The following strategies may be used to measure vision problems in residents of RACFs:

- Ask the resident about their vision and record any visual complaints and history of eye problems and eye disease.
- Check for signs of visual deterioration. These can include the resident's ability to see detail in objects, read (including avoiding reading) or watch television; a tendency to spill drinks; or a tendency to bump into objects.
- Measure visual acuity or contrast sensitivity using a standard eye chart (eg Snellen eye chart) or the Melbourne Edge Test (MET), respectively (see Table 13.1).
- Check for signs of visual field loss using a confrontation test (see Table 13.1) and refer the resident for a full automated perimetry test by an optometrist or ophthalmologist if any defects are found. Large, prospective studies found that prospective falls were mostly as a result of loss of field sensitivity, rather than loss of visual acuity and contrast sensitivity.[252,253]

Table 13.1 Characteristics of eye-screening tests

Snellen eye chart (for testing visual acuity)	
Description	Standardised eye test of visual acuity. Comprises a series of symbols (usually letters) in lines of gradually decreasing sizes. Participant is asked to read the chart from a distance of 6 m for standard charts (charts designed for shorter test distances are available; the examiner should check that they are using the correct working distance for the chart). Charts should also be well lit and not obscured by glare or shadows. Visual acuity is stated as a fraction, with 6 being the numerator and the last line read the denominator (the larger the denominator the worse the visual acuity). Pocket versions of Snellen charts are available for a clinical screen of visual acuity (these smaller charts can be used at a shorter distance than the standard 6 m to test visual acuity).
Time needed	5 minutes
Criterion	A score of 6/12 indicates visual impairment; however, this depends on the age of the person (the cut-off score will decrease with increasing age).

Melbourne Edge Test (MET) (for testing contrast sensitivity)[263]	
Description	The test presents 20 circular patches containing edges with reducing contrast. Correct identification of the orientation of the edges on the patches provides a measure of contrast sensitivity in decibel units, where dB = $-10\log_{10}$ contrast, where contrast defines the ratio of luminance levels of the two halves of the circular patch.
Time needed	5 minutes
Criterion	A score of less than 18/24 indicates visual impairment; however, the results are age dependent.

Confrontation Visual Field Test[264]	
Description	Crude test of visual fields. Participant and examiner sit between 66 cm and 1 m apart at the same height, with the examiner's back towards a blank wall. To test the right eye, the participant covers the left eye with the palm of the hand and stares at the examiner's nose. The examiner holds up both hands in the upper half of the field, one either side of the vertical, and each with either 1 or 2 fingers extended, and asks the participant, 'What is the total number of fingers I am holding up?' The procedure is repeated for the lower half of the field but changing the number of fingers extended in each hand. The procedure is repeated for the left eye. If the participant incorrectly counts the number of fingers in the upper or lower field, it should be repeated again and recorded. If the participant moves fixation to view the peripheral targets, repeat the presentation. Results are recorded as finger counting fields R✓ and L✓ if the participant correctly reports the number of fingers presented. For those who fail this screening, a diagram should be drawn to indicate in which part of the field the participant made an error.
Time needed	4 minutes
Criterion	If the participant incorrectly reports the number of fingers held up for either eye, they should be referred for a full visual field test.

If more detailed visual assessment is needed once the resident has been assessed using the crude visual screening methods described above, or if the resident scores poorly on these tests, RACF staff should refer them to an optometrist, orthoptist or ophthalmologist for a full vision assessment.

13.2.2 Providing interventions

No studies have looked at vision intervention in RACFs. However, research in the community setting about reducing falls risk through vision intervention may also be applicable to RACFs. Interventions that could be used include the following:

- *Expedited cataract surgery:* this is the only evidence based intervention to date that is effective for reducing both falls and fractures in older people.[237,238]
- *Occupational therapy interventions:* in people with severe visual impairments, home safety should be assessed by an occupational therapist to identify potential hazards, lack of equipment and risky behaviour that might lead to falls. Interventions that help to maximise visual cues and reduce visual hazards should also be used; these include providing adequate lighting and contrast (eg painting white strips along the edges of stairs and pathways).[239,265] Three studies in RACFs included environmental modification as part of a successful multifactorial intervention program[31,33,37] (see Chapter 14 on environmental considerations for more information).
- *Detecting new visual problems:* when a new visual problem is detected, staff of the RACF should refer the resident to an eye specialist[112]
  - if the resident has impaired visual acuity, wears spectacles that are scratched or do not fit comfortably, or has not had an eye examination in the past year
  - if there is no known reason for poor vision.
- *Prescription of optimal spectacle correction with caution:* make sure the resident's prescription is correct and refer them to an optometrist if necessary. However, caution is required in frail, older people; a randomised controlled trial found that comprehensive vision assessment with appropriate treatment does not reduce — and may even increase — the risk of falls.[240] The authors speculated that large changes in visual correction may have increased the risk of falls, and that more time may be needed to adapt to updated prescriptions or new glasses.

- *Advice on the most appropriate type of spectacle correction*: wearing bifocal or multifocal spectacle lenses when walking outside the home and on stairs has been associated with a twofold increase in the risk of falls in older people who live in the community.[241] These results may also apply to residents in an RACF setting. The health care team should advise residents with a falls history or identified increased falls risk to use single-vision spectacles (instead of bifocals or multifocals) when walking, especially when negotiating steps or moving about in unfamiliar surroundings. A study also suggested telling older people who wear multifocals and distance, single-vision spectacles to flex their heads rather than just lowering their eyes to look downwards to avoid postural instability.[257]



Point of interest: mobility training

Vision Australia specialises in safe mobility training for visually impaired people: http://www.visionaustralia.org.au



Case study

Mr B is an 84-year-old gentleman who lives in a residential aged care facility (RACF). Recently, he tripped and fell on a step. He said that he did not notice the step, and also reported that his vision seemed to be growing fuzzier. Staff at the RACF referred Mr B to an optometrist to check he was wearing the optimum spectacle correction for distance vision. The optometrist diagnosed that the cause of Mr B's vision loss was macular degeneration. Staff at the RACF took measures to provide a safe environment for Mr B to walk around. Staff also checked that his room was properly lit at all times. Mr B now has a light by his bed and his walking frame is always positioned by the bedside at night, because he tends to get up at night to go to the toilet. Mr B was also given instructions about mobilisation and encouraged to call for help when he did not feel confident to walk around, away from his room. Staff have made sure that Mr B has supervision when negotiating steps.

13.3 Special considerations

13.3.1 Cognitive impairment

Where possible, residents with cognitive impairment should have their vision tested using standard testing procedures. Where this is not possible, visual acuity can be assessed using the Landolt C or Tumbling E chart – neither of which require letter recognition.

The Landolt C is a standardised symbol (a ring with a gap, similar to a capital C) used to test vision. The symbol is displayed with the gap in various orientations (top, bottom, left, right), and the person being tested must say which direction it faces. The Tumbling E chart is similar, but uses the letter E in different orientations.

13.3.2 Rural and remote settings

Health care professionals or carers can contact Optometrists Association Australia in their state or territory for an up-to-date list of optometrists providing services in rural and remote areas. To find a local ophthalmologist, the resident's general practitioner or optometrist can provide a referral. Alternatively, contact the Royal Australian and New Zealand College of Ophthalmologists on +61 2 9690 1001. The strategies outlined earlier in this section should be implemented before a referral to an ophthalmologist is made.

13.3.3 Indigenous and culturally and linguistically diverse groups

Where appropriate, visual acuity can be measured for Indigenous people using a culturally appropriate chart known as the 'turtle chart',[266] which has a series of turtles of different sizes and orientations. Similarly, there is a series of culturally appropriate brochures and posters that describe different eye diseases and conditions, and different types of spectacle corrections.

13.3.4 People with limited mobility

Domiciliary visits by optometrists or ophthalmologists may be necessary for housebound older people. Contact Optometrists Association Australia in your state or territory to access a current list of optometrists willing to provide such services.

13.4 Economic evaluation

No economic evaluations were identified that considered interventions specific to vision in the RACF setting. Some community interventions have been found to be effective and cost effective; however, it is unclear whether the results are applicable to the RACF setting (see Chapter 13 in the community guidelines for more information).



Additional information

The following associations may be helpful:

- Guide dogs associations in Australia help people with visual impairment to gain freedom and independence to move safely and confidently around the community and to fulfil their potential:
  http://www.guidedogsaustralia.com
- Macular Degeneration Foundation promotes awareness of macular degeneration and provides resources and information:
  http://www.mdfoundation.com.au
- Optometrists Association Australia
  Tel: 03 9668 8500
  Fax: 03 9663 7478
  Email: oaanat@optometrists.asn.au
  http://www.optometrists.asn.au (the website contains details for state and territory divisions)
- Vision Australia provides services for people with low vision and blindness across Australia:
  http://www.visionaustralia.org.au



14 Environmental considerations

Recommendations

Assessment

- Residents considered to be at a higher risk of falling should be assessed by an occupational therapist and physiotherapist for specific environmental or equipment needs and training to maximise safety.

Intervention

- Environmental review and modification should be considered as part of a multifactorial approach in a falls prevention program. (Level I)[7]

Good practice points

- Residential aged care facility staff should discuss with residents their preferred arrangement for personal belongings and furniture. They should also determine the resident's preferred sleeping arrangements.
- Make sure residents' personal belongings and equipment are easy and safe for them to access.
- Check all aspects of the environment and modify as necessary to reduce the risk of falls (eg furniture, lighting, floor surfaces, clutter and spills, and mobilisation aids).
- Conduct environmental reviews regularly, and consider combining them with occupational health and safety audits.

14.1 Background and evidence

Rates of falls vary between residential aged care facilities (RACFs), indicating that environmental factors influence the risk of falls.[2]

Environmental review and modification refers to checking the RACF for hazards that might cause residents to fall, and then modifying or rearranging the environment to remove or minimise these hazards. For example, this could include removing clutter, improving lighting, supplying and repairing assistive devices, and installing handrails.

A Cochrane review looked at the effectiveness of different interventions for preventing falls in residents of RACFs.[7] The review found that multifactorial interventions that target several different risk factors (eg falls prevention programs that include environmental modification in a suite of interventions) may help to prevent falls in residential care settings.[2,7] Multifactorial approaches could include exercise, medication review, vision assessment and a number of other interventions. However, there are not enough data to see what effect environmental modification, on its own, has on reducing falls in these settings — mainly because individual trials either did not look at the effectiveness of these interventions in isolation or because the trials were of a low quality.

Based on this Cochrane review, environmental review and modification should be considered as part of a multifactorial approach in a falls prevention program. However, it must be remembered that, when used on their own, environmental modification strategies may or may not make a difference to the incidence of falls.

Different environmental factors may be relevant to specific higher risk populations, such as nonambulatory people, and people with cognitive impairment, incontinence and gait disturbance (see below for more information).[2] Rapp et al[267] evaluated subgroups of nursing home residents from an earlier randomised controlled trial[33] and found that the intervention (which included staff and resident education, environmental modification, progressive balance and resistance training, and hip protectors) was effective for people with cognitive impairment, a history of falls, urinary incontinence and those who reported a depressed mood.



Point of interest: using low beds to reduce risk of injury from falls

As well as minimising the use of bed rails, some Australian health care professionals have identified the use of high/low beds (beds able to be lowered close to floor level), low/low beds (beds able to be lowered to floor level), bean bag chairs and the occasional practice of people sleeping on mattresses on the floor as ways of reducing the injury risk of older people who fall out of bed frequently.

14.2 Principles of care

14.2.1 Assessing the resident in their environment

An environmental assessment should be done by a health professional (eg an occupational therapist) with experience and training in evaluating people and their environment.[34] An occupational therapist can evaluate residents to determine their capacity to plan and perform activities of daily living and to meet the functional demands of the environment.[268]

Where an occupational therapist receives a referral from another member of the health care team and is asked to review a resident because of a fall or risk of falls, the occupational therapist should do the following:

- Conduct an initial evaluation and identify the range of environments in which the person lives, chart their daily schedule or routine and identify relevant activities of daily living (ADL) for assessment.
- Assess the person's impairment by checking their
  - physical resources (strength, range of motion, coordination, sensation, balance)
  - perceptual or cognitive function
  - general mobility (bed, wheelchair ambulation).

- Conduct a performance evaluation using an ADL checklist or standardised ADL evaluation. While many of these exist, assessments that focus on functional performance and safety in ADL concurrently are recommended. ADL assessments should include[268,269]
  - mobility: movement in bed, wheelchair mobility and transfers; indoor and outdoor ambulation with equipment and use of transportation (where appropriate)
  - self-care activities: dressing, feeding, toileting, bathing and grooming
  - management of environmental devices: use of light switches and call bells; ability to open windows, reach into cupboards and access personal items
  - communication: ability to summon help and communicate needs.

The assessment should include observing the person within their environment, including their use of equipment. Also, the assessment should be done at the same time of day and in the same location that the person normally does these tasks,[269] and with the same walking aids and devices that they would usually use.

When evaluating the person's performance in ADL, the occupational therapist should observe:

- methods the person is using or attempting to use to accomplish the task
- safety factors (use of equipment safety features, etc)
- ease of mobility
- limitations imposed by the environment (eg disparity in transfer surfaces, inappropriate position of grab rails)
- suitability of existing assistive devices.

At the end of the evaluation, the occupational therapist should provide a summary identifying:

- additional safety equipment required
- assistive devices required and recommendations for their use
- rearrangement of furniture
- environmental modifications required
- training requirements of the resident in safe transfer technique and equipment use.

Equipment or alterations should be noted in terms of size, specification and cost. Recommendations should be reviewed with the person and the relevant staff of the facility.

14.2.2 Designing multifactorial interventions that include environmental modifications

Several good-quality trials have demonstrated that a multifactorial approach that also addresses the environmental and cultural setting of the institution can prevent falls for nursing home residents.[33,267,270] For example, one randomised controlled trial with a sample of 439 residents reduced falls by 40% (incident rate ration = 0.6, 95%CI 0.50 to 0.73).[270] The intervention consisted of a staff training program that included environmental modification (eg removing furniture that posed a risk and keeping floors dry); exercises to improve muscle strength, balance, gait and transfers; repair and provision of mobility aids, equipment and fitted footwear; medication review; hip protectors for residents with the highest falls risk; and staff team support and reporting systems.

Effective multifactorial interventions should incorporate environmental modifications such as:[2]

- ensuring chairs and beds are at the correct height (ie when the resident's feet are flat on the ground, their hips are slightly higher than their knees)
- assessing lighting
- installing nonslip flooring in wet areas
- routinely cleaning up wet floors
- installing additional rails in bathrooms and corridors
- reducing clutter in residents' rooms
- providing and repairing walking aids
- replacing or repairing unsafe footwear
- removing loose carpets
- providing individual seating
- promoting wheelchair safety
- providing bed stabilisers, and bedside commodes at night
- moving residents at high risk of falling closer to the nursing station
- using electronic warning devices and avoiding use of restraints.

Little research has looked at floor surfaces, but one small observational study has shown that wooden floors covered by carpet were associated with the lowest number of fractures when comparing carpeted, uncarpeted, wooden and concrete floors.[271] Therefore, carpeting high-traffic areas might be a useful component of a multifactorial intervention strategy,[2] although it should be remembered that carpeting will not reduce the risk or incidence of falls, but may help to minimise injuries.

14.2.3 Conducting environmental reviews

Regular environmental reviews should be done with the following points in mind:

- Make modifications based on the findings of the audit.
- Prioritise audits by considering the following environments
  - high-risk environments (bedrooms, dining rooms, bathrooms and toilets)
  - environments identified through incident monitoring, hazard identification or near-miss reporting
  - environments identified through environmental checklists (Appendix 5 contains a general environmental checklist that may be useful when auditing the environment).
- Include external environments in environmental reviewing.[272]
- Consider how environmental reviews may fit in with existing workplace health and safety audits.
- Involve a range of disciplines in environmental reviews and interventions, including health professionals, workplace health and safety personnel, infection-control personnel,[272] staff working in that particular environment, specialists in geriatric assessment or ergonomics, technical advisers and residents' carers, where appropriate.
- Ensure a mechanism is in place for reporting environmental hazards.

When considering environmental change, RACF staff should explore a range of products, equipment and innovative solutions. Keep in mind that changing a resident's environment could have a negative impact. For example, reorganising furniture may be contraindicated for residents who are visually impaired or those with dementia.

Appendix 6 contains useful information on modifying flooring, lighting, bathrooms and toilets, hallways, stairways and steps, furniture, beds, chairs, alert or call systems and external environments.

14.2.4 Orientating new residents

Many falls occur in a person's first few days in a new setting.[273] Therefore, staff in RACFs should help residents to become familiar with new environments and teach them to use equipment.[274] This orientation could include teaching the resident to mobilise and transfer safely between furniture or equipment that they are unfamiliar with.[231,275]

14.2.5 Incorporating capital works planning and design

When building or renovating RACFs, the following issues should be considered:

- Safety and practicality are just as important as aesthetics.
- Facilities should conform to legislated safety requirements.[272,276]
- A design that allows observation or surveillance of residents is important for safety.[272]
- Lighting and handrails at steps and stairs should be used, and stairs should be designed to allow safe descent.[276]
- Slip-resistant flooring should be installed in all wet areas.[276]

14.2.6 Providing storage and equipment

The risk of falls needs to be considered when new equipment is acquired, or when existing equipment arrangements are being designed or modified (eg walking aids, new seating, shower chairs).[272,276] Health professionals and RACF staff should be involved in decisions about buying equipment.

Clutter should be reduced by providing adequate storage space for equipment,[272] and equipment should be audited at least monthly.[113]

14.2.7 Review and monitoring

Environmental strategies are likely to be incorporated in conjunction with other interventions to reduce falls. As discussed earlier, their effectiveness in isolation from other risk factors is difficult to measure. The effectiveness of environmental interventions is likely to be reflected in falls indicators, such as a change in the location of falls and a reduction in falls associated with particular environmental hazards.

Staff should review and assess environments in RACFs regularly (particularly high-risk environments such as bedrooms, bathrooms, dining rooms, etc). A floor plan of the RACF is a useful tool for mapping fall locations and for showing the number of falls and near misses in particular environmental hot spots. Mapping falls before and after environmental modification can provide feedback on the effectiveness of the environmental adjustments.



Case study

Mr G has Parkinson's disease. Recently, staff noticed that he finds it hard to rise from the lounge chair in his room at the residential aged care facility. Nursing staff advised his general practitioner, who undertook a medical review, and therapy staff assessed his transfers and activities of daily living. His chair height was adjusted and a wedge cushion supplied (for use in both lounge and dining rooms), assistive bed equipment was provided for bed transfers, and support staff were instructed in how to best help him with transfers given his condition. Mr G now attends regular group sessions with the physiotherapist aimed at balance and strength training. As a result of this process, Mr G is now safer in his activities of daily living and has a lower risk of falling.

14.3 Special considerations

14.3.1 Cognitive impairment

The physical environment takes on greater significance for people with diminished physical, sensory or cognitive capacity.[274] The unique characteristics of people who are cognitively impaired may adversely affect their interaction with the environment. As well as reviewing the environmental factors noted in Appendix 5, staff of RACFs should make sure that residents who are agitated or who show behavioural disturbances are observed or monitored adequately.

Specific environmental changes can help residents with cognitive impairment to be more comfortable and independent, and can reduce confusion and the risk of falls. For example, consider positioning the resident close to nursing staff, using bed or chair alarms, or using electronic surveillance systems.[277] Colour-coded rooms in dedicated dementia units have been used in some Australian RACFs to help cognitively impaired residents know which room is theirs. Other things that may help include:

- using calming colour schemes to reduce agitation[2]
- making sure the RACF setting supports and promotes improved continence (ie toilet close by, easy to find and clearly marked)[274]
- providing a predictable, consistent environment
- using suitable and stable furniture without sharp edges[232]
- providing adequate lighting to ensure clear vision and to prevent casting shadows.[232]

Specific recommendations for dementia care and the built environment are available and suggest that home-like surroundings may be associated with less agitation and disruptive behaviour for people with dementia.[278] This may prevent falls, but further research is needed to test specific environmental modifications and effect on outcomes including falls.

14.3.2 Rural and remote settings

Many of the environmental strategies suggest multidisciplinary involvement, which may not be readily available in rural and remote settings. Videoconferencing, teleconferencing and interagency collaboration may be beneficial.

In facilities where only a visiting occupational therapist is available, it would be useful to audit the environment (see Appendix 5) and the equipment (see Appendix 6) and to take corrective action before the therapist's visit. This would help to identify key areas requiring specialist advice.

14.3.3 Nonambulatory people

Falls occurring in nonambulatory people are more likely to involve equipment and to occur while seated or during transfers.[279] Therefore, interventions to reduce the risk of falls for these people should consider transfer and equipment safety.

14.3.4 People who wander

RACFs need to include safe walking areas, and staff should provide opportunities for residents who wander.[113,272] This will require assessing both internal and external areas, with due consideration to flooring, lighting and seating.

A simulated community environment in an enclosed and safe area that incorporates a walking track with a bench and bus stop sign can be useful for helping people who wander. For a safe, simulated community environment:

- ensure exits are secure[280]
- avoid extremes of stimulation (noise, activity, lighting) and monitor the impact of these on a person's behaviour, confusion and agitation[2]
- mark appropriate doors (eg toilet, bathroom) with both letters and pictures[275]
- have familiar pictures to provide cues to the resident's own room.[277]

14.4 Economic evaluation

Some environmental modification interventions have been effective and cost effective in the community setting; however, it is unclear whether the results are applicable to the RACF setting (see Chapter 14 in the community guidelines for more information).



Additional information

The following associations and organisations may be helpful:

- Alzheimer's Australia (2004). *Dementia Care and the Built Environment: Position Paper 3*, Australian Government, Canberra:
  http://www.alzheimers.org.au/upload/Design.pdf
- Home Modification Information Clearinghouse collects and distributes information on home maintenance and modifications, and has a number of useful environmental reviews:
  http://www.homemods.info
- Independent living centres, which are available in most states and territories, provide independent information and advice on the ranges of equipment, floor surfacing products, etc. See Independent Living Centres Australia:
  http://www.ilcaustralia.org/home/default.asp
- OT AUSTRALIA
  Ph: 03 9415 2900
  Fax: 03 9416 1421
  Email: info@ausot.com.au
  http://www.ausot.com.au

15 Individual surveillance and observation

Recommendations

Intervention

- Include individual observation and surveillance as components of a multifactorial falls prevention program, but take care not to infringe on residents' privacy. (Level III-2-*)[38]
- Falls risk alert cards and symbols can be used to flag high-risk residents as part of a multifactorial falls prevention program, as long as appropriate interventions are used as follow-up. (Level II-*)[185]
- Falls alerts used on their own are ineffective. (Level II)[35]
- Consider using a volunteer sitter program for people who have a high risk of falling, and define the volunteer roles clearly. (Level IV-*)[281,282]
- Residents with dementia should be observed more frequently for their risk of falling, because severe cognitive impairment is predictive of lying on the floor for a long time after a fall. (Level III-2-*)[38]

Note: most falls in residential aged care facilities are unwitnessed.[23] Therefore, as is done in the hospital setting, the key to reducing falls is to improve surveillance, particularly for residents with a high risk of falling.[38]

Good practice points

- Individual observation and surveillance are likely to prevent falls. Many falls happen in the immediate bed or bedside area, or are associated with restlessness, agitation, attempts to transfer and stand, lack of awareness or wandering in people with dementia.
- Residents who have a high risk of falling should be indentified and checked regularly.
- A staff member should stay with at-risk residents while they are in the bathroom.
- Although many residents are frail, not all are at a high risk of falling; therefore, surveillance interventions can be targeted to those residents who have the highest risk.
- A range of alarm systems and alert devices are commercially available, including motion sensors, video surveillance and pressure sensors. They should be tested for suitability before purchase, and appropriate training and response mechanisms should be offered to staff. Suppliers of these devices should be located if a facility is considering this intervention. However, there is no evidence that their use in residential aged care facilities reduces falls or improves safety.

15.1 Background and evidence

Many falls that occur in residential aged care facilities (RACFs) are unwitnessed.[23] An Australian report on falls leading to hospitalisation showed that one-fifth (21.8%) of these falls occurred in RACFs in 2005–06.[283] A range of approaches have been reported for identifying when a person at high risk of falling is getting out of a bed or chair unsupervised (particularly for people with cognitive impairment). These approaches, which have been investigated in the hospital setting but may be useful in the RACF setting, include:

- locating the resident in an area of higher visibility (eg near the nursing station or using video surveillance)[21]
- flagging those at high risk (eg use of falls risk alert cards or symbols)[35,185]
- making frequent, systematic observations[284]
- using sitter programs[21,281,282]
- using alarm systems and alert devices.[2,285]

Observational studies have looked at technologies for detecting falls, such as infrared movement detectors, fall alarms (which sound when the resident is already on the floor), bed and chair alarms, and movement alarms; however, the studies were generally of poor quality. A systematic review concluded that there are not enough trials in hospitals and care homes that investigate specific interventions, such as alarms.[27]

The use of surveillance can have ethical and legal considerations (ie deprivation of liberty, mental capacity and infringement of autonomy). Care must be taken that surveillance does not infringe on the resident's autonomy or dignity. RACFs must have clear policies and procedures in place for using surveillance. See also Chapter 16 on the use of restraints and associated ethical and legal considerations.

15.2 Principles of care

While many residents of RACFs are frail, not all have a high risk of falling because of their relatively immobile state. Therefore, the burden of care can be eased by targeting surveillance interventions to those who have the highest risk of falling.

The following general principles of observation and surveillance in RACFs are based on good practice in the hospital setting. They may also be considered good practice in the RACF setting despite a lack of RACF-specific trials. However, the circumstances of an older person being admitted to an acute or rehabilitation hospital mean their risk profile differs markedly from that of the resident in a stable state in an RACF. Strategies are not necessarily transferable.

The choice of surveillance and observation approaches will depend on a combination of the findings from the assessment of each resident, clinical reasoning, and access to resources and technology. More than one surveillance and observation approach should be used, thereby avoiding dependence on one specific approach.

An important strategy to consider for improving surveillance is to review staff practices, such as timing of tea and lunch breaks, to ensure adequate supervision is available when required. Also, personal choice for the frequency of showers or personal hygiene needs to be considered on an individual basis and balanced against existing routines in the facility.

Where possible, allocate high-visibility beds or rooms (such as near nursing stations) to those residents who require more attention and supervision, including residents who have a high risk of falling.

15.2.1 Flagging

Residents who have a high risk of falling should be informed of their risk. In an RACF, the resident's risk of falling should be identified ('flagged') in such a way that considers their privacy, yet is recognised easily by staff and the resident's family and carers. A range of methods other than verbal and written communication may be used to ensure ongoing communication of high-risk status (flagging), including:

- coloured stickers or markers (positioned on case notes, walking aids, bedheads)[35]
- signs, pictures or graphics on or near the bedhead.[35,185]

Flagging reminds staff that a resident has a high risk of falling, and should trigger interventions that may prevent a fall. These interventions must be available or the flagging may not be beneficial. Flagging may also improve a resident's own awareness of their potential to fall.[232] A randomised controlled trial conducted in 14 RACFs in New Zealand used a logo and coloured dots to flag falls risk.[35] The logo was a flower with a falling leaf and was displayed on a wall in the resident's room. Each coloured dot indicated a particular falls risk and had a corresponding strategy for staff to follow to minimise that falls risk. This intervention was low intensity and aimed to raise staff awareness. However, it was associated with increased falls in the intervention group, compared with baseline, emphasising the importance of incorporating appropriate interventions with the logo or alert, rather than using the alert as a sole intervention.

A multifactorial trial in three Australian subacute hospital wards included a risks alert card by the bedside.[185] The researchers deliberately used a symbol, rather than words, on the A4-sized card, to minimise violating patient privacy or causing distress to patients or their families. Across the study duration, no official complaints were made about the alert card being displayed. Other components of the intervention included an information brochure, an exercise program, an education program and the use of hip protectors. The incidence of falls in the intervention group was reduced compared with the control group.

15.2.2 Colours for stickers and bedside notices

The Australia-wide consultation process that facilitated the production of these guidelines found that green or orange were frequently used colours for stickers and bedside notices to signify a high risk of falling. Although some falls prevention studies have used 'high-risk' alert stickers, the results are conflicting. In the absence of data to the contrary, it may be beneficial for staff to flag high-risk residents, using colours or symbols consistently. Ongoing staff education about the purpose and importance of flagging is essential.

Ideally, in the hospital setting, patients who have a high risk of falling should be checked at least half-hourly and offered assistance; this may also apply to the RACF setting.[284] A staff member should remain with the high-risk resident while in the bathroom.[284]

If appropriate, RACF staff should notify carers, family or friends of the resident's risk of falling and their need for close monitoring. Encourage them to spend time sitting with the person, particularly in waking hours, and to notify staff if the resident requires assistance.

If a nearby resident consents to informally observe the resident at risk of falling, they may report to staff if that resident needs help.

15.2.3 Sitter programs

Some RACFs have introduced sitter programs.[286] These programs use volunteers, families or paid staff to sit with residents who have a high risk of falling. The sitters are rostered to spend between two and eight hours at a time with a resident. The role of the sitter is to provide company for the resident and to notify the appropriate staff when the resident wishes to undertake an activity where they may be at risk of falling (such as transferring or mobilising). This may be a viable strategy in certain settings, in an effort to prevent falls for selected residents. Using sitters requires planning, resources, education, investment (particularly for paid people) and ongoing coordination.

An observational study in Australian hospitals found that a limitation of volunteer sitters is that they are typically only available in 'business' hours.[281] A feasibility study run in Australian hospitals found that providing 24/7 surveillance coverage by volunteers would require an additional 15 volunteers a week.[282] Both studies found some tensions between volunteers and nursing staff, arising from lack of clarity about the volunteer's role or nurses feeling that volunteers were demanding their time. However, because these studies were conducted in the hospital setting, it is unclear whether similar situations would occur in the RACF setting.

15.2.4 Response systems

Response systems are usually a form of monitor, incorporating an alarm that sounds when a person moves. A number of response systems are commercially available. A prospective cohort study investigated the use of alarms by residents 90 years and older, living either in their own home or in an RACF.[287] All residents had a call alarm installed in their room. However, failure to use the alarm was extremely common among residents who had a fall when alone: 62 out of 66 residents (94%) who had a fall when alone did not use the alarm. In some systems, an alarm is activated by a pressure sensor when a person starts to move from a bed or chair.

A randomised controlled trial of residents of a geriatric evaluation and treatment unit did not find any statistically significant difference between an intervention group who received a bed alarm system and a control group who did not.[288] However, the authors concluded that bed alarm systems may still be beneficial in guarding against bed falls and may be an acceptable method of preventing falls. Therefore, it is difficult to make recommendations about using bed alarm systems in the RACF setting.

Another type of alarm is a credit card–sized patch containing a receiver, which is worn on the body.[285] Ideally, the patch is worn directly on the thigh. However, for people with compromised skin integrity, the patch can be placed on clothing (although this limits its usefulness to when clothing is worn). The alarm can be integrated with existing nurse-call systems and is activated when the wearer's leg moves to a weight-bearing position. A cross-over study investigated the effectiveness of this type of alarm.[285] However, the study had many limitations: the observation time was only one week, and it was not clear what other falls prevention interventions the participants were also using. The study was conducted by the company that produced the device, suggesting that independent studies are needed to verify findings. The possible advantages of a body-worn device appear to be its small size and nonobtrusiveness, and that it can be integrated with existing nurse-call systems.

In other alarm systems, an alarm sounds when any part of a person's body moves within a space monitored by the alarm. Yet another style of alarm activates when a person falls but does not get up. Response systems require capital investment and rely on a third party (eg RACF staff or the resident's carer) to respond when the alarm sounds. The issues of who responds and how, and what impact this has on ward practice — including that it may take away from other areas of care — need to be considered before any system is implemented.

Alarms may pose risk management problems for RACFs in that failure to respond to an alarm because of lack of staffing could be seen as a failure in care. Moreover, it is not necessarily correct to assume that if someone lacks mental capacity due to dementia, they should be subjected to intrusive surveillance to prevent falls.[287] Care should be taken that alarms do not infringe on autonomy. The lack of clear research results (probably due to the difficulties in researching this area), and the ethical and legal considerations of monitoring people should be considered when making decisions. There is no evidence to support the use of alarms in preventing falls.

15.2.5 Review and monitoring

Evaluation of the effectiveness of surveillance and observation systems will depend on the range and mix of systems that are used. Indicators of the acceptance of surveillance and observation systems may include:[281,282]

- frequency of use of observation and surveillance methods
- satisfaction of staff, residents, and their family, carers or friends with observation and surveillance methods.

An indicator of the effectiveness of surveillance and observation systems may include the number of falls after an improved surveillance program has been introduced, compared with the number of falls before it was introduced.

Case study

Miss D is a mobile 90-year-old resident of a residential aged care facility. She has dementia and has been falling frequently in the past month. All staff — including medical, allied health, nursing, administration, food services and operational staff — are aware of Miss D's high fall risk because of a green sticker on her bedhead and her walking aid. This is an ongoing reminder that Miss D should walk with supervision at all times. To avoid confusing and disorientating Miss D, staff agree not to move her to a room of higher visibility, but each hour, night and day, they check on her. If Miss D is awake, she is offered assistance. Family, carers and friends know of Miss D's high risk of falling and are encouraged to spend time with her. Recognising the importance of maintaining her mobility, staff do not discourage her from being mobile. An alarm device is used when she is in bed. All staff are aware of the need to respond promptly when the alarm is activated.

15.3 Special considerations

15.3.1 Cognitive impairment

Surveillance and observation approaches are particularly useful for older people who forget or do not realise their limitations. Improved surveillance and observation may offer a preferable alternative injury minimisation strategy to the use of restraints.[2]

15.3.2 Indigenous and culturally and linguistically diverse groups

In some cultures, it is accepted practice to sit for long periods with ill relatives and elders. This may afford a greater role to carers, family members and friends in supervising the person's activity to reduce the risk of falls.

15.4 Economic evaluation

No economic evaluations were identified that specifically considered interventions for individual surveillance in the RACF setting. Some interventions have been conducted in a hospital environment; however, it is unclear whether the results are applicable to the RACF setting (see Chapter 15 in the hospital guidelines for more information).

Additional information

Successful observation practices in the hospital setting have targeted changes in nursing practice. Nurses are able to observe patients for greater periods of time during the course of their shift by modifying long-established practices related to nurse documentation, nursing handover, patient hygiene practices, staff meal breaks and patient eating times, and creation of a high-observation bay.[38]

The Australian Resource Centre for Health Care Innovation provides information and resources for health care professionals, including information on preventing falls: http://www.archi.net.au/e-library/safety/falls



16 Restraints

Recommendation

Assessment

- Causes of agitation, wandering or other behaviours should be investigated, and reversible causes of these behaviours (eg delirium) should be treated before the use of restraint is considered.

Note: physical restraints should be considered the last option for residents who are at risk of falling[289] because there is no evidence that their use reduces incidents of falls or serious injuries in older people.[290-293] However, there is evidence that they can cause death, injury or infringement of autonomy.[294,295]

Good practice points

- The focus of caring for residents with behavioural issues should be on responding to the resident's behaviour and understanding its cause, rather than attempting to control it.
- All alternatives to restraints should be considered, discussed with family and carers, and trialled for residents with cognitive impairment, including delirium.
- If all alternatives are exhausted, the rationale for using restraint must be documented and an anticipated duration agreed on by the health care team, in consultation with family and carers, and reviewed regularly.
- If drugs are used specifically to restrain a resident, the minimal dose should be used and the resident reviewed and monitored to ensure their safety. Importantly, chemical restraint must not be a substitute for alternative methods of restraint outlined in this chapter.

16.1 Background and evidence

A restraint is a mechanism used to control or modify a person's behaviour. Physical restraints include lap belts, table tops, meal trays and backwards-leaning chairs or 'stroke chairs' that are difficult to get out of, and possibly bed alarm devices. Covert restraint practices may occur, such as tucking bed clothes in too tight, wedging cupboards against beds or locking doors. Drugs, such as sedatives, have sometimes been used as chemical restraints but, in most situations, this is regarded as an inappropriate form of restraint. However, when a resident's behaviour is disturbed and their risk of falling is increased, there may be a case for chemical restraint. Bed rails are also sometimes used as a type of restraint.

Physical restraint of people during admission to residential aged care facilities (RACFs) was common practice for many years.[291] The prevention of falls is cited as the most common reason for the use of physical restraints.[296] Studies have shown that some health care workers believe that restraining people will prevent a fall;[289] however, evidence suggests that restraints may have the opposite effect and that people who are restrained are more likely to fall.[232,296] In some instances, reducing the use of restraints may actually decrease the risk of falling.[297]

An observational study from Finland recorded the use of psychoactive medications and other drugs as chemical restraints in long-term care. They found that, out of 154 participants, 33% received three or more psychoactive medications regularly, and 24% received two or more benzodiazepine derivatives or related drugs regularly. The authors concluded that psychoactive medications were used as chemical restraints in these long-term care wards.[298]

If used, restraints should be the last option considered.[299] A systematic review of physical restraint use and injuries found an association between restraint use and increased risk of injury and death.[291]

If drugs are used specifically to restrain a resident, the minimal dose should be used and the resident reviewed and monitored to ensure their safety. Importantly, chemical restraint must not be a substitute for alternative methods of restraint outlined in this chapter.

16.2 Principles of care

16.2.1 Assessing the need for restraints and considering alternatives

RACFs should aim to be restraint free. All RACFs should have clear policies and procedures on the use of restraints, in line with state or territory legislation and guidelines. Causes of agitation, wandering or other behaviours should be investigated, and reversible causes of these behaviours (eg delirium) should be treated before the use of restraint is considered.[4,300] Restraints should not be used at all for residents who can walk safely and who wander or disturb other residents.[232] Wandering behaviour warrants urgent exploration of other management strategies, including behavioural and environmental alternatives to restraint use. These alternatives may include:[299]

- using strategies to increase observation or surveillance
- providing companionship
- providing physical and diversionary activity
- meeting the resident's physical and comfort needs, especially toileting (according to individual routines as much as possible rather than facility routines)
- using low beds
- decreasing environmental noise and activity
- exploring previous routines, likes and dislikes, and attempting to incorporate these into the care plan.

Staff of RACFs should have appropriate and adequate education about alternatives to restraints. Education can reduce the perceived need to use restraints, as well as minimise the risk of injury when they are used.[289]

16.2.2 Using restraints

When the resident's health care team has considered all alternatives to restraints, and agreed that the alternatives are inappropriate or ineffective, restraints could be considered. In such cases, restraints should only be used temporarily to:[289]

- prevent or minimise harm to the resident
- prevent harm to others
- optimise the resident's health status.

The health care team must also take into account the rights and wishes of the resident, their carer(s) and family.[4] Any decision to use restraints should be made by discussing their use and possible alternatives with the resident, their carer(s) and family.

When the use of restraints is unavoidable, the type of restraint chosen should always be the least restrictive to achieve the desired outcome. Furthermore, restraint use should be monitored and evaluated continually. Restraints should not be a substitute for supervision, inadequate staffing or lack of equipment,[280,299] and they should not be applied without the support of a written order.[299] The minimum standard of documentation for restraint use should include:[289,301]

- date and time of application
- the name of the person ordering the restraint
- authorisation from the medical officer
- evidence of regular review
- type of restraint
- reasons for the restraint
- alternatives considered and trialled
- information about discussion with the resident, carers or substitute decision makers
- any restrictions on the circumstances in which the restraint may be applied
- the intervals at which the resident must be observed
- any special measures necessary to ensure the resident's proper treatment while the restraint is applied
- the duration of the restraint.

16.2.3 Review and monitoring

Every RACF should have a restraint policy that is reviewed regularly. Staff should also be assessed on their knowledge and skill in using alternatives to restraints, as well as their knowledge of the RACF's restraint policy. Trends in the use of restraints should also be monitored; for example, why a restraint is used, for how long and what alternatives were considered.[299] A restraint-use form may be useful for this purpose.

Case study

Mrs S is a 90-year-old woman who lives in a residential aged care facility. She has dementia and walks with supervision. Her family requested that the staff raise the bed rails when she is in bed, because they were concerned she would get up without assistance and could fall. The staff discussed with Mrs S's family the potential for injury if she manages to climb over raised bed rails. They informed the family of their restraint reduction policy, which particularly targets the reduced use of bed rails or bedsides.

Staff repeated a falls risk assessment and developed a management plan aiming to reduce Mrs S's risk of falling. They addressed the identified risk factors for falling, including a medication review and reduction in psychoactive medication, and a supervised balance and strengthening exercise program with the physiotherapist. Staff also issued Mrs S with hip protectors, lowered the bed to its lowest height when Mrs S is in bed, placed one side of the bed against the wall and ensured everything she needed was within her reach. Despite their efforts, the family remained insistent that the bed rails be raised. Staff will continue to work with the family and trial alternative options, and have requested a case conference with the family and the general practitioner in a few weeks to review the current strategies.

16.3 Special considerations

16.3.1 Cognitive impairment

For residents with cognitive impairment who cannot stand or mobilise safely on their own, restraints should only be used after their falls risk has been evaluated and alternatives to restraint have been considered. If restraints are applied, they should be used only for limited periods and reviewed regularly. The use of physical restraints has been associated with delirium and therefore their use should be kept to a minimum.[300] See Chapter 7 for more information on delirium.

16.4 Economic evaluation

No economic evaluations were found that examined the cost effectiveness of restraints in the RACF setting.



Additional information

Below are some useful guidelines, policy statements and tools for the use of restraints and alternatives:

- *Decision-Making Tool: Responding to Issues of Restraint in Aged Care*, Australian Government Department of Health and Ageing. This is a comprehensive resource that includes useful tools and flow charts: http://www.health.gov.au/internet/main/publishing.nsf/Content/ageing-decision-restraint.htm
- *Guidelines for the Use of Restraint as a Nursing Intervention*, Nursing Board of Tasmania: http://www.nursingboardtas.org.au/domino/nbt/nbtonline.nsf/$LookupDocName/publications (and click on *Standards for the Use of Restraints for Nurses and Midwives 2008*).
- *Restraint in the Care of Older People 2001*, Australian Medical Association Policy Statement: http://www.ama.com.au/node/1293





Part D
Minimising injuries from falls



17 Hip protectors

Recommendations

Assessment

- When assessing a resident's need for hip protectors in a residential aged care facility (RACF), staff should consider the resident's recent falls history, age, mobility and steadiness of gait, disability status, and whether they have osteoporosis or a low body mass index.
- Assessing the resident's cognition and independence in daily living skills (eg dexterity in dressing) may also help determine whether they will be able to use hip protectors.

Intervention

- Use hip protectors to reduce the risk of fractures for frail, older people in institutional care. (Level I)[302]
- Hip protectors must be worn correctly for any protective effect, and the residential care facility should educate and train staff in the correct application and care of hip protectors. (Level II)[303]
- When using hip protectors as part of a falls prevention strategy, RACF staff should check regularly that the resident is wearing their protectors, that the hip protectors are in the correct position, and that they are comfortable and the resident can put them on easily. (Level I)[302]

Good practice point

- Hip protectors are a personal garment and should not be shared among people.

17.1 Background and evidence

Hip fractures are fractures to the top of the femur (thigh bone) immediately below the hip joint, and are usually the result of a fall.[302] Hip fractures occur in approximately 1.65% of falls,[31,304,305] are one of the more severe injuries associated with a fall, and usually require surgery and lengthy rehabilitation. Pelvic fractures can also occur, although these are less common.

Hip protectors are one approach to reducing the risk of hip fracture. They come in various styles, and are designed to absorb or disperse forces on the hip if a person falls onto their hip area. Hip protectors consist of undergarments with protective material inserted over the hip regions. They are sometimes called 'hip protector pads', 'protector shields' or 'external hip protector pads'. These guidelines refer to them all as hip protectors.

17.1.1 Studies on hip protector use

There is some evidence that, when worn correctly, hip protectors may prevent hip fractures in residents in residential aged care facilities (RACFs), although more recent research indicates that their benefits may be less than originally thought.[302] Hip protectors can therefore be used as part of a multifactorial falls and injury prevention intervention in RACFs, although they will not prevent falls or protect other parts of the body.[306]

When the results from studies of hip protector use as a stand-alone intervention for preventing hip fractures were pooled in the 2009 Cochrane review,[302] the overall effect of 11 cluster and individually randomised controlled trials (RCTs) was a 23% reduction in incidence (risk ratio = 0.77, 95%CI 0.62 to 0.97). The review authors concluded that there was evidence of marginally significant effectiveness of hip protectors for preventing hip fracture in the RACF setting. However, more attention needs to be paid to their acceptance and adherence in this setting, and further investigation into alternative fracture prevention strategies in high-risk groups should be encouraged.

A large RCT performed in Finland in 2000[307] investigated the effect of hip protector use in frail but ambulatory people. The intervention resulted in a 60% reduction in the risk of fracture. However, because 31% of eligible people in this study refused to wear the hip protectors, it is not clear whether the results can be generalised to the wider population.

The issue of adherence was addressed in a study by Meyer in 2003,[303] where hip protectors were provided to 459 people and compared with 483 controls. Before implementing the intervention, staff and residents were provided with a structured education session, which included information about the risk of hip fracture, prevention strategies and the effectiveness of hip protectors. The results showed that residents wore hip protectors during 54% of all falls in the intervention group, compared with 8% of falls in the control group, and there was a 40% reduction in the relative risk of hip fracture in the intervention group.

A study by Jensen et al in 2002[31] included the use of hip protectors as part of a multiple intervention in the RACF setting. Residents at increased risk of hip fracture were offered hip protectors, and 72% initially agreed to wear them. Results showed a reduction in the number of hip fractures in the intervention group overall; however, adherence with hip protector use was not reported, and the use of co-interventions aimed at reducing the risk of falls make it difficult to determine the effectiveness of hip protectors alone.

Similarly, a large, multiple intervention program run in Germany[33] provided hip protectors to residents who were able to stand. The authors reported no significant difference in hip fracture rates between the intervention and control groups; however, no hip fractures occurred while the residents were wearing the hip protectors properly. Issues identified with this study included poor resident adherence to using the hip protectors and lack of RACF staff support with their use and provision.

17.1.2 Types of hip protectors

There are three types of hip protectors:

- Soft hip protectors (type A) are available in a variety of designs. Their common feature is that they are made from a soft material, rather than a rigid plastic shell.
- Hard hip protectors (type B) consist of a firmer, curved shell, sewn or slipped into a pocket in a lycra undergarment, similar to underpants or bike pants. Most research on hip protectors has evaluated hard hip protectors.
- Adhesive hip protectors (type C) are stuck directly to the skin of the wearer. Few studies use this type of hip protector in trials.

As a general observation, type A is preferred in facilities, because type B presents laundering difficulties. The key factor for success appears to be the commitment of staff to resident care and quality improvement, particularly when this is supported by senior staff. Acceptance of hip protector use was also higher in people in longer term care. Features of long-term care include residents with less acute conditions, greater staff familiarity with the resident and a slower rate of population turnover. Adherence of both the resident and staff to hip protector use is an issue in all environments, and is lower in warmer climates (see Section 17.3.3).

17.1.3 How hip protectors work

Hip protectors work by absorbing or dispersing the energy created by a fall away from the hip joint so that the soft tissues and muscles of the surrounding thigh absorb the energy. The hard plastic hip protectors divert the force of the fall from the bones of the hip to the surrounding muscles of the thigh. The soft hip protectors seem to work mainly by absorbing the energy of the fall. Hip protectors must be worn over the greater trochanter of the femur to be effective.

More than 95% of hip fractures occur from a fall with direct impact on the hip,[308] with only a small number of spontaneous fractures caused by osteoporosis or other bone pathology. Other hip fractures may occur if a person falls onto their buttock or if a rotational force through the neck of the femur is applied.[305]

The force generated by a fall from a standing height is large and has the potential to break the hip of a person of almost any age. The force applied to the femur near the hip in a fall from standing height is approximately 6000 newtons. The most effective padding system can reduce this to approximately 2000 newtons in a laboratory test.[309]

It is not necessary to wear a hip protector over a hip that has been surgically repaired with internal fixation or hip replacement, because the neck of the femur has either been replaced or reinforced (hemiarthroplasty, pin and plate, etc).[310] Equally, it has not been demonstrated to be harmful to do so.

An RCT of hip protectors noted adverse effects in 5% of people.[311] Bruises may occur if the person falls onto the hip protector. Also, skin infections and pressure ulcers (bedsores) can develop under or around the area where a hip protector is worn.

For frail older people, hip protectors can cause difficulties with toileting.[302] For example, older people can become less independent in everyday activities because of the extra time and effort needed to put on and take off the hip protectors (this can also cause incontinence in some people; see Chapter 8 on continence for more information). Also, if dexterity is an issue for the resident, wearing hip protectors can increase their falls risk, because the resident must manage another garment during dressing and undressing, particularly in the toilet.

17.1.4 Adherence with use of hip protectors

A disadvantage of hip protectors is a low level of adherence because of discomfort, practicality,[312] the extra effort needed to put them on or urinary incontinence.[313-316] In some settings, cost might also be a barrier to hip protector use.[317]

Adherence with the use of hip protectors is crucial to their effectiveness.[318] In the first reported randomised trial of hip protectors, only 24% of a subgroup of participants wore hip protectors when they fell.[316] This trial was included in a 2005 Cochrane review of hip protectors, and the other trials included also reported low adherence rates, which may have influenced the outcome.[302]

To help older people to keep wearing their hip protectors, the older person's needs and preferences must be matched with the availability of different types of undergarment material, removable or sewn-in hip protector shields, and different styles of undergarments, including those allowing use of continence aids.[319] In many cases, adherence is most affected by the older person's motivation to wear the hip protectors,[319] and by the type of hip protector (eg hard, soft).[302] In other cases, wearing a hip protector may be a visual reminder of the consequences of falling, and cause the older person or their carer to modify their behaviour to minimise risk.[302]

The attitudes of staff in RACFs may also have a substantial effect on whether a resident wears hip protectors.[319]

Queensland Health developed a set of best practice guidelines for RACFs, which included the following feedback from focus groups and health professionals on why protector pads were difficult to introduce as standard practice:[232]

- They caused skin rashes and increased perspiration.
- They were uncomfortable to sleep in and had the potential to cause pressure sores.
- They were difficult to wash, particularly for people with incontinence.
- Replacing them was costly.
- There were infection-control issues.
- Some residents removed or refused to wear them.
- They were considered too big or bulky, particularly with incontinence pads, catheters and dressings.
- They move and can become uncomfortable.
- There was not enough information about how to fit them.
- Some staff did not always support residents to use them, or were sceptical about their efficacy.
- There were problems with price, style and comfort for the wearer, including image perception.



Point of interest: Cochrane review of hip protector use and adherence

The 2005 Cochrane Collaboration review[302] contains tables that summarise the randomised trials of hip protectors (see http://www.thecochranelibrary.org and search for 'hip protectors').



Point of interest: using helmets and limb protectors

When these guidelines were being developed, a national consultation process revealed that a strategy in some residential aged care facilities for residents who often fell was the use of helmets and limb protectors to minimise the risk of injuries to the head and limbs. While this approach appears to have potential to reduce injury from falls, to date there has been no research evaluating the effectiveness of these protective devices.

17.2 Principles of care

Because of the diversity of older people, service settings and climates, residents should be offered a choice of types and sizes of hip protectors. Soft, energy-absorbing protectors are often reported to be more comfortable for wearing in bed. A choice of underwear styles and materials means that problems with hot weather, discomfort and appearance can be addressed.

17.2.1 Assessing the need for hip protectors

When assessing a resident's need for hip protectors, RACF staff should consider the resident's recent history of falls, age, mobility, whether they have a disability, whether they are unsteady on their feet and whether they have osteoporosis. Assessing the resident's cognition and independence in daily living skills (eg dexterity in dressing) may also help determine whether the resident will be able to use hip protectors. RACF staff can use a falls risk assessment tool (see Chapter 5) to help decide whether someone has a high risk of falling and therefore be considered for the use of hip protectors.

17.2.2 Using hip protectors at night

There is a risk of falling and breaking the hip during the evening and night. If the risk is sufficient to justify the use of hip protectors, and the resident gets out of bed to go to the toilet at night, the use of hip protectors at night should be considered. The soft protectors (type A) are relatively comfortable when positioned correctly and can be worn more easily in bed, because they are less obtrusive than the hard shell protectors (type B).[232]

17.2.3 Cost of hip protectors

The cost of hip protectors appears to be a factor influencing uptake. Reimbursement by private health funds or by appliance supply schemes may improve this problem. It is unclear to what degree cost affects adherence with longer term use of hip protectors (see Section 17.4 on economic analyses).

17.2.4 Training in hip protector use

Fitting and managing hip protectors are often the responsibilities of a particular member of the health team. Nurses and personal care attendants are in a key position to encourage adherence with hip protector use, because they help frail residents with dressing, bathing and toileting. Nurses and personal care attendants should be given education and support in developing strategies to encourage adherence with, and correct application of, hip protectors.

Two studies have assessed the benefits of training staff in the correct application and reason for use of hip protectors, and the importance of supporting and encouraging residents to use hip protectors.[33,303] One of these studies found that training the individual wearer may also improve adherence by addressing any barriers that the person sees to wearing hip protectors, and providing them with precise instructions and demonstration on how to wear them.[303]

Before the resident starts wearing hip protectors, RACF staff should discuss arrangements for cleaning the protectors. Washing in domestic washing machines and dryers is feasible, but some hip protectors will not withstand commercial laundering. While self-adhesive hip protectors may be appealing in some instances (ie they can be worn with the resident's own undergarments), it is unclear whether they can be used safely in the long term.

17.2.5 Review and monitoring

Currently, the design and production of hip protectors is unregulated and there are no national or international testing procedures for their effectiveness.[302]

A standard definition of adherence with use of hip protectors should be used when reviewing and monitoring their use.[320] The most easily measured marker of adherence is the number of 'protected falls', which is the proportion of falls in which a hip protector is worn.



Case study

Recently, Mrs J was admitted to a residential aged care facility (RACF). On admission, her falls risk assessment indicated she had a moderate risk of falling. RACF staff implemented several falls prevention strategies, including recommending safer footwear and referring Mrs J to the physiotherapist for an exercise program. Staff reviewed Mrs J's medical history (from her general practitioner) and noted that she had a history of osteoporosis, and had fractured a wrist in a fall 12 months earlier. RACF staff discussed hip protectors with Mrs J, highlighting how they appear to work in reducing forces on the hip in the case of a fall. They also showed her examples of the different types of hip protectors. Mrs J discussed buying hip protectors with her family, who bought them for her. Staff members used a checklist to record her adherence with hip protector use each day. Mrs J feels more confident walking around the RACF when wearing the hip protectors, and even wears them at night, as she usually needs to get up to the toilet once or twice a night.

17.3 Special considerations

17.3.1 Cognitive impairment

People with cognitive impairment have a higher prevalence of falls and fractures[321] and should be considered for hip protector use. People with cognitive impairment will often need help to use hip protectors both initially and in the long term. Hip protectors may need to be used with an additional risk management strategy for people known to have balance difficulties and who wander.

17.3.2 Indigenous and culturally and linguistically diverse groups

The use of hip protectors in people from Indigenous and culturally and linguistically diverse groups has not been researched specifically. Firmly fitting underwear may be unfamiliar in some cultures, but the extent to which this may influence adherence with the use of hip protectors is unknown.

17.3.3 Climate

Much of the research in relation to hip protectors has been done in cooler climates. Adherence in warmer and more humid areas may be problematic.

17.4 Economic evaluation

A number of trial-based and modelled economic evaluations of hip protectors in a residential care setting have been conducted. These analyses primarily rely on trial-based efficacy and adherence data. Results should therefore be interpreted with some caution, as these estimates may be somewhat optimistic, compared to the levels of efficacy and adherence achievable in usual clinical practice.

Two economic evaluations[317,319] were conducted alongside RCTs of hip protectors. Van Schoor et al[319] found that there was no significant difference in the number of hip fractures in the intervention and control groups of an RCT of hip protectors in a frail, institutionalised older population. The average total costs (in 2001€) over a 12-month period (including hip fracture and rehabilitation and intervention costs) were €913 (95%CI €643 to €1353) in the hip protector group, and €502 (95%CI €284 to €803) in the control group. Unlike many modelled analyses, hip protector use was not associated with lower costs. In contrast, Meyer et al[317] found that there were significantly fewer fractures in the hip protector group (21 fractures versus 42 fractures) in an RCT of German nursing home residents aged 70 years or over who had a high risk of falling. The hip protector group was associated with slightly higher mean total costs (in 2000US$, US$634 versus US$583), and the incremental cost effectiveness ratio (ICER) was US$1234 per hip fracture avoided. The ICER was sensitive to costs of the education programs, the time horizon of the analysis and the need for extra nursing care.

Two Canadian analyses modelled costs (in CA$) and health outcomes (quality-adjusted life years, QALYs) of hip protector use in nursing home residents.[322,323] Waldegger et al[323] modelled one year of hip protector use in women aged 82 years with a previous hip fracture, with QALYs measured over a lifetime. In the primary analysis (82-year-old females with previous hip fracture), the authors reported hip protector use was both less costly and more effective than no hip protector use. However, cost effectiveness was particularly sensitive to starting age, history of previous fracture and adherence with hip protector use, and ranged from CA$6600 per QALY gained to CA$14 200 per QALY gained, depending on these variables. Singh et al[322] conducted a modelled analysis of hip protectors compared with vitamin D and calcium, or with no treatment, in Canadian nursing home residents with a mean age of 85 years. The authors reported that hip protector use resulted in lower costs (in 2001CA$), fewer hip fractures and higher QALYs, compared with both no treatment and with calcium and vitamin D supplementation. However, results were sensitive to the relative risk of fracture, the price of hip protectors and the extent of additional nursing requirements, and ICERs ranged up to CA$28 326 per QALY gained depending on these variables.

A US modelled analysis[324] reported, over an 18-month timeframe, an ICER of US$4720 per hip fracture prevented (in 2000US$), which ranged from US$85 to US$49 345 per hip fracture prevented, depending on costs and efficacy. The primary analysis considering QALYs reported an average cost saving of US$300 and a gain of 0.01 QALYs. The ICER increased to between US$15 700 and US$30 600 per QALY gained, when the price of hip protectors increased. A simple modelled analysis in the United Kingdom[325] directly applied RCT efficacy data to hip fracture incidence and admission rates from institutional care. The cost per fracture prevented (in 1998GB£) ranged from £678 000 in men aged 50–59 years, to £9309 in women aged 75–79 years.

In addition, two cost analyses estimated the costs of hip protector use and potential cost offsets from hip fractures averted in nursing homes.[326,327] Cost effectiveness ratios were not calculated. A Canadian analysis[327] considered costs over a one-year period (in 2003CA$), and estimated that provision of hip protectors to all Ontario nursing home residents older than 65 years may result in cost savings of CA$6 million in one year. The costs associated with this strategy ranged from costing an extra $26.4 million to saving $39.7 million. These results are based on hip protectors resulting in a 60% reduction in hip fracture risk, and adherence estimates from clinical trials that may not be achievable in usual clinical practice. A United States analysis[326] estimated lifetime potential cost savings to Medicare (in 2002US$) from providing hip protectors to permanent nursing home residents aged 65 years or older, without a previous hip fracture. Three pairs of hip protectors replaced annually would lead to an 8.5% lifetime absolute risk reduction of hip fracture, with net lifetime savings of US$223 per person. However, the extent of any savings depended on the person's starting age and sex. Hip protectors did not reduce costs in women who started wearing them at 65 years of age, nor in men who started wearing them at 70 years of age.

In summary, these data suggest that the use of hip protectors in a residential care setting may offer reasonable value for money, depending on starting age, previous history of fracture and cost of hip protectors. However, these results should be interpreted with some caution, because analyses rely on trial-based efficacy and adherence data that may be somewhat optimistic, compared with the levels of efficacy and adherence that are achievable in clinical practice.

Additional information

The following resources provide additional information:

- Appendix 7 contains a checklist of issues to consider before using hip protectors.[310]
- Appendix 8 is a sample hip protector care plan.
- Appendix 9 is a sample hip protector observation record.
- The description of the educational program used in the study of Meyer and colleagues[303] provides a guide to hip protector implementation in residential aged care facilities (Appendix 10).
- Cochrane Collaboration website — The Cochrane Library: http://www.thecochranelibrary.org and search for 'hip protectors'.





18 Vitamin D and calcium supplementation

Recommendation

Intervention

- Vitamin D and calcium supplementation should be recommended as an intervention strategy to prevent falls in residents of residential aged care facilities. (Level I)[7]

Good practice point

- Assess whether residents are receiving adequate sunlight for vitamin D production.

18.1 Background and evidence

Low vitamin D levels have been associated with reduced bone mineral density, high bone turnover and increased risk of hip fracture.[328] Furthermore, vitamin D may prevent falls by improving muscle strength and psychomotor performance, independent of any other role in maintaining bone mineral density.[329,330]



Point of interest: How vitamin D reduces the risk of falling

The active vitamin D metabolite (25-hydroxyvitamin D) binds to a highly specific nuclear receptor in muscle tissue. This improves muscle function, which may be the reason why vitamin D reduces the risk of falling.[329] Furthermore, vitamin D deficiency has also been associated with osteoporosis, urinary incontinence, cognitive decline and macular degeneration.[331]

Vitamin D levels are measured by blood serum 25-hydroxyvitamin D (25(OH)D) levels. Previously recommended levels of 25(OH)D considered indicative of adequate vitamin D stores may be too low.[328,332] The incidence of deficiency of vitamin D (25(OH)D levels less than 25 nmol/L) in Australia has been reported as 22–86% in residential aged care, 67% of geriatric hospital admissions and 61% of people experiencing hip fractures.[328] Another study found that in Australia, 86% of women and 68% of men in residential aged care facilities (RACFs) have vitamin D deficiency and virtually all the remainder have a level in the lower half of the reference range.[333]

People at high risk of vitamin D deficiency include older people, particularly in RACFs, those with skin conditions that require them to avoid the sun, dark-skinned people (particularly if veiled) and people with malabsorption.[328] Vitamin D deficiency is significantly more common among people with dementia and people from culturally and linguistically diverse groups.[334]

Nutrition management is an important element of good aged care practice, and can play an important role in some aspects of falls prevention, directly and indirectly (eg good nutrition is required to gain optimal effect from an exercise program). Other than vitamin D and calcium supplementation (and related nutritional involvement in osteoporosis management), nutrition is not included as a separate core falls prevention activity in these guidelines, because it is an area with limited research to guide best practice in falls prevention to date. However, Appendix 11 provides a chart for monitoring food and fluid intake, and Appendix 12 provides food guidelines for calcium intake for preventing falls in older people.

Intervention approaches to improving the levels of vitamin D in residents and older people have used a range of options with varying success levels, including vitamin D supplementation alone, vitamin D supplementation together with calcium supplementation, and exposure to sunlight. These are explained in the following sections.

18.1.1 Vitamin D supplementation alone

A meta-analysis found that vitamin D supplementation appears to reduce the risk of falls among ambulatory or institutionalised older people with stable health by more than 20%.[329] Although not looking at the same outcome, an earlier Cochrane review of vitamin D for preventing fractures associated with osteoporosis reported uncertainty about the efficacy of regimens.[335] In this review, vitamin D without any calcium co-supplementation was not associated with a reduced risk of hip fracture or other nonvertebral fractures.[334-336]

18.1.2 Vitamin D combined with calcium supplementation

A high-quality systematic review (a Cochrane review) looked at interventions — including vitamin D supplementation — for preventing falls in the hospital and RACF settings.[7] The review included five trials, two of which were similar enough for the data to be pooled. The pooled results showed that vitamin D with calcium appeared to be effective for preventing falls in long-term residents of RACFs, and that the benefits of supplementation were more certain in people who had low serum vitamin D.

A study of the alfacalcidol form of vitamin D supplementation in nonvitamin D-deficient older people in the community supports the hypothesis that treatment with vitamin D (or its analogues) requires a minimum daily calcium intake of more than 500 mg/day to produce clinically significant results.[332] The Australian recommended daily intake (RDI) for calcium in older people is 800 mg for men and 1000 mg for women.[337] However, this level may be too low, with other sources recommending daily intake of 1500 mg for both men and women.[338]

Calcium supplementation should be approached with caution in women older than 70 years of age. A large trial of calcium supplementation of 1000 mg/day found an excess of cardiovascular events in the intervention group.[339,340]

The Nottingham Neck of Femur study (which was not included in the Cochrane review discussed above) concluded that vitamin D administered orally or injected increases bone mineral density and decreases falls, and that calcium co-supplementation may help.[341]

18.1.3 Vitamin D and sunlight

The main source of vitamin D is from sunlight.[337] Evidence suggests that sourcing vitamin D from dietary intake alone is not sufficient.[328] Compounding this fact is that nutrient intake in residential care is often limited.[342]

Sun exposure may not work if the skin of older people does not convert cholesterol precursors to vitamin D efficiently. Additionally, sun exposure recommendations are difficult to implement in frailer people, particularly in RACFs. In the absence of routine fortification of food, either sunlight exposure, the regular consumption of oily fish or vitamin D supplementation are the mainstay approaches to ensuring adequate levels of calcitriol (1,25(OH)2D3).

The Geelong Osteoporosis Study found that in winter there was reduced serum vitamin D, increased bone resorption and an increase in the proportion of falls resulting in fracture.[343] The role of vitamin D supplementation during the Australian winter has yet to be investigated.



Point of interest: vitamin D and latitude

Little vitamin D is produced beyond latitudes of about 35° (ie Victoria and Tasmania) in winter, especially in older people. This is because of an increase in the zenith angle of the sun (angle between directly overhead and a line through the sun), resulting in more photons being absorbed by the stratospheric ozone layer.[344]

18.1.4 Toxicity and dose

Toxicity to vitamin D cannot be caused by prolonged sun exposure; however, it can occur from supplementation with vitamin D.[337] Hypercalcaemia may occur if vitamin D is given, particularly in the form of the vitamin D analogues.[335] However, toxicity with cholecalciferol (vitamin D3) up to 10 000 IU daily is rare and occurs predominantly if dietary or oral calcium supplements are high, or if granulomatous disorders are present. There is no RDI for vitamin D, although trials that show benefit from vitamin D have used a minimum of 800 IU daily. The United States Institute of Medicine's Food and Nutrition Board proposes a daily intake of 600 IU vitamin D in people over 71 years of age.[328] In Australia, a minimum daily dose of 400 IU is recommended, with higher doses required for people with vitamin D levels lower than 50 nmol/L.[345] In New Zealand, a preparation of 50 000 IU of vitamin D is available, and current recommendations are for one tablet monthly. Recommended daily doses in RACFs tend to be higher, given the limited exposure to sunlight.[328,346,347]

18.2 Principles of care

18.2.1 Assess adequacy of vitamin D

Dieticians, nutrition and dietetic support staff, or nursing and medical staff can collect information on eating habits, food preferences, meal patterns, food intake and sunlight exposure. To do this, they can use:

- food preference records
- food and fluid intake records (see Appendix 11)
- 25(OH)D blood levels.

18.2.2 Ensure minimum sun exposure to prevent vitamin D deficiency

Osteoporosis Australia (in association with the Cancer Council Australia) recommends that for most older Australians, vitamin D deficiency can be prevented by 5–15 minutes exposure of the face and upper limbs to sunlight, four to six times per week — although deliberate exposure to sunlight between 10 am and 3 pm in the summer months for more than 15 minutes is not advised.

If this modest sunlight exposure is not possible, then a vitamin D supplement of at least 800 IU/day is recommended.

18.2.3 Consider vitamin D and calcium supplementation

Health care professionals should consider the high possibility of vitamin D deficiency in people living in RACFs and supplement without doing routine blood tests. If there is uncertainty, 25(OH)D can be measured using a blood test.

For confirmed cases of vitamin D deficiency, supplementation with 3000–5000 IU/day for at least one month is required to replenish body stores (one 50 000 IU tablet daily for three days and then one tablet monthly). Increased availability of larger dose preparations of cholecalciferol (vitamin D3) would be a useful therapy in the case of severe deficiencies.

For most older people in long-term care in Australia, it is appropriate to supplement with 1000 IU vitamin D without measuring 25(OH)D vitamin D blood levels. This is based on the prevalence of deficiency, the low risk and the benefit shown when doing it in this untargeted way for hip fracture prevention.[328,346,347]

However, use calcium supplementation with caution in women older than 70 years of age, due to the possible association with cardiovascular events.[339,340] Dietary calcium should be encouraged if at all possible and a maximum supplementation dose of 500 mg/day considered if daily dietary intake does not reach 1000 mg.

18.2.4 Encourage residents to include foods high in calcium in their diet

The food guidelines in Appendix 12, which outline calcium and vitamin dietary suggestions and hints,[348] are useful for encouraging residents to include more calcium in their diet. Referral to a dietician may be appropriate if a resident is having trouble consuming adequate calcium, has lactose intolerance, does not include calcium as a normal part of their diet (culturally) or does not consume dairy foods (eg they follow a vegan diet).

18.2.5 Discourage residents from consuming foods that prevent calcium absorption

Oral calcium intake needs to meet the RDI. To achieve this, discourage residents from consuming too many foodstuffs that lower or prevent calcium absorption (eg caffeine, soft drinks containing phosphoric acid). Instead, encourage them to include foods high in calcium in their diet.

Analysis of food intake records or diet history should show a daily intake of calcium of 800 mg for men and 1000 mg for women.[348]



Case study

Mrs Q lives in a nursing home and has been falling frequently. Staff report that she has difficulty getting out of a chair and has notable proximal muscle weakness (a clinical manifestation of vitamin D deficiency). She eats a nutritionally balanced diet, including regular consumption of milk. She does not go outside but does 'catch some rays' in the sunroom, which has large glass windows. Unfortunately, glass absorbs nearly all ultraviolet B photons, which are required for vitamin D production. Blood tests confirmed vitamin D deficiency, which was corrected with oral supplementation. Other interventions were also included as part of a targeted multifactorial falls prevention program in response to the falls risk assessment.

18.3 Special considerations

18.3.1 Cognitive impairment

Cognitive impairment can be associated with nutritional deficiencies, including a reduced calcium and vitamin D intake in the diet. RACF staff should monitor residents' oral intake closely, and refer them to a dietician if intake is reduced. Oral calcium and vitamin D supplementation is frequently required to maintain levels of both calcium and vitamin D in this population.

18.3.2 Indigenous and culturally and linguistically diverse groups

Increased skin pigment reduces the amount of vitamin D production after sun exposure, so dark-skinned people are more susceptible to reduced vitamin D levels. People who are heavily clothed and veiled for religious or cultural reasons are also at increased risk of reduced vitamin D levels.

18.4 Economic evaluation

A number of vitamin D and calcium-based compounds are publicly funded via the Pharmaceutical Benefits Scheme. See Chapter 19 on osteoporosis management for more information.



Additional information

The following publications provide useful information on dietary intake of vitamin D and calcium:

- *Dietary Guidelines for all Australians*, National Health and Medical Research Council (2003): http://www.nhmrc.gov.au/publications/synopses/dietsyn.htm
- Nowson CA, Diamond TH, Pasco JA, Mason RS, Sambrook PN and Eisman JA (2004). Vitamin D in Australia: issues and recommendations. *Australian Family Physician* 33(3):133–138. http://www.osteoporosis.org.au/files/research/vitamind_nowson_2004.pdf
- Recommendations from the Vitamin D and Calcium Forum. *Medicine Today* 6(12):43–50. http://www.osteoporosis.org.au/files/research/Vitdforum_OA_2005.pdf
- *Vitamin D and adult bone health in Australia and New Zealand: a position statement*, Working Group of the Australian and New Zealand Bone and Mineral Society, Endocrine Society of Australia and Osteoporosis Australia. *Medical Journal of Australia* 182:281–285.
- Osteoporosis Australia provides information and resources to reduce fractures and improve bone health in the community: http://www.osteoporosis.org.au



19 Osteoporosis management

Recommendations

Assessment

- Residents with a history of recurrent falls should be considered for a bone health check. Also, residents who sustain a minimal-trauma fracture should be assessed for their risk of falls.

Intervention

- Residents with diagnosed osteoporosis or a history of low-trauma fracture should be offered treatment for which there is evidence of benefit. (Level I)[349]
- Residential aged care facilities should establish protocols to increase the rate of osteoporosis treatment in residents who have sustained their first osteoporotic fracture. (Level IV)[350]

Good practice points

- Strengthening and protecting bones will reduce the risk of injurious falls.
- In the case of recurrent fallers and those sustaining low-trauma fractures, health care professionals and care staff should consider strategies for optimising function, minimising a long lie on the floor, protecting bones, improving environmental safety and prescribing vitamin D.
- When using osteoporosis treatments, residents should be co-prescribed vitamin D with calcium.

19.1 Background and evidence

19.1.1 Falls and fractures

Only a small proportion of falls result in fractures and most, if not all, fractures occur after falls.[351] Bone mineral density is an important measure in predicting fractures in both men and women, while quadricep strength and postural sway are of similar importance in predicting fractures.[352] No therapy is likely to normalise bone mineral density, but small improvements can reduce fracture risk.[353]

With this in mind, interventions that reduce falls risk may prevent fractures, even if bone density is not altered. This is of particular relevance to the very old, in whom low bone density places them at particular risk, and for whom each additional fall increases the likelihood of a fracture.

19.1.2 Diagnosing osteoporosis

Osteoporosis Australia (a national nongovernment organisation that aims to reduce fractures and improve bone health in the community) states that the presence of osteoporosis can sometimes be recognised by a fracture, usually of the wrist, hip or spine; an increased curve of the thoracic (mid) spine; or loss of height.[354] A 30% loss of anterior vertebral height is sufficient to diagnose osteoporosis for the Pharmaceutical Benefits Scheme (PBS).

Osteoporosis is diagnosed by having a bone mineral density test. The most reliable and accurate test of the several methods available is the DXA (dual energy X-ray absorptiometry), which is widely available in Australia. All bone mineral density tests measure the amount of mineral in a specific area of bone. The DXA test will give results as the following two scores:[354]

- *T score*, which compares bone density with that of an average young adult of the same sex. A T score of zero means bones are the same density as the average younger population and no treatment is necessary. A T score above one means bones are denser than the average younger population, and a T score below zero means bones are less dense than the average younger population. Treatment should be considered if the score is below one (osteopaenia = 1 to –2.5) and there are several clinical risk factors for osteoporosis. T scores below –2.5 indicate osteoporosis, and treatment is strongly recommended to stop further bone loss and fractures.
- *Z score*, which compares bone density with the average from the person's age group and sex. If the Z score is zero, bones are average for their age and sex. Below zero indicates bones are below average density, and above zero indicates bones are above average density for age. A Z score below –2 means bone is being lost more rapidly than matched peers, so treatment needs to be monitored carefully. A Z score below –2 may also indicate that an underlying disease is responsible for the osteoporosis.

Health care professionals and care staff in residential aged care facilities (RACFs) should be vigilant in detecting anyone who has obvious manifestations of osteoporosis (eg thoracic kyphosis, low-trauma fracture). Also, residents with multiple risk factors for osteoporosis can be detected opportunistically by routine screening in RACFs (eg residents on long-term steroids).

19.1.3 Interventions for falls and falls-related injuries relevant to osteoporosis

A previous fracture is one of the strongest risk factors for future fracture.[350] However, studies suggest that many people who sustain fractures are not checked or treated for osteoporosis, or are not treated adequately to reduce future fracture risk, even when a diagnosis of osteoporosis has been made.[355,356]

Despite this, several effective drug treatments are now available. A meta-analysis and various randomised controlled trials (RCTs) have shown beneficial effects of oral or intravenous bisphosphonates in postmenopausal women who have low bone density;[349,357] a systematic review has shown the benefits of selective oestrogen receptor modulators in postmenopausal women with osteoporosis;[358] and an RCT has shown the benefits of strontium ranelate for preventing osteoporosis in postmenopausal women.[359] These drugs are now considered the first-line treatments for osteoporosis.

As most of the RCTs of antiresorptive agents have used concomitant calcium and vitamin D (see Chapter 18), it is appropriate to ensure vitamin D deficiency is corrected and to add a low-dose calcium supplement to these therapies when dietary calcium intake is suboptimal.

Bisphosphonates

Bisphosphonates are potent inhibitors of bone resorption. They stick to the bone surface and make the cells that destroy bone tissue less effective. This allows bone rebuilding cells to work more effectively, resulting in increased bone density.[354,357] Currently, four bisphosphonates are available on the PBS to treat osteoporosis. The following three medications are available for men and postmenopausal women with an osteoporotic fracture:[354]

- alendronate (Fosamax, Fosamax Plus, Alendro), which increases bone density and reduces the frequency of fractures at the hip and spine
- risedronate (Actonel, Actonel Combi and Actonel Combi D), which increases bone density and reduces the risk or frequency of fractures at the spine and hip in postmenopausal women who have low bone density[357]
- zoledronic acid (Aclasta), which is also used to treat osteoporosis in postmenopausal women or to prevent additional fractures in men and women who have recently had a hip fracture. Because zoledronic acid works for a long time, only a single dose is required each year, making this osteoporosis therapy advantageous for frail older people living in the community or residential aged care.

A fourth bisphosphonate medication is also available for osteoporosis:

- etidronate (Didrocal), which increases bone density and reduces risk of fractures in the spine, but not the hip.[349,354,357,360]

An association between bisphosphonate use and a rare dental condition termed osteonecrosis of the jaw has been reported.[357] Osteoporosis Australia recommends that the small risk of this condition needs to be considered against the significantly reduced risk of fracture and other skeletal complications in older people with established osteoporosis. One approach is to ensure appropriate oral health and dental treatment before prescription, particularly if high doses or intravenous drugs are prescribed, or if a dental extraction is already planned.[361]

Alendronate and risedronate have been associated with adverse gastrointestinal effects (eg dyspepsia, abdominal pain, oesophageal ulceration).[357] Therefore, residents who have reflux oesophagitis or hiatus hernia should be screened before use.[362] However, most studies have shown that the overall risk of adverse gastrointestinal events associated with risedronate or alendronate use is low, although there are a small number of studies that report the opposite.[363] There is also evidence that risedronate is less risky than alendronate.[364] The potential for experiencing gastrointestinal side effects from either drug is lowered when the dosing is decreased to once per week.[364]

Selective oestrogen receptor modulators

Selective oestrogen receptor modulators (SERMs) are a special class of drug with many features similar to oestrogen in hormone replacement therapy; however, they do not stimulate the breast and uterus tissues. As a result, SERMs have the positive effect of oestrogens on bone without increasing the risk of breast and uterine cancer. Raloxifene (Evista) increases bone density and reduces the risk of fractures in the spine. Evidence also shows it reduces the incidence of breast cancer.[349,354,360] However, SERMs have also been associated with an increased risk of venous thromboembolism.[365]

Strontium ranelate

In RCTs, strontium ranelate has reduced the risk of both vertebral and peripheral fractures.[359] Strontium ranelate is the only anti-osteoporotic agent that both increases bone formation markers and reduces bone resorption markers, resulting in a rebalance of bone turnover in favour of bone formation.

19.1.4 Osteoporosis in residential aged care

There is evidence of undertreatment of osteoporosis in residents in RACFs. For example, in one study, 37% of female RACF residents were known to have previous osteoporotic fractures; however, calcium supplementation was prescribed in only 14% of residents and specific anti-osteoporosis therapy was prescribed in only 3% of residents.[356]

Older people are more likely to have several risk factors for fractures, including previous fractures.[353] In these frail, older people, osteoporosis treatments must take account of the likelihood of comorbidity and the use of multiple other medications.

19.2 Principles of care

Screening for osteoporosis is important for minimising falls-related injuries. It is important to recognise that people sustaining low-trauma fractures after the age of 60 years probably have osteoporosis and an increased risk of subsequent fracture.[362,366] Health care professionals and care staff should consider bone densitometry and specific anti-osteoporosis therapy for people in this group. Also, older people with a history of recurrent falls should be considered for a bone health check.

In both cases (recurrent fallers and those sustaining low-trauma fractures), the health care team should consider strategies for optimising function, minimising a long lie on the floor, protecting bones, improving environmental safety and prescribing vitamin D.[367,368]

Postmenopausal women who have low bone density, or who have already had one fracture in their spine or wrist, should be treated with a bisphosphonate (such as risedronate) to reduce their risk of further fractures in their spine or hip.[357] Consider using bisphosphonates, strontium or raloxifene to reduce the risk of vertebral fractures and to increase bone density in older men at risk of osteoporosis (ie those with a low body mass index). Bisphosphonates work best in people with adequate vitamin D and calcium levels, and should therefore be co-prescribed.

RACFs should establish protocols to increase the rate of osteoporosis treatment in residents who have sustained their first osteoporotic fracture.[350]

19.2.1 Review and monitoring

A good-practice clinical indicator among residential care populations may be to review medication charts to see whether residents have been prescribed vitamin D supplements, and to adjust for the number of residents who go outside regularly and for the geographical latitude of the facility. Also, check whether residents sustaining fractures are screened for osteoporosis. Finally, compare the resident's fracture rate with that of people being treated for osteoporosis, checking first that they are of a comparable age, falls risk, sex, etc.



Case study

Mrs N is an 85-year-old lady who lives in a residential aged care facility. She has a history of falling, and recently fell and fractured her hip. She thinks she has a family history of osteoporosis, and was treated for osteoporosis in hospital. On return to her aged care facility, Mrs N was treated by a physiotherapist using a graduated exercise program, beginning at a low intensity, with a goal of safe ambulation with the use of a frame. Mrs N was prescribed vitamin D and calcium supplementation and was taught about the use and availability of hip protectors.

19.3 Special considerations

19.3.1 Cognitive impairment

Some residents with cognitive impairment need to be supervised in the correct and safe manner of taking oral bisphosphonates. This is because there are restrictions on lying down or eating after taking these medications.

19.4 Economic evaluation

A number of antiresorptive agents (such as bisphosphonates and strontium) and vitamin D analogues (alone or in combination with antiresportive agents) are available on the Australian PBS for treatment of osteoporosis (prevention of fracture) in specific populations. The safety, effectiveness and cost effectiveness of these agents have been reviewed by the Pharmaceutical Benefits Advisory Committee, and the fact that they are subsidised by the PBS indicates that they offer acceptable value for money in the Australian context, for specific populations.

Table 19.1 provides specific PBS subsidy details for various agents affecting bone mineral density (current at 27 August 2009).

Table 19.1 Pharmaceutical Benefits Scheme details for osteoporosis drugs

Drug	Subsidised indications
Alendronate Alendronate + cholecalciferol Risedronate Risedronate + calcium carbonate Risedronate + calcium carbonate + cholecalciferol	Treatment as the sole PBS-subsidised antiresorptive agent for osteoporosis in a patient aged 70 years or older with a bone mineral density T-score of –3.0 or less. Treatment as the sole PBS-subsidised antiresorptive agent for established osteoporosis in patients with fracture due to minimal trauma.
Calcitriol	Treatment for established osteoporosis in patients with fracture due to minimal trauma.
Etidronate + calcium carbonate	Treatment as the sole PBS-subsidised antiresorptive agent for established osteoporosis in patients with fracture due to minimal trauma.
Raloxifene	Treatment as the sole PBS-subsidised antiresorptive agent for established postmenopausal osteoporosis in patients with fracture due to minimal trauma.
Strontium ranelate	Treatment as the sole PBS-subsidised antiresorptive agent for osteoporosis in a woman aged 70 years or older with a bone mineral density T-score of –3.0 or less. Treatment as the sole PBS-subsidised antiresorptive agent for established postmenopausal osteoporosis in patients with fracture due to minimal trauma.
Teriparatide	Treatment as the sole PBS-subsidised agent by a specialist or consultant physician for severe, established osteoporosis in a patient with a very high risk of fracture who (a) has a bone mineral density T-score of –3.0 or less, and (b) has had two or more fractures due to minimal trauma, and (c) has experienced at least one symptomatic new fracture after at least 12 months continuous therapy with an antiresorptive agent at adequate doses.
Zoledronic acid	Treatment as the sole PBS-subsidised antiresorptive agent for (a) established osteoporosis in women with fracture due to minimal trauma, (b) established osteoporosis in men with hip fracture due to minimal trauma, or (c) osteoporosis in women aged 70 years or older with a bone mineral density T-score of –3.0 or less (only one treatment each year for three consecutive years per patient is subsidised).

PBS = Pharmaceutical Benefits Scheme
Note: All agents require authority permission for prescription.



Additional information

For readers seeking definitive information on osteoporosis management, particularly related to medication management, the following resources are recommended:

- The National Institute for Health and Clinical Excellence (NICE), an independent organisation in the United Kingdom, produces clinical practice guidelines, including guidelines on osteoporosis management, based on the best available evidence. The guidelines contain recommendations on the appropriate treatment and care of people with specific diseases and conditions:
  http://www.nice.org.uk
- Osteoporosis Australia is a national organisation that aims to reduce fractures and improve bone health in the community. They provide information kits on falls and fractures.
  Ph: 02 9518 8140
  Fax: 02 9518 6306
  Toll free: 1800 242 141
  http://www.osteoporosis.org.au/html/index.php



Part E
Responding to falls



20 Post-fall management

Recommendation

Assessment

- Staff of residential aged care facilities should complete a post-fall assessment for every resident who falls.

Good practice points

- Residential aged care facility (RACF) staff should report and document all falls.
- It is better to ask a resident whether they remember the sensation of falling rather than whether they think that they blacked out, because many older people who have syncope are unsure whether they blacked out.
- RACF staff should follow the facility's post-fall protocol or guideline for managing residents immediately after a fall.
- After the immediate follow-up of a fall, review the fall. This should include trying to determine how and why a fall may have occurred, and implementing actions to reduce the risk of another fall.
- An in-depth analysis of the fall event (eg a root-cause analysis) is required if there has been a serious injury following a fall, or if there has been a death from a fall.

20.1 Background and evidence

Staff of residential aged care facilities (RACFs) must take all falls seriously. Falls may be the first and main indication of another underlying and treatable problem in a resident.[280] Older people who fall are also more likely to fall again.[369] All RACF staff should be aware of what constitutes a fall (see Section 1.3.1 for a definition), what to do when a person falls, and what follow-up is necessary (including completing an incident form).

Post-fall assessments have been part of multifactorial interventions successful in reducing falls.[256] A randomised controlled trial of 439 residents of RACFs in Sweden included post-fall assessments and meetings in an 11-week multifactorial falls prevention program. The program also included staff education, environmental modification, medication review, exercise programs, supplying and repairing aids, and providing free hip protectors, and was compared with usual care.[256] Post-fall assessment involved follow-up from a nurse on the day of the fall, and follow-up from a physiotherapist within three days. A team of a physician, nurse and physiotherapist (and other staff, as needed) met weekly to discuss falls and identify possible causes. Physical restraints were not suggested for any residents who fell. At 34-week follow-up, 82 residents (44%) in the intervention group fell compared with 109 residents (56%) in the control group. The authors concluded that a multifactorial falls prevention program targeting residents, staff and the environment reduced falls and femoral fractures.

Another randomised controlled trial collected falls information and used this feedback to improve the multifactorial falls prevention intervention.[33] The trial, which was run in six RACFs in Germany and involved 981 residents, included falls education for staff and residents, advice on environmental modification, progressive balance and resistance training, and hip protectors. Staff received training in falls prevention at the start of the trial, and then monthly feedback on fallers, rates of falls and severe injuries over 12 months. There was a significant decrease in the number of falls and fallers in the study group, although the trial was too underpowered to show a difference in hip or nonhip fractures.

The remainder of this chapter describes the responsibilities of RACF staff during and following a fall by a resident.

20.2 Responding to incidents

RACF staff should review every fall [280] and complete a falls report, including recommendations for the immediate and longer term care required.[4]

The circumstances surrounding a fall are of critical importance. However, this information is often difficult to obtain and may need to be sourced from people other than the residents themselves, including staff, visitors and other residents. This may be particularly important if the resident, when questioned directly, does not recall the circumstances of the fall or hitting the ground.

RACFs should have their own falls incident policy, or follow a clinical practice guideline for preventing and responding to falls. Staff should be made aware of, and have access to, these policies or guidelines. The following checklist for RACF staff is a guide to what should be included in a falls incident policy.

Checklist for managing the resident immediately after a fall

Offer basic life support and provide reassurance

- Check for ongoing danger.
- Check whether the resident is responsive (eg responds to verbal or physical stimulus).
- Check the resident's airways, breathing and circulation.
- Reassure and comfort the resident.[232,280]

Take baseline measurements

- Conduct a preliminary assessment that includes taking baseline measurements of pulse, blood pressure, respiratory rate, oxygen saturation and blood sugar levels. If the resident has hit their head, or if their fall was unwitnessed, record neurological observations (eg using the Glasgow Coma Scale).[280] The RACF's incident policy should guide the staff member according to their level of training, including helping them to know when to call for assistance.

Check for injuries

- Check for signs of injury, including abrasion, contusion, laceration, fracture and head injury.[232,275,280]

Move the resident

- Assess whether it is safe to move the resident from their position, and identify any special considerations in moving them. Staff members should use a lifting device instead of trying to lift the resident on their own. Follow the RACF's policy or guideline on lifting.

Monitor the resident

- Observe residents who have fallen and who are taking anticoagulants or antiplatelets (blood-thinning medications) carefully, because they have an increased risk of bleeding and intracranial haemorrhage. Residents with a history of alcohol abuse may be more prone to bleeding. Contact the medical officer and provide relevant details.
- Ensure ongoing monitoring of the resident, because some injuries may not be apparent at the time of the fall.[4,232] Make sure RACF staff know the type, frequency and duration of the observations that are required.

Report the fall

- Report all falls to a medical officer, even if injuries are not apparent.[232,275,280] The medical officer should assess and treat any injury, assess the conditions that may have caused the fall, and put any appropriate interventions in place. Staff may need to call for an ambulance to transfer the resident to hospital. In this case, transfer information should be provided, including details of the fall event.
- Document all details in the person's medical record, including their appearance or response, evidence of injury, location of the fall, notification of their medical provider and actions taken.[232,275,280]
- Complete an incident reporting form for all falls,[4,275,280,299] regardless of where the fall occurred or whether the person was injured.
- Note any details of the fall when reporting the incident, including any recollections of the resident.[275,280] At a minimum, this should include the location and time of the fall, what the resident was doing immediately before they fell, the mechanisms of the fall (eg slip, trip, overbalance, dizziness), and whether they lost consciousness or had a conscious collapse.

Discuss the fall and future risk management

- Communicate to all relevant staff, family and carers that the resident has fallen and has an increased risk of falling again.[275]
- At the earliest opportunity, notify the person nominated to be contacted in case of an emergency.[275,280]
- Discuss with the resident and their family the circumstances of the fall, its consequences and actions planned to reduce their risk of falling again.[232]
- Assume that once a resident has fallen, they automatically have a high risk of falling again until they have been assessed.[232]
- Follow local guidelines for identifying residents as being at increased risk of falling.

20.2.1 Post-fall follow-up

After the fall, determine how and why the fall may have occurred, to reduce the risk of another fall. The following steps are a guide to what should be included in an RACF's falls policy or practice guidelines:

- Investigate the cause of the fall, including assessing for delirium.
- Complete a falls risk assessment on the resident following a fall (see Chapter 5), because new risk factors may be present.[4,232,275]
- Review the implementation of existing falls prevention strategies, including standard falls prevention strategies for the resident.[4,232,275]
- Implement a targeted, individualised plan for daily care, based on a reassessment from a falls risk assessment tool. Implement multifactorial interventions as appropriate. These may include, but are not limited to, gait, balance and exercise programs, footwear review, medication review, hypotension management, environmental hazard modification and cardiovascular disorder treatment.[370] This will often involve referral to other members of the health care team (eg general practitioner, physiotherapist, podiatrist, dietician).
- Encourage the resident to resume their normal level of activity, because many older people are apprehensive after a fall and the fear of falling is a strong predictor of future falls.[371]
- Consider the use of injury-prevention interventions, such as vitamin D and calcium supplementation, and the use of hip protectors (see Chapters 17 and 18).[4,232,275]
- Consider investigations for osteoporosis in the presence of low-trauma fractures.
- Ensure effective communication of assessment and management recommendations to everyone involved.[4,232,275]

20.2.2 Analysing the fall

A more in-depth analysis of the fall may be required, particularly where there has been a serious injury or adverse outcome for the older person. A review of a serious fall can address both individual and broader system issues to provide a greater understanding of the cause and future prevention. This is sometimes known as a root-cause analysis. A root-cause analysis is always required if a fall results in serious injury or death. In some jurisdictions, a fall in an RACF that results in death must be reported to the state coroner.

Each RACF should have a falls review process in place.

20.3 Reporting and recording falls

Accurate reporting of falls will only occur in a culture that is fair and just — that is, a 'no blame culture'. Staff often feel anxious when having to complete an incident form and can associate the incident with feelings of guilt and blame. For accurate reporting of falls, the leaders in the facility must promote incident reporting as a part of the quality improvement process, rather than a punitive tool to identify potential staff negligence.[372] This requires a fair and just culture for achieving safe and high-quality care.

For high-quality care and risk management, information about falls must be collected and collated to monitor falls incidence, identify falls patterns, identify ways of preventing future falls and provide feedback on the effectiveness of falls prevention programs.[280] Feedback should also be provided to staff regularly (eg monthly) so that local trends can be identified and addressed as part of the routine, continuous quality-improvement plan.

Any data collected should be used to inform changes in RACF practice aimed at reducing resident falls rates. This requires analysing collected data regularly, monitoring trends, comparing falls data with that from other RACFs and making changes to usual care based on findings.

20.3.1 Minimum dataset for reporting and recording falls

A minimum dataset about all falls within an RACF should be collected for reporting and reviewing, and to improve the safety and quality of care to the resident. Items to be included in a minimum dataset should be determined by each facility or organisation. Examples of some items that could be included are:

- type of fall (eg slip, trip, bumping into or falling on an object),[4] and activity at time of the fall (eg attempting to stand, walking)
- whether the resident depends on aids or staff
- relevant information about clothing, footwear, eyewear and mobility aids used at the time of the fall[4]
- any restraints in use
- any recent change in medications that might be associated with falls risk
- any staff supervision provided at the time of the fall
- factors contributing to the fall, such as environmental conditions (eg floor, lighting, clutter[4]) or staffing levels
- status following the fall (eg baseline observations, injuries)
- interventions to be implemented following the fall, and medical treatment required
- the resident's perception of the fall, including description of any preceding sensations or symptoms[4] and what they consider could have prevented the fall
- any witnesses to the fall
- any other comments.

This information should be completed whenever a fall or near miss occurs in an RACF. A generic incident form may already be in use; however, RACFs may need to develop a falls-specific incident form to focus on the details required to monitor falls incidences and management plans. Any of this information not being collected can be captured by incorporating it into existing incident reports.

To achieve the most accurate information about the incident, the description of the fall should also allow for free text. There should be room on the incident form for additional comments to be made. Staff should be encouraged to complete all sections of the incident report to minimise missing information when the fall is being reviewed.

20.4 Comprehensive assessment of falls

People who fall repeatedly and people who are prone to injurious falls require a comprehensive and detailed assessment, in addition to their falls risk assessment.[370] When RACF staff believe that a more detailed assessment is necessary, they should discuss it with the resident's general practitioner and, if appropriate, arrange for a referral to a specialist (eg geriatrician) or to a falls clinic.

20.5 Loss of confidence after a fall

A common but often overlooked consequence of a fall is a loss of confidence in walking or fear of falling,[373] which can occur even in the absence of any injury. In the period after a fall, RACF staff should observe the resident to note any change in their usual activity that might indicate the presence of, or increase in, fear of falling. Discussion with the resident about any concerns about falling might also be an opportunity to identify its presence.

Common approaches to improving loss of confidence or fear of falling in RACF settings include participation in a balance and mobility training exercise program, and other falls prevention activities, including the use of hip protectors.[374]



Additional information

The following information sheet is useful:

- *General Practice in Residential Aged Care: Clinical Information Sheet. Falls Management and Prevention*, North West Melbourne Division of General Practice: http://nwmdgp.org.au/pages/after_hours/GPRAC-CIS-06.html


STOP

Appendices

Appendix 1
Contributors to the guidelines

Chapter authors and reviewers

Chapter	Author(s)	Reviewer
Preliminaries	Ms Meg Heaslop	Mr Graham Bedford
Part A — Introduction		
Background	Ms Meg Heaslop	Mr Graham Bedford
Falls and falls injuries in Australia	Ms Meg Heaslop	Assoc Prof Stephen Lord
Involving residents in falls prevention	Dr Constance Vogler	Dr Constance Vogler
Part B — Standard falls prevention strategies		
Falls prevention interventions	Ms Meg Heaslop	Dr Constance Vogler
Falls risk screening and assessment	Dr Kim Delbaere	Prof Keith Hill
Part C — Management strategies for common falls risk factors		
Balance and mobility limitations	Dr Cathie Sherrington	Dr Cathie Sherrington
Cognitive impairment	Dr Kim Delbaere	Dr Jeffrey Rowland
Continence	Dr Kim Delbaere	Assoc Prof Pauline Chiarelli
Feet and footwear	Dr Kim Delbaere	Assoc Prof Hylton Menz
Syncope	Dr Janet Salisbury	Assoc Prof Jacqueline Close
Dizziness and vertigo	Dr Kate Murray	Assoc Prof Jacqueline Close
Medications	Assoc Prof Jacqueline Close	Assoc Prof Jacqueline Close
Vision	Assoc Prof Stephen Lord Assoc Prof Jacqueline Close Dr Kim Delbaere	Prof Joanne Wood
Environmental considerations	Ms Meg Heaslop	Assoc Prof Lindy Clemson
Individual surveillance and observation	Ms Jacinda Wilson	Assoc Prof David Fonda
Restraints	Ms Meg Heaslop	Assoc Prof David Fonda

Chapter	Author(s)	Reviewer
Part D — Minimising injuries from falls		
Hip protectors	Ms Meg Heaslop	Prof Ian Cameron
Vitamin D and calcium supplementation	Assoc Prof Jacqueline Close Ms Meg Heaslop	Prof Terry Diamond
Osteoporosis management	Assoc Prof Stephen Lord Ms Meg Heaslop	Dr Peter Ebling
Part E — Responding to falls		
Post-fall management	Ms Meg Heaslop	Assoc Prof Michael Dorevitch

Guideline	Australian reviewer	International reviewer
Community	Dr Nancye Peel	Assoc Prof Clare Robertson
Residential aged care facility	Ms Mandy Harden	Assoc Prof Ngaire Kerse
Hospital	Assoc Prof Jacqueline Close	Prof David Oliver
Additional work		
Economic evaluations	Dr Kirsten Howard	
Editors	Ms Meg Heaslop, Biotext Pty Ltd Dr Janet Salisbury, Biotext Pty Ltd	
Design	True Characters Pty Ltd	

Contributors

Name	Position
Mr Graham Bedford	Policy Team Manager, Australian Commission on Safety and Quality in Health Care
Prof Ian Cameron	Professor of Rehabilitation Medicine, The University of Sydney; and Head, Rehabilitation Studies Unit, The University of Sydney
Assoc Prof Pauline Chiarelli	Associate Professor, Convener of Bachelor of Physiotherapy Program, School of Health Sciences, The University of Newcastle
Assoc Prof Lindy Clemson	Associate Professor in Ageing and Thompson Fellow, Faculty of Health Sciences, The University of Sydney
Assoc Prof Jacqueline Close	Senior Staff Specialist, Prince of Wales Hospital and Clinical School, The University of New South Wales; and Honorary Senior Fellow, Prince of Wales Medical Research Institute, The University of New South Wales
Dr Kim Delbaere	Postdoctoral researcher, Prince of Wales Medical Research Institute, The University of New South Wales
Prof Terry Diamond	Senior Endocrinologist, St George Hospital; and Associate Professor in Endocrinology, The University of New South Wales

Name	Position
Assoc Prof Michael Dorevitch	Senior Geriatrician, Austin Health
Dr Peter Ebeling	Professor of Medicine, Department of Medicine (RMH/WH), The University of Melbourne; and Head, Endocrinology, Western Health
Assoc Prof David Fonda	Associate Professor of Medicine, Monash University; and Consultant Geriatrician, Cabrini Medical Centre
Ms Mandy Harden	CNC Aged Care Education/Community Aged Care Services, Hunter New England Area Health Services
Prof Keith Hill	Professor of Allied Health, La Trobe University and Northern Health; and Senior Researcher, Preventive and Public Health Division, National Ageing Research Institute
Dr Kirsten Howard	Senior Lecturer, Health Economics, School of Public Health, The University of Sydney
Ms Lorraine Lovitt	Leader, New South Wales Falls Prevention Program, Clinical Excellence Commission
Assoc Prof Ngaire Kerse	Associate Professor, General Practice and Primary Health Care, School of Population Health, Faculty of Medical and Health Sciences, The University of Auckland
Assoc Prof Stephen Lord	Principal Research Fellow, Prince of Wales Medical Research Institute, The University of New South Wales
Assoc Prof Hylton Menz	National Health and Medical Research Council Research Fellow; and Director, Musculoskeletal Research Centre, Faculty of Health Sciences, La Trobe University
Dr Kate Murray	Principal, Dizzy Day Clinics
Prof David Oliver	Consultant Physician and Clinical Director, Royal Berkshire Hospital, United Kingdom; and Visiting Professor of Medicine for Older People, School of Community and Health Sciences, City University, London
Dr Nancye Peel	Research Fellow, Academic Unit in Geriatric Medicine, School of Medicine, The University of Queensland
Assoc Prof Clare Robertson	Research Associate Professor, Department of Medical and Surgical Sciences, Dunedin School of Medicine, University of Otago
Dr Jeffrey Rowland	Staff Physician, The Prince Charles Hospital
Dr Cathy Sherrington	Senior Research Fellow, Musculoskeletal Division, The George Institute for International Health and Faculty of Medicine, The University of Sydney
Dr Anne Tiedemann	Research Officer, Prince of Wales Medical Research Institute, The University of New South Wales
Dr Constance Vogler	Clinical Senior Lecturer, Medicine, Northern Clinical School, The University of Sydney; and Staff Specialist Geriatrician, Royal North Shore Hospital
Prof Joanne Wood	Professor, School of Optometry and Institute of Health and Biomedical Innovation, Queensland University of Technology

Appendix 2
Falls risk screening and assessment tools

A2.1 Peninsula Health FRAT (screening component)

The Peninsula Health Falls Risk Assessment Tool (FRAT) has several parts, and is part of a comprehensive falls prevention package called the FRAT Pack (available for purchase), which includes detailed guidelines for use of the full Peninsula Health FRAT. The first part of the Peninsula Health FRAT can be used as a falls risk screen, and is provided below.

Permission to use this tool was provided by the Peninsula Health Falls Prevention Service. It was developed through funding from the Department of Human Services.

Acknowledgment is required if the tool is used by your organisation. Contact details for further information:

Ms Vicki Davies and Ms Carolyn Stapleton
Peninsula Health Falls Prevention Service
Jackson's Road (PO Box 192)
Mt Eliza VIC 3930
Email: VDavies@phcn.vic.gov.au or CStapleton@phcn.vic.gov.au

Peninsula Health FRAT (screening component)

Patient's name: Date:

Risk factor	Level		Risk score
Recent falls	None in the past 12 months		2
	One or more between 3 and 12 months ago		4
	One or more in the past 3 months		6
	One or more in the past 3 months while inpatient/resident		8
Medications *Sedatives, antidepressants, antiparkinsons, diuretics, antihypertensives, hypnotics*	Not taking any of these		1
	Taking one		2
	Taking two		3
	Taking more than two		4
Psychological *Anxiety, depression, ↓ cooperation, ↓ insight or ↓ judgment, especially regarding mobility*	Does not appear to have any of these		1
	Appears mildly affected by one or more		2
	Appears moderately affected by one or more		3
	Appears severely affected by one or more		4
Cognitive status *m-m: Hodkinson Abbreviated Mental Test Score*	m-m score 9–10/10	**OR** intact	1
	m-m score 7–8	mildly impaired	2
	m-m score 5–6	moderately impaired	3
	m-m score 4 or less	severely impaired	4
		Total score	**/20**
	Low risk: 5–11 Medium risk: 12–15 High risk: 16–20	**Risk category**	

Appendix 3

Rowland Universal Dementia Assessment Scale (RUDAS)[105]

RUDAS

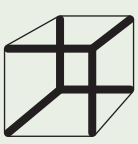
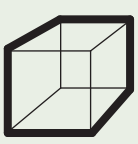
Rowland Universal Dementia Assessment Scale: A Multicultural Mini-Mental State Examination.

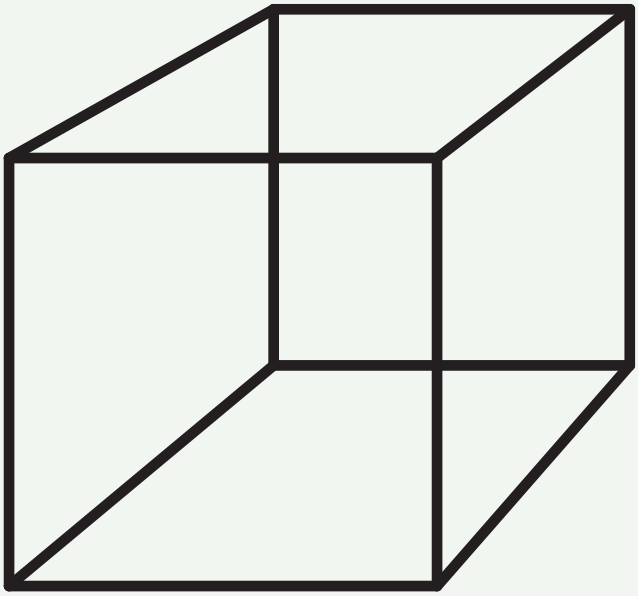
(Storey, Rowland, Basic, Conforti & Dickson, 2002)

Date: / /

Name: _____

Patient Name: _____

Item	Max Score
Memory	
1. (Instructions) I want you to imagine that we are going shopping. Here is a list of grocery items. I would like you to remember the following items which we need to get from the shop. When we get to the shop in about 5 mins. time I will ask you what it is that we have to buy. You must remember the list for me. **Tea, Cooking Oil, Eggs, Soap** Please repeat this list for me. *(Ask person to repeat the list 3 times). (If person did not repeat all four words, repeat the list until the person has learned them and can repeat them, or, up to a maximum of five times.)*	
Visuospatial Orientation	
2. I am going to ask you to identify/show me different parts of the body. *(Correct = 1).* *Once the person correctly answers 5 parts of this question, do not continue as the maximum score is 5.* (1) show me your right foot 1 (2) show me your left hand 1 (3) with your right hand touch your left shoulder 1 (4) with your left hand touch your right ear 1 (5) which is (indicate/point to) my left knee 1 (6) which is (indicate/point to) my right elbow 1 (7) with your right hand indicate/point to my left eye 1 (8) with your left hand indicate/point to my left foot 1	/5
Praxis	
3. I am going to show you an action/exercise with my hands. I want you to watch me and copy what I do. Copy me when I do this … *(One hand in fist, the other palm down on table – alternate simultaneously.)* Now do it with me: Now I would like you to keep doing this action at this pace until I tell you to stop – approximately 10 seconds. *(Demonstrate at moderate walking pace).* Score as: Normal = 2 *(very few if any errors; self-corrected, progressively better; good maintenance; only very slight lack of synchrony between hands)* Partially Adequate = 1 *(noticeable errors with some attempt to self-correct; some attempt at maintenance; poor synchrony)* Failed = 0 *(cannot do the task; no maintenance; no attempt whatsoever)*	/2
Visuoconstructional Drawing	
4. Please draw this picture exactly as it looks to you *(Show cube on back of page).* Score as: *(Yes = 1)* (1) Has person drawn a picture based on a square? 1 (2) Do all internal lines appear in person's drawing? 1 (3) Do all external lines appear in person's drawing? 1 (2)  (3) 	/3



Item				Max Score
Judgment				
5. You are standing on the side of a busy street. There is no pedestrian crossing and no traffic lights. Tell me what you would do to get across to the other side of the road safely. *(If person gives incomplete response that does not address both parts of answer, use prompt:* "Is there anything else you would do?"*) Record exactly what patient says and circle all parts of response which were prompted.*				
Score as:				
Did person indicate that they would look for traffic?	(YES = 2;YES PROMPTED = 1; NO = 0)		2	
Did person make any additional safety proposals?	(YES = 2;YES PROMPTED = 1; NO = 0)		2	/4
Memory Recall				
1. (Recall) We have just arrived at the shop. Can you remember the list of groceries we need to buy? *(Prompt: If person cannot recall any of the list, say* "The first one was 'tea'." *(Score 2 points each for any item recalled which was not prompted — use only 'tea' as a prompt.)*				
Tea	2			
Cooking Oil	2			
Eggs	2			
Soap	2			/8
Language				
6. I am going to time you for one minute. In that one minute, I would like you to tell me the names of as many different animals as you can. We'll see how many different animals you can name in one minute. *(Repeat instructions if necessary). Maximum score for this item is 8. If person names 8 new animals in less than one minute there is no need to continue.*				
1.		5.		
2.		6.		
3.		7.		
4.		8.		/8
TOTAL SCORE =				**/30**

Appendix 4

Safe shoe checklist[232]

The requirement for safe, well-fitting shoes varies, depending on the individual and their level of activity. The features outlined below may help in the selection of an appropriate shoe. The shoe should:

Heel	☐	Have a low heel (ie less than 2.5 cm) to ensure stability and better pressure distribution on the foot. A straight-through sole is also recommended.
	☐	Have a broad heel with good ground contact.
	☐	Have a firm heel counter to provide support for the shoe.
Sole	☐	Have a cushioned, flexible, nonslip sole. Rubber soles provide better stability and shock absorption than leather soles. However, rubber soles do have a tendency to stick on some surfaces.
Weight	☐	Be lightweight.
Toe box	☐	Have adequate width, depth and height in the toe box to allow for natural spread of toes.
	☐	Have approximately 1 cm space between the longest toe and the end of the shoe when standing.
Fastenings	☐	Have laces, buckles, elastic or velcro to hold the shoe securely onto the foot.
Uppers	☐	Be made from accommodating material. Leather holds its shape and breathes well; however, many people find walking shoes with soft material uppers are more comfortable.
	☐	Have smooth and seam-free interiors.
Safety	☐	Protect feet from injury.
Shape	☐	Be the same shape as the feet, without causing pressure or friction to the foot.
Purpose	☐	Be appropriate for the activity being undertaken during their use. Sports or walking shoes may be ideal for daily wear. Slippers generally provide poor foot support and may only be appropriate when sitting.
Orthoses	☐	Have comfortably accommodating orthoses, such as ankle foot orthoses or other supports, if required. The podiatrist, orthotist or physiotherapist can advise the best style of shoe if orthoses are used.

This is a general guide only. Some people may require the specialist advice of a podiatrist for the prescription of appropriate footwear for their individual needs.

Appendix 5

Environmental checklist[280]

This tool was adapted from CERA — '*Putting your Best Foot Forward*' — *Preventing and Managing Falls in Aged Care Facilities*', by staff at the rehabilitation unit, Bundaberg Base Hospital Health Service District, as part of Queensland Health's Quality Improvement and Enhancement Program.

General environment checklist

Surname _____

First name _____

U.R. No _____

Date of birth / /

(Please affix patient ID label here if available)

Client location:	Bed/room No:		
Bathroom and toilets	**Please ✓ appropriate box**	**Yes**	**No**	**N/A**
Grab rails are appropriately positioned and secured in the toilet, shower and bath			
Floors are nonslip			
Baths/showers have nonslip treatment and/or mats			
Are areas immediately around the bath and sink marked in contrasting colours?			
Raised toilet seats are available			
Toilet surrounds and/or grab rails are available in toilets			
Soap, shampoo and washers are within easy reach and do not require bending to reach			
Do all shower chairs have adjustable legs, arms and rubber stoppers on the legs?			
Is there room for a seat in AND near the shower?			
Is the shower base without steps? (not necessary for most patients)			
Are call buttons accessible from sitting position in shower area?			
Are doors lightweight and easy to use?			
Furniture	**Please ✓ appropriate box**	**Yes**	**No**	**N/A**
Is furniture secure enough to support a client should they lean on or grab for balance?			
Are bedside lockers or tables available to clients so they can put things on safely without undue stretching and twisting?			
Are footstools in good repair and stoppers in good condition?			
Is space available for footstool when required?			

Client location:	Bed/room No:		
Floor surfaces Please ✓ appropriate box	Yes	No	N/A
Are carpets low pile, firmly attached and a constant colour rather than patterned?			
Are walls a contrasting colour to the floor?			
Is non-skid wax used on wooden and vinyl floors?			
Do floors have a matted finish which is not glary?			
Are 'Wet Floor' signs readily available and used promptly in the event of a spillage?			
Do steps have a non-slip edging in contrasting colour to make it easier to see?			
Is routine cleaning of floors done in a way to minimise risk to residents eg. well signed, out of hours?			
Lighting Please ✓ appropriate box	Yes	No	N/A
Is lighting in all areas at a consistent level so that patients are not moving from darker to lighter areas and vice versa?			
Do staircases have light switches at the top and bottom of them?			
Do patients have easy access to night lights?			
Are the hallways and rooms well lit (75 watts)?			
There is minimal glow from furniture/floorings			
Are all switches marked with luminous tape for easy visibility?			
Passageways Please ✓ appropriate box	Yes	No	N/A
Are all passageways kept clear of clutter and hazards?			
Are firm and colour contrasted handrails provided in passageways and stairwells?			
Is there adequate space for mobility aids?			
Is there adequate storage space for equipment?			
Are ramps/lifts available as an alternative to stairs?			
Do steps have a non-slip edging in contrasting colour?			
Is there enough room for two people with frames/wheelchairs to pass each other safely?			
Passageways Please ✓ appropriate box	Yes	No	N/A
Are all passageways kept clear of clutter and hazards?			
Are firm and colour contrasted handrails provided in passageways and stairwells?			
Is there adequate space for mobility aids?			
Is there adequate storage space for equipment?			
Are ramps/lifts available as an alternative to stairs?			
Do steps have a non-slip edging in contrasting colour?			
Is there enough room for two people with frames/wheelchairs to pass each other safely?			
Lifts Please ✓ appropriate box	Yes	No	N/A
Do doors close slowly?			
Are buttons easily accessible to avoid excessive reaching?			
Are floor signs at eye level to prevent stretching the neck?			
Are handrails available?			

Client location:	Bed/room No:		
External areas Please ✓ appropriate box	**Yes**	**No**	**N/A**
Are pathways even and with a non-slip surface?			
Are pathways clear of weeds, moss and leaves?			
Are steps marked with a contrasting colour and non-slip surface?			
Are there handrails beside external steps and pathways?			
Are there any overhanging trees, branches and shrubs?			
Are sensor lights installed?			
Are there sufficient numbers of outdoor seats for regular rests?			
Security of environment Please ✓ appropriate box	**Yes**	**No**	**N/A**
Are all exits from the facility secured to prevent confused patients leaving?			
Are there clear walking routes both inside and outside where patients can wander safely without becoming lost?			
Does the layout of the facility, or allocation of rooms, allow staff to monitor high risk patients?			
Remedial actions that need to be taken:			

Appendix 6

Equipment safety checklist[275]

Reproduced with permission from VA National Centre for Patient Safety 2004 Falls Toolkit, page 43.

Equipment safety checklist:		Please ✓
Wheelchairs		
Brakes	Secure chair when applied	
Arm rest	Detaches easily for transfers	
Leg rest	Adjust easily	
Foot pedals	Fold easily so that patient may stand	
Wheels	Are not bent or warped	
Anti-tip devices	Installed, placed in proper position	
Electric wheelchairs/scooters		
Speed	Set at the lowest setting	
Horn	Works properly	
Electrical	Wires are not exposed	
Beds		
Side rails	Raise and lower easily	
	Secure when up	
	Used for mobility purposes only	
Wheels	Roll/turn easily, do not stick	
Brakes	Secures the bed firmly when applied	
Mechanics	Height adjusts easily (if applicable)	
Transfer bars	Sturdy, attached properly	
Over-bed table	Wheels firmly locked	
	Positioned on wall-side of bed	
IV poles/stand		
Pole	Raises/lowers easily	
Wheels	Roll easily and turn freely, do not stick	
Stand	Stable, does not tip easily (should be five-point base)	

Equipment safety checklist:		Please ✓
Footstools		
Legs	Rubber skid protectors on all feet	
	Steady—does not rock	
Top	Non-skid surface	
Call bells/lights		
Operational	Outside door light	
	Sounds at nursing station	
	Room number appears on the monitor	
	Intercom	
	Room panel signals	
Accessible	Accessible in bathroom	
	Within reach while patient is in bed	
Walkers/canes		
Secure	Rubber tips in good condition	
	Unit is stable	
Commode		
Wheels	Roll/turn easily, do not stick	
	Are weighted and not 'top heavy' when a person is sitting on it	
Brakes	Secure commode when applied	
Chairs		
Chair	Located on level surface to minimize risk of tipping	
Wheels	Roll/turn easily, do not stick	
Brakes	Applied when chair is stationary	
	Secure chair firmly when applied	
Footplate	Removed when chair is placed in a non-tilt or non-reclined position	
	Removed during transfers	
Positioning	Chair is positioned in proper amount of tilt to prevent sliding or falling forward	
Tray	Secure	

Completed by: _____ Date: / /

Appendix 7

Checklist of issues to consider before using hip protectors[313]

A checklist of issues to consider before using hip protectors is as follows:

- Is the risk of hip fracture high enough to justify their use?
- Will the user wear them as directed?
- Will the user be able to put them on and pull them down for toileting; if not, is assistance available?
- How will they be laundered?
- Who will encourage their use?
- Who will pay for them?
- Is the potential wearer aware of the different types of hip protector available?

Additionally, a checklist of issues when using hip protectors is as follows:

- Is the fit adequate?
- Are they being worn in the correct position?
- Are they being worn at the correct times and should they be worn at night?
- Are continence pads worn if needed?
- Should other underwear be worn under the hip protectors?
- Is additional encouragement needed to improve adherence?
- When should the hip protectors be replaced?
- Has education been provided to care staff?

Appendix 8

Hip protector care plan[232]

This chart was developed by staff at Eventide Nursing Home, Sandgate, Prince Charles Health Service District, as part of Queensland Health's Quality Improvement and Enhancement Program.

Hip protector pad care plan	
Date: / /	Affix ID label

Identified/expressed needs	Negotiated outcomes	
Total of hip protector pads (type).	To allow independent mobility with less associated risks due to protective device	
Management plan	**Review date**	**Signature**
Hip protector pads to be individually marked and stored with incontinence aids.		
Two pairs of hip protector pads per person.		
Removable cover can be changed if soiled or wet (these are washable).		
Stretch pants secure hip protector pads in place. For those people who already wear stretch pants for incontinence pads, a second pair of stretch pants may be needed and worn over the first pair.		
For type A hip protector pads, position just below the person's waist with Velcro closure at the top. This allows cover for the entire hip region.		
Please choose clothing with a loose fit to allow for hip protector pad insertion.		
Please complete hip protector pad observation form with time applied and removed. Comment on compliance, fit, comfort etc. and any problems.		

Please contact _____ if any problems

Appendix 9

Hip protector observation record[232]

This chart was developed by staff at Eventide Nursing Home, Sandgate, Prince Charles Health Service District, as part of Queensland Health's Quality Improvement and Enhancement Program.

Hip protector pad observations	
Observations (please specify):	Affix ID label

Date	Time applied	Time removed	Hours in use	Comment	Initials

Appendix 10

Hip protector education plan[303]

The following information is taken from Meyer G, Warnke A, Bender R and Muhlhauser I (2003). Effect of hip fractures on increased use of hip protectors in nursing homes: cluster randomised controlled trial. *British Medical Journal* 326:76–80.

> 'The education session lasted for 60–90 minutes, took place in small groups (average 12 members of staff from each cluster), and was delivered by two investigators. It covered: information about the risk of hip fracture and related morbidity; strategies to prevent falls and fractures; effectiveness of hip protectors; relevant aspects known to interfere with the use of protectors, such as aesthetics, comfort, fit, and handling; and strategies for successful implementation. The session included experience based, theoretical, and practical aspects. Staff members were encouraged to try wearing the hip protector. Apart from the printed curriculum we also developed and provided 16 coloured flip charts illustrating the main objectives and leaflets for residents, relatives, and physicians.
>
> At least one nurse from each intervention cluster was then responsible for delivering the same education programme to residents individually or in small groups. Nursing staff were encouraged to wear a hip protector during these sessions and to include residents who readily accepted the hip protector as activating group members.
>
> About two weeks later we visited the intervention clusters again to encourage the administration of the programme. Otherwise frequency and intensity of contacts were similar for intervention and control groups.'

Appendix 11

Food and fluid intake chart

Reproduced with permission of Toowoomba Health Services District, Queensland Health.

Food and fluid intake chart	
	Please affix client identification label here

What is the patient eating?

(please write down all foods and fluids this patient is consuming – specify amounts)

Day:	Consumed (please circle)					Fluid (mL)	Comments
Breakfast juice	None	1/4	1/2	3/4	All		
Fruit	None	1/4	1/2	3/4	All		
Cereal	None	1/4	1/2	3/4	All		
Yoghurt	None	1/4	1/2	3/4	All		
Bread/toast	None	1/4	1/2	3/4	All		
Drink	None	1/4	1/2	3/4	All		
Other *(specify fluid type and volume)*							
Morning tea							
Food	None	1/4	1/2	3/4	All		
Drink	None	1/4	1/2	3/4	All		
Other							
Midday meal							
Soup	None	1/4	1/2	3/4	All		
Meat	None	1/4	1/2	3/4	All		
Vegetables	None	1/4	1/2	3/4	All		
Bread	None	1/4	1/2	3/4	All		
Fruit	None	1/4	1/2	3/4	All		
Dessert	None	1/4	1/2	3/4	All		
Drink	None	1/4	1/2	3/4	All		
Other *(specify fluid type and volume)*							

What is the patient eating?							
Afternoon tea	**Consumed (please circle)**					**Fluid (mL)**	**Comments**
Food	None	1/4	1/2	3/4	All		
Drink	None	1/4	1/2	3/4	All		
Other *(specify)*							
Evening meal							
Soup	None	1/4	1/2	3/4	All		
Meat	None	1/4	1/2	3/4	All		
Vegetables	None	1/4	1/2	3/4	All		
Bread	None	1/4	1/2	3/4	All		
Fruit	None	1/4	1/2	3/4	All		
Dessert	None	1/4	1/2	3/4	All		
Drink	None	1/4	1/2	3/4	All		
Other *(specify fluid type and volume)*							
Supper							
Food	None	1/4	1/2	3/4	All		
Drink	None	1/4	1/2	3/4	All		
Other *(specify fluid type and volume)*							

NB: Extra fluids ie from taking medications, swallow tests, sips of water etc must be recorded in the above chart as 'other' with a volume provided (eg Medication–20 mL).

Appendix 12

Food guidelines for calcium intake for preventing falls in older people[348]

Guidelines	More information and hints
• Men: provide 3 serves of dairy products every week. • Women: provide 4 serves of dairy products every week.	• One serve of dairy products is equal to: – 250 mL milk (whole, reduced fat, skim, fortified soy) – 250 mL custard – 200 mL high-calcium milk – 200 g yoghurt – 45 g cheese. • Soft cheeses (eg cottage and ricotta cheeses) have less calcium. • Encourage some high-calcium foods (eg a glass of milk) before bed, because calcium is best absorbed overnight. • Soy milk, oat milk and rice milk are not naturally high in calcium, so check for supplementation with calcium of at least 100 mg of calcium per 100 mL milk.
• Provide a menu low in salt and advise limiting salt use.	Sodium chloride (salt) can increase calcium loss. • Provide lower salt versions of processed foods, canned foods and margarines. • Low-salt foods contain 120 mg or less of sodium per 100 g of food • Do not add salt to cooking. • Discourage addition of salt at meal times.
• Avoid providing large amounts of caffeine-containing drinks and alcohol.	• Keep coffee intake to 3–4 cups of weak coffee a day. • Lower intake of other drinks that contain caffeine (eg tea, cola, soft drinks). • Provide no more than 1–2 standard drinks per day. • Have at least 2 alcohol-free days a week.

Glossary

Cognitive impairment	Impairment in one or more domains of normal brain function (eg memory, perception, calculation).
Cognitively intact	Suffering no form of cognitive impairment.
Comorbidity	Two or more health conditions or disorders occurring at the same time.
Consumer	Refers to patients, clients and carers in acute and subacute settings. It also refers to people receiving care in residential aged care settings and their carers.
Delirium	An acute change in cognitive function characterised by fluctuating confusion, impaired concentration and attention.
Dementia	Impairment in more than one cognitive domain that impacts on a person's ability to function, and that progresses over time.
Extrinsic factors	Factors that relate to a person's environment or their interaction with the environment.
Facility	Used to refer to both hospitals and residential aged care facilities.
Fall	A standard definition of a fall should be used in Australian facilities, so that a nationally consistent approach to falls prevention can be applied. For these guidelines, the expert panel and taskforce agreed on the following definition: 'A fall is an event which results in a person coming to rest inadvertently on the ground or floor or other lower level'. World Health Organization: http://www.who.int/ageing/publications/Falls_prevention7March.pdf
Falls Guidelines	Used in place of the full title of these guidelines, *Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Residential Aged Care Facilities 2009*.
Falls risk assessment	A more detailed and systematic process than a falls risk screen and is used to identify a person's risk factors for falling.
Falls risk screen	The minimum process for identifying older people at greatest risk of falling. It is also an efficient process, because fewer than five risk factors are usually required to identify who should be assessed more comprehensively for falls risk.
Hip protector	A device worn over the greater trochanter of the femur, designed to absorb and deflect the energy created by a fall away from the hip joint. The soft tissues of the surrounding thigh absorb the energy instead.
Hospital	Refers to both acute and subacute settings.
Hypotension, orthostatic	A drop in blood pressure resulting from a change in position from lying to standing.
Hypotension, postprandial	A drop in blood pressure experienced after eating.
Incremental cost effectiveness ratio (ICER)	A measure of the cost effectiveness of an intervention, which is calculated by comparing the costs and health outcomes of the new program with the costs and health outcomes of an alternative health care program. Interventions with lower ICERs are better value for money.

Injurious fall	These guidelines use the Prevention of Falls Network Europe (ProFaNE) panel definition of an injurious fall. They consider that the only injuries that could be confirmed accurately using current data sources were peripheral fractures (defined as any fracture of the limb girdles and of the limbs). Head injuries, maxillo-facial injuries, abdominal, soft tissue and other injuries are not included in the recommendation for a core dataset. However, other definitions of an injurious fall include traumatic brain injuries (TBIs) as a falls-related injury, particularly as falls are the leading cause of TBIs in Australia.
Intervention	A therapeutic procedure or treatment strategy designed to cure, alleviate or improve a certain condition.
Intrinsic factors	Factors that relate to a person's behaviour or condition.
Life-years saved or life-years generated (LYS)	A measure of the gain in health outcomes from an intervention.
Multifactorial interventions	Where people receive multiple interventions, but the combination of these interventions is tailored to the individual, based on an individual assessment.
Multiple interventions	Where everyone receives the same, fixed combination of interventions.
Older person or older people	These guidelines define older people as 65 years of age and over. When considering Indigenous Australians, the term 'older people' refers to people 50 years of age and over.
Patient	Refers to both patients and clients in acute and subacute settings.
Pharmacodynamics	The study of the biochemical and physiological effects that medications have on the body.
Pharmacokinetics	The study of the way in which the body handles medications, including the processes of absorption, distribution, excretion and localisation in tissues and chemical breakdown.
Psychoactive medication	A medication that affects the mental state. Psychoactive medications include antidepressants, anticonvulsants, antipsychotics, mood stabilisers, anxiolytics, hypnotics, antiparkinsonian drugs, psychostimulants and dementia medications.
Quality-adjusted life year (QALY)	A summary measure used in assessing the value for money of an intervention. It is based on the number of years of life that would be added by an intervention, and combines survival and quality of life in a single composite measure.
Resident	These guidelines use 'resident' wherever possible, in favour of 'patient', 'older person' or 'older people'. The term refers to people receiving care in residential aged care settings.
Residential aged care facility (RACF)	Refers to both high-care and low-care settings.
Root-cause analysis (RCA)	An in-depth analysis of an event, including individual and broader system issues, to provide greater understanding of causes and future prevention.
Single interventions	Interventions targeted at single risk factors.
Syncope	A temporary loss of consciousness with spontaneous recovery, which occurs when there is a transient decrease in cerebral blood flow.
Vision	The ability of the unaided eye to see fine detail.
Visual acuity	A measure of the ability of the eye to see fine detail when the best spectacle or contact lens prescription is worn. Visual acuity (VA) = d/D (written as a fraction) where: d = the viewing distance (usually 6 metres), and D = the number under or beside the smallest line of letters that the person is able to see. Normal visual acuity is 6/6 or better. If someone can only see the '60' line at the top of the chart, the acuity is recorded as being 6/60. Some people can see better than 6/6 (eg 6/5, 6/3); however, 6/6 has been established as the standard for good vision.

References

1 ACSQHC (Australian Commission on Safety and Quality in Health Care) (2005). *Preventing Falls and Harm from Falls in Older People – Best Practice Guidelines for Australian Hospitals and Residential Aged Care Facilities 2005*, Australian Government, Canberra.

2 NARI (National Ageing Research Institute) (2004). *An Analysis of Research on Preventing Falls and Falls Injury in Older People: Community, Residential Care and Hospital Settings (2004 update)*, Australian Government Department of Health and Ageing, Injury Prevention Section, Canberra.

3 *Aged Care Act 1997*. http://scaletext.law.gov.au (Accessed July 2007)

4 VQC (Victorian Quality Council) (2004). *Minimising the Risk of Falls and Falls-related Injuries: Guidelines for Acute, Sub-acute and Residential Care Settings*, Department of Human Services, Metropolitan Health and Aged Care Services Division, Melbourne.

5 World Health Organization. *Definition of a fall*. http://www.who.int/violence_injury_prevention/other_injury/falls/links/en/index.html

6 Rushworth N (2009). *Brain Injury Australia Policy Paper: Falls-Related Traumatic Brain Injury*, Brain Injury Australia Inc, Auburn. http://www.bia.net.au/reports_factsheets/BIA%20Paper_Falls%20related%20TBI.pdf

7 Cameron I, Murray G, Gillespie L, Cumming R, Robertson M, Hill K and Kerse N (2008). Interventions for preventing falls in older people in nursing care facilities and hospitals. *Cochrane Database of Systematic Reviews* (3) Art. No.: CD005465. DOI: 10.1002/14651858.CD005465.

8 NHMRC (National Health and Medical Research Council) (2007). *NHMRC additional levels of evidence and grades for recommendations for developers of guidelines. Stage 2 Consultation*. http://www.nhmrc.gov.au/guidelines/_files_nhmrc/file/guidelines/Stage%202%20Consultation%20Levels%20and%20Grades.pdf (Accessed 20 May 2009)

9 Glasziou P, Del Mar C and Salisbury J (2007). *Evidence Based Practice Workbook*, Blackwell, Melbourne.

10 NHMRC (National Health and Medical Research Council) (1999). *A Guide to the Development, Implementation and Evaluation of Clinical Practice Guidelines*, Australian Government, Canberra.

11 Pointer S, Harrison J and Bradley C (2003). *National Injury Prevention Plan Priorities for 2004 and Beyond: Discussion Paper*, Australian Institute of Health and Welfare, Canberra.

12 AIHW (Australian Institute of Health and Welfare) (2008). *Hospitalisations Due to Falls by Older People, Australia 2005–06*, Australian Government, Canberra.

13 AIHW (Australian Institute of Health and Welfare) (2008). *A Picture of Osteoporosis in Australia*, Australian Institute of Health and Welfare, Australian Government, Canberra.

14 AIHW (Australian Institute of Health and Welfare) (2008). *Movement from Hospital to Residential Aged Care*, Australian Government, Canberra.

15 AIHW (Australian Institute of Health and Welfare) (2007). *Older Australians in Hospital*, Australian Government, Canberra.

16 Rubenstein L, Josephson K and Osterweil D (1996). Falls and fall prevention in the nursing home. *Clinics in Geriatric Medicine* 12(4):881–902.

17 Morse J (1996). *Preventing Patient Falls*, Sage Publications, Thousand Oaks, California.

18 Sutton J, Standen P and Wallace A (1994). Incidence and documentation of patient accidents in hospital. *Nursing Times* 90(33):29–35.

19 DoHA (Australian Government Department of Health and Ageing) (2003). *Projected Costs of Fall Related Injury to Older Persons Due to Demographic Change in Australia*, Department of Health and Ageing, Australian Government, Canberra.

20 Brandis S (1999). A collaborative occupational therapy and nursing approach to falls prevention in hospital inpatients. *Journal of Quality in Clinical Practice* 19(4):215–220.

21 Hitcho E, Krauss M, Birge S, Dunagan W, Fischer I, Johnson S, Nast P, Costantinou E and Fraser V (2004). Characteristics and circumstances of falls in a hospital setting: a prospective analysis. *Journal of Geriatric Internal Medicine* 19(7):732–739.

22 Kerzman H, Chetrit A, Brin L and Toren O (2004). Characteristics of falls in hospitalized patients. *Journal of Advanced Nursing* 47(2):223–229.

23 Butler M, Kerse N and Todd M (2004). Circumstances and consequences of falls in residential care: the New Zealand story. *The New Zealand Medical Journal* 117(1202):1076–1088.

24 Nyberg L and Gustafson Y (1995). Patient falls in stroke rehabilitation: a challenge to rehabilitation strategies. *Stroke* 26(5):838–842.

25 Vassallo M, Amersey R, Sharma J and Allen S (2000). Falls on integrated medical wards. *Gerontology* 46(3):158–162.

26 Kuehn A and Sendelweck S (1995). Acute health status and its relationship to falls in the nursing home. *Journal of Gerontological Nursing* 21(7):41–49.

27 Oliver D, Connelly J, Victor C, Shaw F, Whitehead A, Genc Y, Vanoli A, Martin F and Gosney M (2007). Strategies to prevent falls and fractures in hospitals and care homes and effect of cognitive impairment: systematic review and meta-analyses. *British Medical Journal* 334(7584):82.

28 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, Canberra. http://www.health.gov.au/internet/wcms/publishing.nsf/content/health-pubhlth-strateg-injury-fall-documents.htm

29 NCC-NSC (National Collaborating Centre for Nursing and Supportive Care) (2004). *Clinical Practice Guideline for the Assessment and Prevention of Falls in Older People*. http://guidance.nice.org.uk/CG21 (Accessed July 2007)

30 Clemson L, Cumming R, Kendig H, Swann M, Heard R and Taylor K (2004). The effectiveness of a community-based program for reducing the incidence of falls in the elderly: a randomized trial. *Journal of the American Geriatrics Society* 52(9):1487–1494.

31 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 randomised trial. *Annals of Internal Medicine* 136(10):733–741.

32 Zermansky A, Alldred D, Petty D, Raynor D, Freemantle D, Eastaugh J and Bowie P (2006). Clinical medication review by a pharmacist of elderly people living in care homes — randomised controlled trial. *Age and Ageing* 35(6):586–591.

33 Becker C, Kron M, Lindemann U, Sturm E, Eichner B, Walter-Jung B and Nikolaus T (2003). Effectiveness of a multifaceted intervention on falls in nursing home residents. *Journal of the American Geriatrics Society* 51(3):306–313.

34 Gillespie LD, Robertson MC, Gillespie WJ, Lamb SE, Gates S, Cumming RG and Rowe BH (2009). Interventions for preventing falls in older people living in the community. *Cochrane Database of Systematic Reviews* (2) Art. No.: CD007146. DOI: 10.1002/14651858.CD007146.pub2.

35 Kerse N, Butler M, Robinson E and Todd M (2004). Fall prevention in residential care: a cluster, randomized, controlled trial. *Journal of the American Geriatrics Society* 52(4):524–531.

36 Shaw F, Richardson D, Dawson P, Steen N, McKeith I and Kenny R (2003). Multifactorial intervention after a fall in older people with cognitive impairment and dementia presenting to the accident and emergency department: randomised controlled trial. *British Medical Journal* 326(7380):73.

37 Ray W, Taylor J, Meador K, Thapa P, Brown A, Kajihara H, Davis C, Gideon P and Griffin M (1997). A randomized trial of a consultation service to reduce falls in nursing homes. *Journal of the American Medical Association* 278(7):557–562.

38 Fonda D, Cook J, Sandler V and Bailey M (2006). Sustained reduction in serious falls-related injuries in older people in hospital. *Medical Journal of Australia* 184(8):379–382.

39 Bischoff H, Stahelin H, Dick W, Akos R, Knecht M, Salis C, Nebiker M, Theiler R, Pfeifer M, Begerow B, Lew R and Conzelmann M (2003). Effects of vitamin D and calcium supplementation on falls: a randomized controlled trial. *Journal of Bone and Mineral Research* 18(2):343–351.

40 Chapuy M, Arlot M, Duboeuf F, Brun J, Crouzet B, Arnaud S, Delmas P and Meunier P (1992). Vitamin D3 and calcium to prevent hip fractures in the elderly women. *Journal of Medicine* 327(23):1637–1642.

41 Flicker L, MacInnis R, Stein M, Scherer S, Mead K, Nowson C, Thomas J, Lowndes C, Hopper J and Wark J (2005). Should older people in residential care receive vitamin D to prevent falls? Results of a randomized trial. *Journal of the American Geriatrics Society* 53(11):1881–1888.

42 Nordin E, Lindelof N, Rosendahl E, Jensen J and Lundin-Olsson L (2008). Prognostic validity of the Timed Up-and-Go test, a modified Get-Up-and-Go test, staff's global judgement and fall history in evaluating fall risk in residential care facilities. *Age and Ageing* 37(4):442–448.

43 Bischoff H, Stahelin H, Monsch A, Iversen M, Weyh A, von Dechend M, Akos R, Conzelmann M, Dick W and Theiler R (2003). Identifying a cut-off point for normal mobility: a comparison of the timed 'up and go' test in community-dwelling and institutionalised elderly women. *Age and Ageing* 32(3):315–320.

44 Ellis A and Trent R (2001). Hospitalised fall injuries and race in California. *Injury Prevention* 7:316–320.

45 Haines T, Hill K, Walsh W and Osborne R (2007). Design-related bias in hospital fall risk screening tool predictive accuracy evaluations: systematic review and meta-analysis. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 62(6):664–672.

46 Myers H (2003). Hospital fall risk assessment tools: a critique of the literature. *Age and Ageing* 9(4):223–235.

47 Lundin-Olsson L, Nyberg L and Gustafson Y (2000). The Mobility Interaction Fall chart. *Physiotherapy Research International* 5(3):190–201.

48 Barker A, Nitz J, Low Choy N and Haines T (2008). Clinimetric evaluation of the physical mobility scale supports clinicians and researchers in residential aged care. *Archives of Physical Medicine and Rehabilitation* 89(11):2140–2145.

49 Lundin-Olsson L, Jensen J, Nyberg L and Gustafson Y (2003). Predicting falls in residential care by a risk assessment tool, staff judgement, and history of falls. *Aging — Clinical and Experimental Research* 15(1):51–59.

50 Delbaere K, Close J, Menz H, Cumming R, Cameron I, Sambrook P, March L and Lord S (2008). Development and validation of falls risk screening tools for use in residential aged care facilities in Australia. *Medical Journal of Australia* 189(4):193–196.

51 McMurdo M, Millar A and Daly F (2000). A randomised controlled trial of fall prevention strategies in old peoples' homes. *Gerontology* 46(2):83.

52 Mulrow C, Gerety M, Kanten D, Cornell J, DeNino L, Chiodo L, Aguilar C, O'Neil M, Rosenberg J and Solis R (1994). A randomized trial of physical rehabilitation for very frail nursing home residents. *Journal of the American Medical Association* 271(7):519–524.

53 Faber M, Bosscher R, Chin A, Paw M and Van Wieringen P (2006). Effects of exercise programs on falls and mobility in frail and pre-frail older adults: a multicenter randomized controlled trial. *Archives of Physical Medicine and Rehabilitation* 87(7):885–896.

54 Nowalk M, Prendergast J, Bayles C, D'Amico F and Colvin G (2001). A randomised trial of exercise programs among older individuals living in two long-term care facilities: the FallsFREE program. *Journal of the American Geriatrics Society* 49(7):859–869.

55 Lipsitz LA, Jonsson PV, Kelley MM and Koestner JS (1991). Causes and correlates of recurrent falls in ambulatory frail elderly. *Journal of Gerontology* 46(4):M114–122.

56 Stapleton C, Hough P, Bull K, Hill K, Greenwood K and Oldmeadow L (2009). Four-item falls risk screening tool for sub-acute and residential aged care: the first step in falls prevention. *Australasian Journal on Ageing* 28(3):139–143.

57 Jensen J, Nyberg L, Gustafson Y and Lundin-Olsson L (2003). Fall and injury prevention in residential care — effects in residents with higher and lower levels of cognition. *Journal of the American Geriatrics Society* 51(5):627–635.

58 Sherrington C, Whitney J, Lord S, Herbert R, Cumming R and Close J (2008). Effective exercise for the prevention of falls: a systematic review and meta-analysis. *Journal of the American Geriatrics Society* 56(12):2234–2243.

59 Lord S, Castell S, Corcoran J, Dayhew J, Matters B, Shan A and Williams P (2003). The effect of group exercise on physical functioning and falls in frail older people living in retirement villages: a randomized controlled trial. *Journal of the American Geriatrics Society* 51(12):1685–1692.

60 Schnelle J, Kapur K, Alessi C, Osterweil D, Beck J, Al-Samarrai N, Ouslander J and Schnelle J (2003). Does an exercise and incontinence intervention save healthcare costs in a nursing home population? *Journal of the American Geriatrics Society* 51(2):161–168.

61 Lord S and Ward J (1994). Age-associated differences in sensori-motor function and balance in community dwelling women. *Age and Ageing* 23:452–460.

62 Kiely D, Kiel D, Burrows A and Lipsitz L (1998). Identifying nursing home residents at risk for falling. *Journal of the American Geriatrics Society* 46(5):551–555.

63 Lord S, March L, Cameron I, Cumming R, Schwarz J, Zochling J, Chen J, Makaroff J, Sitoh Y, Lau T, Brnabic A and Sambrook P (2003). Differing risk factors for falls in nursing home and intermediate-care residents who can and cannot stand unaided. *Journal of the American Geriatrics Society* 51(11):1645–1650.

64 Schnelle J, Alessi C, Simmons S, Al-Samarrai N, Beck J and Ouslander J (2002). Translating clinical research into practice: a randomized controlled trial of exercise and incontinence care with nursing home residents. *Journal of the American Geriatrics Society* 50(9):1476–1483.

65 Dyer C, Taylor G, Reed M, Robertson D and Harrington R (2004). Falls prevention in residential care homes: a randomised controlled trial. *Age and Ageing* 33(6):596–602.

66 Sakamoto K, Nakamura T, Hagino H, Endo N, Mori S, Muto Y, Harada A, Nakano T, Itoi E, Yoshimura M, Norimatsu H, Yamamoto H and Ochi T (2006). Effects of unipedal standing balance exercise on the prevention of falls and hip fracture among clinically defined high-risk elderly individuals: a randomized controlled trial. *Journal of Orthopaedic Science* 11(5):467–472.

67 French D, Werner D, Campbell R, Powell-Cope G, Nelson A, Rubenstein L, Bulat T and Spehar A (2007). A multivariate fall risk assessment model for VHA nursing homes using the minimum data set. *Journal of the American Medical Directors Association* 8(2):115–122.

68 NICE (National Institute for Clinical Excellence) (2004). *Clinical Guideline 21. Falls: the Assessment and Prevention of Falls in Older People*, Royal College of Nursing, London.

69 Forster A, Lambley R, Hardy J, Young J, Smith J, Green J and Burns E (2009). Rehabilitation for older people in long-term care. *Cochrane Database of Systematic Reviews* (1) Art. No.: CD004294. DOI: 10.1002/14651858.CD004294.pub2.

70 Rydwick E, Frandin K and Akner G (2004). Effects of physical training on physical performance in institutionalised elderly patients (70+) with multiple diagnoses. *Age and Ageing* 33(1):13–23.

71 Shimada H, Obuchi S, Furuna T and Suzuki T (2004). New intervention program for preventing falls among frail elderly people: the effects of perturbed walking exercise using a bilateral separated treadmill. *American Journal of Physical Medicine and Rehabilitation* 83(7):493–499.

72 Sihvonen S, Sipila S and Era P (2004). Changes in postural balance in frail elderly women during a 4-week visual feedback training: a randomized controlled trial. *Gerontology* 50(2):87–95.

73 Moe-Nilssen R, Nordin E and Lundin-Olsson L (2008). Criteria for evaluation of measurement properties of clinical balance measures for use in fall prevention studies. *Journal of Evaluation in Clinical Practice* 14(2):236–240.

74 Duncan P, Studenski S, Chandler J and Prescott B (1992). Functional reach: predictive validity in a sample of elderly male veterans. *Journal of Gerontology* 47:M93–98.

75 Eagle D, Salama S, Whitman D, Evans L, Ho E and Olde J (1999). Comparison of three instruments in predicting accidental falls in selected inpatients in a general teaching hospital. *Journal of Gerontological Nursing* 35:40–45.

76 Tiedemann A, Shimada H, Sherrington C, Murray S and Lord S (2008). The comparative ability of eight functional mobility tests for predicting falls in community-dwelling older people. *Age and Ageing* 37(4):430–435.

77 Podsiadlo D and Richardson S (1991). The timed "up & go": a test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society* 39:142–148.

78 Shumway-Cook A, Baldwin M, Polissar N and Gruber W (1997). Predicting the probability for falls in community-dwelling older adults. *Physical Therapy* 77:812–819.

79 Csuka M and McCarty D (1985). Simple method for measurement of lower extremity muscle strength. *American Journal of Medicine* 78:77–81.

80 Lord S, Menz H and Tiedemann A (2003). A physiological profile approach to falls risk assessment and prevention. *Physical Therapy* 83:237.

81 Berg K, Wood-Dauphinee S, Williams J and Maki B (1992). Measuring balance in the elderly: validation of an instrument. *Canadian Journal of Public Health* 83:S7–11.

82 Conradsson M, Lundin-Olsson L, Lindelof N, Littbrand H, Malmqvist L, Gustafson Y and Rosendahl E (2007). Berg Balance Scale: intra-rater test-retest reliability among older people dependent in activities of daily living and living in residential care facilities. *Physical Therapy* 87:1155–1163.

83 Tinetti M (1986). Performance-oriented assessment of mobility problems in elderly patients. *Journal of the American Geriatrics Society* 34:119–126.

84 Faber M, Bosscher R and van Wieringen P (2006). Clinimetric properties of the performance-orientated mobility assessment. *Physical Therapy* 86:944–954.

85 Yardley L, Beyer N, Hauer K, Kempen G, Piot-Ziegler C and Todd C (2005). Development and initial validation of the falls efficacy scale-international (FES-i). *Age and Ageing* 34:614–619.

86 Visser H (1983). Gait and balance in senile dementia of Alzheimer's type. *Age and Ageing* 12(4):296–301.

87 Wilson C and Datta S (2001). Tai chi for the prevention of fractures in a nursing home population: an economic analysis. *Journal of Clinical Outcomes Management* 8:19–27.

88 Matthews F and Dening T (2002). Prevalence of dementia in institutional care. *Lancet* 360(9328):225–226.

89 Hendrie H (1998). Epidemiology of dementia and Alzheimer's disease. *American Journal of Geriatric Psychiatry* 62(suppl. 1):s3–18.

90 Inouye S, van Dyck C, Alessi C, Balkin S, Siegal A and Horwitz R (2006). Delirium in older persons. *New England Journal of Medicine* 354(11):1157–1165.

91 Thapa P, Gideon P, Fought R and Ray W (1995). Psychotropic drugs and risk of recurrent falls in ambulatory nursing home residents. *American Journal of Epidemiology* 142(2):202–211.

92 Tinetti M, Speechley M and Ginter S (1988). Risk factors for falls among elderly persons living in the community. *New England Journal of Medicine* 319(26):1701–1707.

93 Passant U, Warkentin S and Gustafson L (1997). Orthostatic hypotension and low blood pressure in organic dementia: a study of prevalence and related clinical characteristics. *International Journal of Geriatric Psychiatry* 12(3):395–403.

94 Mossey J (1985). Social and psychologic factors related to falls among the elderly. *Clinics in Geriatric Medicine* 1(3):541–553.

95 Nakamura T, Meguro K and Sasaki H (1996). Relationship between falls and stride length variability in senile dementia of the Alzheimer type. *Gerontology* 42(2):108–113.

96 Buchner D and Larson E (1987). Falls and fractures in patients with Alzheimer-type dementia. *Journal of the American Medical Association* 257(11):1492–1495.

97 van Doorn C, Gruber-Baldini A, Zimmerman S, Hebel J, Port C, Baumgarten M, Quinn C, Taler G, May C and Magaziner J (2003). Dementia as a risk factor for falls and fall injuries among nursing home residents. *Journal of the American Geriatrics Society* 51(9):1213–1218.

98 Shaw F (2002). Falls in cognitive impairment and dementia. *Clinics in Geriatric Medicine* 18(2):159–173.

99 Shaw F (2007). Prevention of falls in older people with dementia. *Journal of Neural Transmission* 114(10):1259–1264.

100 Toulotte C, Fabre C, Dangremont D, Lensel G and Thévenon A (2003). Effects of physical training on the physical capacity of frail, demented patients with a history of falling: a randomised controlled trial. *Age and Ageing* 32(1):67–73.

101 Weber J, Coverdale J and Kunik M (2004). Delirium: current trends in prevention and treatment. *Internal Medicine Journal* 34(3):115–121.

102 DoHA (Australian Government Department of Health and Ageing) (2007). *Aged Care Funding Instrument (ACFI) — User Guide*, Department of Health and Ageing, Australian Government, Canberra.

103 Folstein M, Folstein S and McHugh P (1975). "Mini-Mental state": a practical method for grading the cognitive status of patients for the clinician. *Journal of Psychiatric Research* 12:189–198.

104 Rowland J, Basic D, Storey J and Conforti D (2006). The Rowland Universal Dementia Assessment Scale (RUDAS) and the Folstein MMSE in a multicultural cohort of elderly persons. *International Psychogeriatrics* 18(1):111–120.

105 Storey J, Rowland J, Basic D, Conforti D and Dickson H (2004). The Rowland Universal Dementia Assessment Scale (RUDAS): a multicultural cognitive assessment scale. *International Psychogeriatrics* 16(1):13–31.

106 Inouye S, van Dyck C, Alessi C, Balkin S, Siegal A and Horwitz R (1990). Clarifying confusion: the confusion assessment method - a new method for detection of delirium. *Annals of Internal Medicine* 113(12):941–948.

107 Wei L, Fearing M, Sternberg E and Inouye S (2008). The confusion assessment method: a systematic review of current usage. *Journal of the American Geriatrics Society* 56(5):823–830.

108 Bouwen A, De Lepeleire J and Buntinx F (2008). Rate of accidental falls in institutionalised older people with and without cognitive impairment halved as a result of a staff-oriented intervention. *Age and Ageing* 37(3):306–310.

109 Cohen-Mansfield J (2001). Nonpharmacologic interventions for inappropriate behaviors in dementia: a review, summary, and critique. *American Journal of Geriatric Psychiatry* 9(4):361–381.

110 Joanna Briggs Institute (2001). Maintaining oral hydration in older people. *Best Practice* 5:1–5.

111 Keller N (2006). Maintaining oral hydration in older adults living in residential aged care facilities. *International Journal of Evidence Based Healthcare* 4:68–73.

112 Healey F, Monro A, Cockram A, Adams V and Heseltine D (2004). Using targeted risk factor reduction to prevent falls in older in-patients: a randomised controlled trial. *Age and Ageing* 33(4):390–395.

113 Lord S, Sherrington C and Menz H (2007). *Falls in Older People: Risk Factors and Strategies for Prevention*, Cambridge University Press, New York.

114 Wagg A, Potter J, Peel P, Irwin P, Lowe D and Pearson M (2008). National audit of continence care for older people: management of urinary incontinence. *Age and Ageing* 37:39–44.

115 Peet S, Castleden C and McGrother C (1995). Prevalence of urinary and faecal incontinence in hospitals and residential and nursing homes for older people. *British Medical Journal* 311(7012):1063–1064.

116 AIHW (Australian Institute of Health and Welfare) (2006). *Australian Incontinence Data Analysis and Development*, Australian Institute of Health and Welfare, Australian Government, Canberra.

117 Thom D, Haan M and Eeden S (1997). Medically recognized urinary incontinence and risks of hospitalisation, nursing home admission and mortality. *Age and Ageing* 26:367–374.

118 Resnick N (1996). Geriatric incontinence. *Urological Clinics of North America* 23(1):55–74.

119 Spice C, Morotti W, George S, Dent T, Rose J, Harris S and Gordon C (2009). The Winchester falls project: a randomised controlled trial of secondary prevention of falls in older people. *Age and Ageing* 38:33–40.

120 Tinetti M and Williams C (1997). Falls, injuries due to falls and risk of admission to a nursing home. *New England Journal of Medicine* 337:1279–1284.

121 Tromp A, Smit J, Deeg D, Bouter L and Lips P (1998). Predictors for falls and fractures in the Longitudinal Aging Study Amsterdam. *Journal of Bone and Mineral Research* 13(12):1932–1939.

122 Teo J, Briffa N, Devine A, Dhaliwal S and Prince R (2006). Do sleep problems or urinary incontinence predict falls in elderly women? *Australian Journal of Physiotherapy* 52(1):19–24.

123 Brown J, Vittinghoff E, Wyman J, Stone K, Nevitt M, Ensrud K and Grady D (2000). Urinary incontinence: does it increase risk for falls and fractures? *Journal of the American Geriatrics Society* 48(7):721–725.

124 Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, van Kerrebroeck P, Victor A and Wein A (2002). The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. *American Journal of Obstetrics and Gynecology* 187(1):116–126.

125 Hampel C, Wienhold D, Benken N, Eggersmann C and Thüroff J (1997). Definition of overactive bladder and epidemiology of urinary incontinence. *Urology* 50(6 suppl. A):4–16.

126 Chiarelli P, Brown W and McElduf P (2000). Constipation in Australian women: prevalence and associated factors. *International Urogynecology Journal* 11:71–78.

127 Lillo A and Rose S (2000). Functional bowel disorders in the geriatric patient: constipation, fecal impaction, and fecal incontinence. *American Journal of Gastroenterology* 95:901–905.

128 Charach G, Greenstein A, Rabinovich P, Groskopf I and Weintraub M (2001). Alleviating constipation in the elderly improves lower urinary tract symptoms. *Gerontology* 47:72–76.

129 Abrams P (2003). Describing bladder storage function: overactive bladder syndrome and detrusor overactivity. *Urology* 62(5 suppl. 2):28–37.

130 Stewart R, Moore M, May F, Marks R and Hale W (1992). Nocturia: a risk factor for falls in the elderly. *Journal of the American Geriatrics Society* 40(12):1217–1220.

131 Chiarelli C, Mackenzie L and Osmotherly P (2009). Association between urinary incontinence and falls: a systematic review. *Australian Journal of Physiotherapy* 55(2):89–95.

132 Perry S, Shaw C, Assassa P, Dallosso H, Williams K, Brittain K, Mensah F, Smith N, Clarke M, Jagger C, Mayne C, Castleden C, Jones J and McGrother C (2000). An epidemiological study to establish the prevalence of urinary symptoms and felt need in the community: the Leicestershire MRC Incontinence Study. *Journal of Public Health Medicine* 22(3):427–434.

133 Coyne K, Revicki D, Hunt T, Corey R, Stewart W, Bentkover J, Kurth H and Abrams P (2002). Psychometric validation of an overactive bladder symptom and health-related quality of life questionnaire: the OAB-q. *Quality of Life Research* 11(6):563–574.

134 Bhargava S, Canda A and Chapple C (2004). A rational approach to benign prostatic hyperplasia evaluation: recent advances. *Current Opinion in Urology* 14(1):1–6.

135 Ashley M, Gryfe C and Amies A (1977). A longitudinal study of falls in an elderly population II. Some circumstances of falling. *Age and Ageing* 6(4):211–220.

136 Pils K, Neumann F, Meisner W, Schano W, Vavrovsky G and Van der Cammen T (2003). Predictors of falls in elderly people during rehabilitation after hip fracture—who is at risk of a second one? *Zeitschrift fur Gerontologie und Geriatrie* 36(1):16–22.

137 Eustice S and Roe B (2000). Prompted voiding for the management of urinary incontinence in adults. *Cochrane Database of Systematic Reviews* (2) Art. No.: CD002113. DOI: 10.1002/14651858.CD002113.

138 Ostaszkiewicz J and Chestney T (2004). Habit retraining for the management of urinary incontinence in adults. *Cochrane Database of Systematic Reviews* (2) Art. No.: CD002801. DOI: 10.1002/14651858.CD002801.pub2.

139 Ostaszkiewicz J and Roe B (2004). Timed voiding for the management of urinary incontinence in adults. *Cochrane Database of Systematic Reviews* (1) Art. No.: CD002802. DOI: 10.1002/14651858.CD002802.pub2.

140 Hay-Smith E and Dumoulin C (2006). Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. *Cochrane Database of Systematic Reviews* (1) Art. No.: CD005654. DOI: 10.1002/14651858.CD005654.

141 Sahlin Y and Berner E (2008). Fecal Incontinence. In: *Evidence Based Physical Therapy For The Pelvic Floor*, Berghmans B, Morkved S and Kampen M (eds), Butterworth Heinemann Elsevier, Edinburgh.

142 Gardner J and Fonda D (1994). Urinary incontinence in the elderly. *Disability and Rehabilitation* 16(3):140–148.

143 Holroyd-Leduc J, Lyder C and Tannenbaum C (2006). Practical management of urinary incontinence in the long-term setting. *Annals of Long-Term Care* 14(2):30–37.

144 Fonda D, DuBeau C, Harari D, Palmer M, Ouslander J and Roe B (2005). Incontinence in the frail elderly. In: *Incontinence*, vol. 2, *Management*, Abrams P, Andersson K and Brubaker L (eds), Proceedings of the Third International Consultation on Incontinence, Monte Carlo, 26–29 June 2004, Health Publications Ltd, Plymouth, UK, 1163–1239.

145 Berg W, Alessio H, Mills E and Tong C (2002). Circumstances and consequences of falls in independent community-dwelling older adults. *Age and Ageing* 26(4):261–268.

146 Sherrington C and Menz H (2003). An evaluation of footwear worn at the time of falls-related hip fracture. *Age and Ageing* 32(3):310–314.

147 Robbins S, Waked E and McClaran J (1995). Proprioception and stability: foot position awareness as a function of age and footwear. *Age and Ageing* 24:67–72.

148 Lord S and Bashford G (1996). Shoe characteristics and balance in older women. *Journal of the American Geriatrics Society* 44(4):429–433.

149 Koepsell T, Wolf M, Buchner D, Kukull W, LaCroix A, Tencer A, Frankenfeld C, Tautvydas M and Larson E (2004). Footwear style and risk of falls in older adults. *Journal of the American Geriatrics Society* 52(9):1495–1501.

150 Kerse N, Butler M, Robinson E and Todd M (2004). Wearing slippers, falls and injury in residential care. *Australian and New Zealand Journal of Public Health* 28(2):180–187.

151 Dunne R, Bergman A, Rogers L, Inglin B and Rivara F (1993). Elderly persons' attitudes towards footwear—a factor in preventing falls. *Public Health Reports* 108(2):245–248.

152 Menant J, Steele J, Menz H, Munro B and Lord S (2008). Optimizing footwear for older people at risk of falls. *Journal of Rehabilitation Research and Development* 45(8):1167–1182.

153 Richardson J, Ashton-Miller J, Lee S and Jacobs K (1996). Moderate peripheral neuropathy impairs weight transfer and unipedal balance in the elderly. *Archives of Physical Medicine and Rehabilitation* 77(11):1152–1156.

154 Butler M, Norton R, Lee-Joe T and Coggan C (1998). Preventing falls and falls-related injuries among older people living in institutions: current practice and future opportunities. *New Zealand Medical Journal* 111(1074):359–361.

155 Meddaugh D, Friedenberg D and Knisley R (1996). Special socks for special people: falls in special care units. *Geriatric Nursing* 17(1):24–26.

156 Dunn J, Link C, Felson D, Crincoli M, Keysor J and McKinlay J (2004). Prevalence of foot and ankle conditions in a multiethnic community sample of older adults. *American Journal of Epidemiology* 159(5):491–498.

157 Benvenutti F, Ferrucci L, Guralnik J, Gangemi S and Baroni A (1995). Foot pain and disability in older persons: an epidemiologic survey. *Journal of the American Geriatrics Society* 43:479–484.

158 Menz H and Morris M (2005). Footwear characteristics and foot problems in older people. *Gerontology* 51(5):346–351.

159 Brodie B, Rees C, Robins D and Wilson A (1988). Wessex Feet: a regional foot health survey, volume I: the survey. *The Chiropodist* 43:152–165.

160 Gorter K, Kuyvenhoven M and deMelker R (2000). Nontraumatic foot complaints in older people. a population-based survey of risk factors, mobility, and well-being. *Journal of the American Podiatric Medical Association* 90:397–402.

161 Menz H and Lord S (2001). Foot pain impairs balance and functional ability in community-dwelling older people. *Journal of the American Podiatric Medical Association* 91:222–229.

162 Menz H, Morris M and Lord S (2005). Foot and ankle characteristics associated with impaired balance and functional ability in older people. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 60(12):1546–1552.

163 Menz H, Morris M and Lord S (2006). Foot and ankle risk factors for falls in older people: a prospective study. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 61(8):866–870.

164 Menz H and Lord S (2001). The contribution of foot problems to mobility impairment and falls in older people. *Journal of the American Geriatrics Society* 49:1651–1656.

165 Lord S, Ward J, Williams P and Anstey K (1994). Physiological factors associated with falls in older community-dwelling women. *Journal of the American Geriatrics Society* 42:1110–1117.

166 Koski K, Luukinen H, Laippala P and Kivelä S (1998). Risk factors for major injurious falls among the home-dwelling elderly by functional abilities. *Gerontology* 44:232–238.

167 Lord SL, Lloyd DG and Li S (1996). Sensori-motor function, gait patterns and falls in community-dwelling women. *Age and Ageing* 25(4):292–299.

168 Wallace C, Reiber G, LeMaster J, Smith D, Sullivan K, Hayes S and Vath C (2002). Incidence of falls, risk factors for falls, and falls-related fractures in individuals with diabetes and a prior foot ulcer. *Diabetes Care* 25(11):1983–1986.

169 Richardson J and Hurvitz E (1995). Peripheral neuropathy: a true risk factor for falls. *Journal of Gerontology* 50(4):M211–215.

170 Menz H and Hill K (2007). Podiatric involvement in multidisciplinary fall-prevention clinics in Australia. *Journal of the American Podiatric Medical Association* 97(5):377–384.

171 Munro B and Steele J (1998). Foot-care awareness - a survey of persons aged 65 years and older. *Journal of the American Podiatric Medical Association* 88(5):242–248.

172 Balanowski K and Flynn L (2005). Effect of painful keratoses debridement on foot pain, balance and function in older adults. *Gait & Posture* 22(4):302–307.

173 Menz H and Sherrington C (2000). The footwear assessment form: a reliable clinical tool to assess footwear characteristics of relevance to postural stability in older adults. *Clinical Rehabilitation* 14(6):657.

174 Richardson J and Ashton-Miller J (1996). Peripheral neuropathy: an often-overlooked cause of falls in the elderly. *Postgraduate Medicine* 99:161–172.

175 Menz H (2008). *Foot Problems in Older People: Assessment and Management*, Churchill Livingstone, New York.

176 Menz H (2009). Assessment of the older person. In: *Merriman's Assessment of the Lower Limb*, Yates B (ed), Churchill Livingstone, London.

177 Kenny R, Richardson D, Steen N, Bexton R, Shanahan M, Shaw F and Bond J (2001). Carotid sinus syndrome: a modifiable risk factor for non-accidental falls in older adults. *Journal of the American Medical Directors Association* 38:1491–1496.

178 Tan M and Parry S (2008). Vasovagal syncope in the older patient. *Journal of the American College of Cardiology* 51(6):599–606.

179 Brignole M, Alboni P, Benditt D, Bergfeldt L, Blanc J and Thomsen P (2004). Guidelines on management (diagnosis and treatment) of syncope (Update 2004). *European Heart Journal* 25(22):2054–2072.

180 Lord S and Dayhew J (2001). Visual risk factors for falls in older people. *Journal of the American Geriatrics Society* 49(5):508.

181 Chen-Scarabelli C and Scarabelli T (2004). Neurocardiogenic syncope. *British Medical Journal* 329(7461):336–341.

182 Davies AJ, Steen N and Kenny RA (2001). Carotid sinus hypersensitivity is common in older patients presenting to an accident and emergency department with unexplained falls. *Age and Ageing* 30(4):289–293.

183 Kenny RA (2002). Neurally mediated syncope. *Clinical Geriatric Medicine* 18(2):191–210, vi.

184 Richardson DA, Bexton RS, Shaw FE and Kenny RA (1997). Prevalence of cardioinhibitory carotid sinus hypersensitivity in patients 50 years or over presenting to the accident and emergency department with "unexplained" or "recurrent" falls. *Pacing and Clinical Electrophysiology* 20(3 pt. 2):820–823.

185 Haines T, Bennell K, Osborne R and Hill K (2004). Effectiveness of targeted falls prevention programme in subacute hospital setting: randomised controlled trial. *British Medical Journal* 328(7441):676–679.

186 Close J, Ellis M, Hooper R, Glucksman E, Jackson S and Swift C (1999). Prevention of falls in the elderly trial (PROFET): a randomised controlled trial. *Lancet* 353(9147):93–97.

187 Tinetti M, Baker D, McAvay G, Claus E, Garrett P, Gottschalk M, Koch M, Trainor K and Horwitz R (1994). A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *New England Journal of Medicine* 331(13):821–827.

188 Davison J, Bond J, Dawson P, Steen I and Kenny R (2005). Patients with recurrent falls attending Accident & Emergency benefit from multifactorial intervention — a randomised controlled trial. *Age and Ageing* 34(2):162–168.

189 Gupta V and Lipsitz L (2007). Orthostatic hypotension in the elderly: diagnosis and treatment. *American Journal of Medicine* 120(10):841–847.

190 Maule S, Papotti G, Naso D, Magnino C, Testa E and Veglio F (2007). Orthostatic hypotension: evaluation and treatment. *Cardiovascular and Hematolological Disorders Drug Targets* 7(1):63–70.

191 Waterston J (2000). Dizziness. *Medical Journal of Australia* 172:506–511.

192 Woodworth B, Gillespie M, Boyd M and Lambert P (2004). The canalith repositioning procedure for benign positional vertigo: a meta-analysis. *Laryngoscope* 114(7):1143–1146.

193 Hillier S and Hollahan V (2007). Vestibular rehabilitation for unilateral peripheral vestibular dysfunction. *Cochrane Database of Systematic Reviews* (4) Art. No.: CD005397. DOI: 10.1002/14651858.CD005397.pub2.

194 Hall C, Schubert M and Herdman S (2004). Prediction of falls risk reduction as measured by dynamic gait index in individuals with unilateral vestibular hypofunction. *Otology Neurotology* 25:746–751.

195 Sloane P, Coeytaux R, Beck R and Dallara J (2001). Dizziness: state of the science. *Annals of Internal Medicine* 134(9):823–832.

196 Colledge N, Barr Hamilton R, Lewis S, Sellar R and Wilson J (1996). Evaluation of investigations to diagnose the cause of dizziness in elderly people: a community-based controlled study. *British Medical Journal* 373:788–792.

197 Baloh R, Jacobson K and Socotch T (1993). The effect of ageing on visual-vestibulo-ocular responses. *Experimental Brain Research* 95:509–516.

198 Kristinsdottir E, Nordell E, Jarnlo G, Tjader R, Thorngren K and Magnusson M (2001). Observation of vestibular asymmetry in a majority of patients over 50 years with fall related wrist fractures. *Acta Otolaryngology* 121:481–485.

199 Sloane P, Blazer D and George L (1989). Dizziness in a community elderly population. *Journal of American Geriatrics Society* 37:101–108.

200 Oghalai J, Manolidis S, Barth J, Stewart M and Jenkins H (2000). Unrecognised benign paroxysmal positional vertigo in elderly patients. *Otolaryngology Head and Neck Surgery* 122(5):630–634.

201 Hamalgyi M and Curthoys I (1988). A sign of canal paresis. *Archives of Neurology* 45:737–739.

202 Maarsingh O, Dros J, van Weert H, Schellevis F, Bindels P and van der Horst H (2009). Development of a diagnostic protocol for dizziness in elderly patients in general practice: a Delphi procedure. *BMC Family Practice* 10:1–33.

203 Furman J (1995). The role of posturography in the management of vestibular patients. *Otolaryngology Head and Neck Surgery* 112:8–15.

204 Fife T, Tusa R, Furman J, Zee D, Frohman E, Baloh R, Hain T, Goebel J, Demer J and Eviatar L (2000). Assessment: vestibular testing techniques in adults and children: report of the Neurology Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. *Neurology* 55:1431–1441.

205 Strupp M, Zingler V, Arbusow V, Niklas D, Maag K, Dieterich M, Bense S, Theil D, Jahn K and Brandt T (2004). Methylprednisolone, valacyclovir, or the combination for vestibular neuritis. *New England Journal of Medicine* 351:354–361.

206 Lalwani A (2004). The aging inner ear. In: *Current Diagnosis and Treatment in Otolaryngology – Head and Neck Surgery*, McGraw Hill Professional.

207 Brandt T and Daroff R (1980). Physical therapy for benign paroxysmal positional vertigo. *Archives of Otolaryngology* 106:484–485.

208 Epley J (1992). The canalith repositioning procedure: for treatment of benign paroxysmal positional vertigo. *Otolaryngology Head and Neck Surgery* 107(3):399–404.

209 Lea P, Kushnir M, Shpirer Y, Zomer Y and Flechter S (2005). Approach to benign paroxysmal positional vertigo in old age. *Israeli Medical Association Journal* 7:447–450.

210 Whitney S and Rossi M (2000). Efficacy of vestibular rehabilitation. *Otolaryngology Clinics of North America* 33:659–673.

211 Cohen H (1992). Vestibular rehabilitation reduces functional disability. *Otolaryngology Head and Neck Surgery* 107:638–643.

212 Swan L (2003). Facilitating psychological intervention for a patient with unilateral vestibular hypofunction. *Neurology Report* 27:54–60.

213 Bamiou D, Davies R, McKee M and Luxon L (2000). Symptoms, disability and handicap in unilateral peripheral vestibular disorders. *Scandinavian Audiology* 29:238–244.

214 Whitney S, Wrisley D, Marchetti G and Furman J (2002). The effect of age on vestibular rehabilitation outcomes. *Laryngoscope* 112:1785–1790.

215 Black F, Angel C, Pesznecker S and Gianna C (2000). Outcome analysis of individualized vestibular rehabilitation protocols. *American Journal of Otology* 21:543–551.

216 Szturm T, Ireland D and Lessing-Turner M (1994). Comparison of different exercise programs in the rehabilitation of patients with chronic peripheral vestibular dysfunction. *Journal of Vestibular Research* 4(6):461–479.

217 Macias J, Massingdale S and Gerkin R (2005). Efficacy of vestibular rehabilitation therapy in reducing falls. *Otolaryngology Head and Neck Surgery* 133:323–325.

218 Hansson E, Mansson N, Ringsberg K and Hakansson A (2008). Falls among dizzy patients in primary healthcare: an intervention study with control group. *International Journal of Rehabilitation Research* 31:51–57.

219 Whitney S (2000). Management of the elderly person with vestibular dysfunction. In: *Vestibular Rehabilitation*, Herdman S (ed), FA Davis Company, Philadelphia, 510–533.

220 Cumming R, Miller J, Kelsey J, Davis P, Arfken C, Birge S and Peck W (1991). Medications and multiple falls in elderly people: the St Louis OASIS study. *Age and Ageing* 20(6):455–461.

221 van der Velde N, Stricker B, Pols H and van der Cammen T (2006). Risk of falls after withdrawal of falls-risk-increasing drugs: a prospective cohort study. *British Journal of Clinical Pharmacology* 63(2):232–237.

222 Yip Y and Cumming R (1994). The association between medications and falls in Australian nursing-home residents. *Medical Journal of Australia* 160(1):14–18.

223 Snowdon J, Day S and Baker W (2006). Current use of psychotropic medication in nursing homes. *International Psychogeriatrics* 18(2):241–250.

224 Hartikainen S, Lönnroos E and Louhivuori K (2007). Medication as a risk factor for falls: critical systematic review. *Journal of Gerontology* 62A(10):1172–1181.

225 Beard J, Rowell D, Scott D, van Beurden E, Barnett L, Hughes K and Newman B (2006). Economic analysis of a community-based falls prevention program. *Public Health* 120(8):742–751.

226 Leipzig R, Cumming R and Tinetti M (1999). Drugs and falls in older people: a systematic review and meta-analysis II. Cardiac and analgesic drugs. *Journal of the American Geriatrics Society* 47(1):40–50.

227 APAC (Australian Pharmaceutical Advisory Council) (1998). *National Guidelines to Achieve the Continuum of Quality Use of Medicines Between Hospital and Community*, Department of Health and Ageing, Australian Government, Canberra.

228 Crotty M, Rowett D, Spurling L, Giles L and Phillips P (2004). Does the addition of a pharmacist transition coordinator improve evidence based medication management and health outcomes in older adults moving from the hospital to a long-term care facility? Results of a randomized, controlled trial. *American Journal Geriatric Pharmacotherapy* 2(4):257–264.

229 Campbell A, Robertson M, Gardner M, Norton R and Buchner D (1999). Psychotropic medication withdrawal and a home based exercise programme to prevent falls: results of a randomised controlled trial. *Journal of the American Geriatrics Society* 47:850–853.

230 APAC (Australian Pharmaceutical Advisory Council) (2002). *Guidelines for Medication Management in Residential Aged Care Facilities*, Department of Health and Ageing, Australian Government, Canberra.

231 Conforti D (2004). *The Assessment, Management and Prevention of Falls in the Elderly in the South Western Sydney Area Health Service*, South West Sydney Area Health Service, Liverpool, New South Wales.

232 Queensland Health (2003). *Falls Prevention. Best Practice Guidelines for Public Hospitals and State Government Residential Aged Care Facilities Incorporating a Community Integration Supplement*, Queensland Health, Brisbane.

233 Gilbert A, Owen N, Innes J and Sansom L (1993). Trial of an intervention to reduce chronic benzodiazepine use among residents of aged-care accommodation. *Australian and New Zealand Journal of Medicine* 23(4):343–347.

234 Wagner A, Zhang F, Soumerai S, Walker A, Gurwitz J, Glynn R and Ross-Degnan D (2004). Benzodiazepine use and hip fractures in the elderly: who is at greatest risk? *Archives of Internal Medicine* 164:1567–1572.

235 Neyens J, Dijcks B, Twisk J, Schols J, van Haastregt J, van den Heuvel W and de Witte L (2009). A multifactorial intervention for the prevention of falls in psychogeriatric nursing home patients, a randomised controlled trial (RCT). *Age and Ageing* 38(2):194–199.

236 Haumschild M, Karfonta T, Haumschild M and Phillips S (2003). Clinical and economic outcomes of a fall-focused pharmaceutical intervention program. *American Journal of Health-System Pharmacy* 60(10):1029–1032.

237 Foss A, Harwood R, Osborn F, Gregson R, Zaman A and Masud T (2006). Falls and health status in elderly women following second eye cataract surgery: a randomised controlled trial. *Age and Ageing* 35(1):66–71.

238 Harwood R, Foss A, Osborn F, Gregson R, Zaman A and Masud T (2005). Falls and health status in elderly women following first eye cataract surgery: a randomised controlled trial. *British Journal of Ophthalmology* 89(1):53–59.

239 Campbell A, Robertson M, La Grow S, Kerse N, Sanderson G, Jacobs R, Sharp D and Hale L (2005). Randomised controlled trial of prevention of falls in people aged ≥75 with severe visual impairment: the VIP trial. *British Medical Journal* 331(7520):817–820.

240 Cumming R, Ivers R, Clemson L, Cullen J, Hayes M, Tanzer M and Mitchell P (2007). Improving vision to prevent falls in frail older people: a randomized trial. *Journal of the American Geriatrics Society* 55(2):175–181.

241 Lord S, Dayhew J and Howland A (2002). Multifocal glasses impair edge-contrast sensitivity and depth perception and increase the risk of falls in older people. *Journal of the American Geriatrics Society* 50(11):1760.

242 Friedman D, West S, Munoz B, Park W, Deremeik J, Massof R, Frick K, Broman A, McGill W, Gilbert D and German P (2004). Racial variations in causes of vision loss in nursing homes: the Salisbury Eye Evaluation in Nursing Home Groups (SEEING) study. *Archives of Ophthalmology* 122(7):1019–1024.

243 West S, Friedman D, Muñoz B, Roche K, Park W, Deremeik J, Massof R, Frick K, Broman A, McGill W, Gilbert D and German P (2003). A randomized trial of visual impairment interventions for nursing home residents: study design, baseline characteristics and visual loss. *Ophthalmic Epidemiology* 10(3):193–209.

244 Mitchell P, Hayes P and Wang J (1997). Visual impairment in nursing home residents: the Blue Mountains Eye Study. *Medical Journal of Australia* 166(2):73–76.

245 Jantti P, Pyykko V and Hervonen A (1993). Falls among elderly nursing home residents. *Public Health* 107(2):89–96.

246 Luukinen H, Koski K, Laippala P and Kivela S (1995). Risk factors for recurrent falls in the elderly in long-term institutional care. *Public Health* 109(1):57–65.

247 Klein B, Klein R, Lee K and Cruickshanks K (1998). Performance-based and self-assessed measures of visual function as related to history of falls, hip fractures, and measured gait time. The Beaver Dam Eye Study. *Ophthalmology* 105(1):160–164.

248 Dargent-Molina P, Favier F, Grandjean H, Baudoin C, Schott A, Hausherr E, Meunier P and Bréart G (1996). Falls-related factors and risk of hip fracture: the EPIDOS prospective study. *Lancet* 348(9021):145–149.

249 de Boer M, Pluijm S, Lips P, Moll A, Volker-Dieben H, Deeg D and Van Rens G (2004). Different aspects of visual impairment as risk factors for falls and fractures in older men and women. *Journal of Bone and Mineral Research* 19:1539–1547.

250 Lord S, Clark R and Webster I (1991). Visual acuity and contrast sensitivity in relation to falls in an elderly population. *Age and Ageing* 20(3):175–181.

251 Nevitt M, Cummings S, Kidd S and Black D (1989). Risk factors for recurrent non-syncopal falls: a prospective study. *Journal of the American Medical Association* 261:2663–2668.

252 Coleman A, Cummings S and Yu F (2007). Binocular visual-field loss increases the risk of future falls in older white women. *Journal of the American Geriatrics Society* 55:357–364.

253 Freeman E, Muñoz B, Rubin G and West S (2007). Visual field loss increases the risk of falls in older adults: the Salisbury Eye Evaluation. *Investigative Ophthalmology and Visual Science* 48(10):4445–4450.

254 Klein B, Moss S, Klein R, Lee K and Cruickshanks K (2003). Associations of visual function with physical outcomes and limitations 5 years later in an older population: the Beaver Dam Eye Study. *Ophthalmology* 110(4):644.

255 Ramrattan R, Wolfs R and Panda-Jonas S (2001). Prevalence and causes of visual field loss in the elderly and associations with impairment in daily functioning: the Rotterdam Study. *Archives of Ophthalmology* 119:1788–1794.

256 Rubenstein L, Josephson K and Robbins A (1994). Falls in the nursing home. *Annals of Internal Medicine* 121(6):442–451.

257 Schwartz S and Segal O (2005). The effect of cataract surgery on postural control. *Investigative Ophthalmology and Visual Science* 46(3):920–924.

258 Ivers R, Optom B, Cumming R, Mitchell P, Simpson J and Peduto A (2003). Visual risk factors for hip fracture in older people. *Journal of the American Geriatrics Society* 51:356–363.

259 Black A and Wood J (2008). Visual impairment and postural sway among older adults with glaucoma. *Ophthalmology and Visual Science* 85(6):489–497.

260 Dolinis J, Harrison J and Andrews G (1997). Factors associated with falling in older Adelaide residents. *Australian and New Zealand Journal of Public Health* 21:462–468.

261 Wood J, Lacherez P, Black A, Cole M, Boon M and Kerr G (2009). Postural stability and gait among older adults with age-related maculopathy. *Investigative Ophthalmology and Visual Science* 50(1):482–487.

262 Szabo S, Janssen P, Khan K, Potter M and Lord S (2008). Older women with age-related macular degeneration have an increased risk of falls: a Physiological Profile Assessment (PPA) study. *Journal of the American Geriatrics Society* 56(5):800–807.

263 Eperjesi F, Wolffsohn J, Bowden J, Napper G and Rubinstein M (2004). Normative contrast sensitivity values for the backlit Melbourne Edge Test and the effect of visual impairment. *Ophthalmic and Physiological Optics* 24:600–606.

264 Anderson A, Shuey N and Wall M (2009). Rapid confrontation screening for peripheral visual field defects and extinction. *Clinical and Experimental Optometry* 92(1):45–48.

265 La Grow S, Robertson M, Campbell A, Clarke G and Kerse N (2006). Reducing hazard related falls in people 75 years and older with significant visual impairment: how did a successful program work? *Injury Prevention* 12(5):296–301.

266 Wildsoet C, Wood J and Hassan S (1998). Development and validation of a visual acuity chart for Australian Aborigines and Torres Strait Islanders. *Optometry and Vision Science* 75:806–812.

267 Rapp K, Lamb S, Buchele G, Lall R, Lindemann U and Becker C (2008). Prevention of falls in nursing homes: subgroup analyses of a randomized fall prevention trial. *Journal of the American Geriatrics Society* 56:1092–1097.

268 Pedretti L and Zolan B (1996). *Occupational Therapy Practice Skills for Physical Dysfunction*, Mosby, Missouri.

269 Trombly C and Radomski M (2001). *Occupational Therapy for Physical Dysfunction*, Lippincott, Williams and Wilkins, Maryland.

270 Jensen J, Nyberg L, Rosendahl E, Gustafson Y and Lundin-Olsson L (2004). Effects of a fall prevention program including exercise on mobility and falls in frail older people living in residential care facilities. *Aging - Clinical and Experimental Research* 16(4):283–292.

271 Simpson A, Lamb S, Roberts P, Gardner T and Evans J (2004). Does the type of flooring affect the risk of hip fracture? *Age and Ageing* 33:242–246.

272 New South Wales Health (2003). *NSW Health Management Policy to Reduce Fall Injury Among Older People*, New South Wales Health, Sydney.

273 Aronow W and Ahn C (1997). Association of postprandial hypotension with incidence of falls, syncope, coronary events, stroke and total mortality at 29 month follow-up in 499 older nursing home residents. *Journal of the American Geriatrics Society* 45:1051–1053.

274 Tideiksaar R (2002). *Falls in Older People*, Health Professions Press Incorporated, Baltimore.

275 NCPS (National Center for Patient Safety) (2004). *National Center for Patient Safety Falls Toolkit*, US Department of Veteran Affairs.
http://www.va.gov/ncps/SafetyTopics/fallstoolkit/index.html

276 Ozanne-Smith J, Guy J, Kelly M and Clapperton A (2008). The relationship between slips, trips and falls and the design and construction of buildings. Report for Australian Building Codes Board by Monash University Accident Research Centre, Report #281, Melbourne.
http://www.monash.edu.au/muarc/reports/muarc281.pdf

277 Hadjuk D and Shellenbarger T (2004). When dementia complicates care. *RN Web* 67:50–55.
http://www.rnweb.com/rnweb/article/articleDetail.jsp?id=112801

278 Alzheimer's Australia (2004). *Dementia Care and the Built Environment: Position Paper 3*, Australian Government, Canberra.

279 Thapa P, Brockman K, Gideon P, Fought R and Ray W (1996). Injurious falls in non-ambulatory nursing home residents: a comparative study of circumstances, incidence, and risk factors. *Journal of the American Geriatrics Society* 44:273–278.

280 CERA (Centre for Education and Research on Ageing) (1998). *Putting Your Best Foot Forward. Preventing and Managing Falls in Aged Care Facilities*, Australian Government, Canberra.

281 Donoghue J, Graham J, Mitten-Lewis S, Murphy M and Gibbs J (2005). A volunteer companion-observer intervention reduces falls on an acute aged care ward. *International Journal of Health Care Quality Assurance Incorporating Leadership in Health Services* 18(1):24–31.

282 Giles L, Bolch D, Rouvray R, McErlean B, Whitehead C, Phillips P and Crotty M (2006). Can volunteer companions prevent falls among inpatients? A feasibility study using a pre-post comparative design. *BMC Geriatrics* 6:11.

283 Bradley C and Pointer S (2009). *Hospitalisations Due to Falls by Older People, 2005–06*, Australian Institute of Health and Welfare, Canberra.

284 Szumlas S, Groszek J, Kitt S, Payson C and Stack K (2004). Take a second glance: a novel approach to inpatient fall prevention. *Joint Commission Journal on Quality and Safety* 30(6):295–302.

285 Kelly K, Phillips C, Cain K, Polissar N and Kelly P (2002). Evaluation of a nonintrusive monitor to reduce falls in nursing home patients. *Journal of the American Medical Directors' Association* 3(6):377–382.

286 Boswell D, Ramsay J, Smith M and Wagers B (2001). The cost effectiveness of a patient-sitter programme in an acute care hospital: a test of the impact of sitters on the incidence of falls and patient satisfaction. *Quality Management in Health Care* 10(1):10–16.

287 Fleming J and Brayne C (2008). Inability to get up after falling, subsequent time on floor, and summoning help: prospective cohort study in people over 90. *British Medical Journal* 337:A2227.

288 Tideiksaar R and Feiner C (1993). Falls prevention: the efficacy of a bed alarm system in an acute care setting. *The Mount Sinai Journal of Medicine* 60(6):522–527.

289 Queensland Health (2003). *Restraint and Protective Assistance Guidelines*, Queensland Health, Brisbane.

290 ECRI (Emergency Care Research Institute) (2004). Bed exit alarms. A component (but only a component) of fall prevention. *Health Devices* 33(5):157–168.

291 Evans D, Wood J and Lambert L (2003). Patient injury and physical restraint devices: a systematic review. *Journal of Advanced Nursing* 41(3):274–282.

292 Evans D, Wood J, Lambert L and Fitzgerald M (2002). *Physical Restraint in Acute and Residential Care. A Systematic Review*, The Joanna Briggs Institute, Adelaide, South Australia.

293 Frengley J and Mion L (1998). Physical restraints in the acute care setting: issues and future direction. *Clinics in Geriatric Medicine* 14(4):727–743.

294 Cassel C, Leipzig R, Cohan H, Larson E and Meier D (2003). *Geriatric Medicine: An Evidence Based Approach*, Springer-Verlag, New York.

295 Oliver D (2002). Bed falls and bed rails—what should we do? *Age and Ageing* 31:415–418.

296 Hamers J, Gulpers M and Strik W (2004). Use of physical restraints with cognitively impaired nursing home residents. *Journal of Advanced Nursing* 45(3):246–251.

297 Shojania K, Duncan B and McDonald J (2001). *Making Health Care Safer: A Critical Analysis of Patient Safety Practices*, Agency for Healthcare Research and Quality, Rockville, Maryland.

298 Nurminen J, Puustinen J, Kukola M and Kivela S (2009). The use of chemical restraints for older long-term hospital patients: a case report from Finland. *Journal of Elderly Abuse and Neglect* 21(2):89–104.

299 ASGM (Australian Society for Geriatric Medicine) (2005). *Australian Society for Geriatric Medicine Position Statement 2: Physical Restraint Use in Older People*. http://www.anzsgm.org/documents/POSITIONSTATEMENTNO2.PhysicialRestraint-Revision.pdf (Accessed May 2009).

300 Clinical Epidemiology and Health Service Evaluation Unit, Melbourne Health and Delirium Clinical Guidelines Expert Working Group (2006). *Clinical Practice Guidelines for the Management of Delirium in Older People*, Victorian Government Department of Human Services, Melbourne.

301 Park M, Hsiao-Chen Tang J and Ledford L (2005). *Changing the Practice of Physical Restraint Use in Acute Care*, University of Iowa Gerontological Nursing Interventions Research Center, Research Translation and Dissemination Core, Iowa City.

302 Parker M, Gillespie W and Gillespie L (2005). Hip protectors for preventing hip fractures in older people. *Cochrane Database of Systematic Reviews* (3) Art. No.: CD001255. DOI: 10.1002/14651858.CD001255.pub3.

303 Meyer G, Warnke A, Bender R and Muhlhauser I (2003). Effect on hip fractures of increased use of hip protectors in nursing homes: cluster randomised controlled trial. *British Medical Journal* 326(7380):76.

304 Chen J, Simpson J, March L, Cameron I, Cumming R, Lord S, Seibel M and Sambrook P (2008). Risk factors for fracture following a fall among older people in residential care facilities in Australia. *Journal of the American Geriatrics Society* 56(11):2020–2026.

305 Greenspan S, Myers E, Kiel D, Parker R, Hayes W and Resnick N (1998). Fall direction, bone mineral density, and function: risk factors for hip fracture in frail nursing home elderly. *American Journal of Medicine* 104(6):539–545.

306 Kurrle S, Cameron I and Ouine S (2004). Predictors of adherence with the recommended use of hip protectors. *Journal of Gerontology* 59(9):958–961.

307 Kannus P, Parkkari J, Niemi S, Pasanen M, Palvanen M, Jarvinen M and Vuori I (2000). Prevention of hip fracture in elderly people with use of a hip protector. *New England Journal of Medicine* 343(21):1506–1513.

308 Norton R, Campbell A, Lee-Joe T, Robinson E and Butler M (1997). Circumstances of falls resulting in hip fractures among older people. *Journal of the American Geriatrics Society* 45(9):1108–1112.

309 Kannus P, Parkkari J and Poutala J (1999). Comparison of force attenuation properties of four different hip protectors under simulated falling conditions in the elderly: an in vitro biomechanical study. *Bone* 25:229–235.

310 Cameron I (2004). Hip protectors: how the evidence says they should be used. Australian Falls Prevention Inaugural Conference, Manly, NSW.

311 Cameron I, Cumming R, Kurrle S, Quine S, Lockwood K, Salkeld G and Finnegan T (2003). A randomised trial of hip protector use by frail older women living in their own homes. *Injury Prevention* 9(2):138–141.

312 Cryer C, Knox A, Martin D and Barlow J (2002). Hip protector compliance among older people living in residential care homes. *Injury Prevention* 8:202–206.

313 Cameron I, Kurrle S, Quine S, Lockwood K and Cumming R (2002). Hip protectors: promising but no panacea. *Australasian Journal on Ageing* 12:4–8.

314 Campbell A (2001). Purity, pragmatism and hip protector pads. *Age and Ageing* 30:431–432.

315 Hubacher M and Wettstein A (2001). Acceptance of hip protectors for hip fracture prevention in nursing homes. *Osteoporosis International* 12:794–799.

316 Lauritzen J, Petersen M and Lund B (1993). Effect of external hip protectors on hip fractures. *Lancet* 341:11–13.

317 Meyer G, Wegscheider K, Kersten J, Icks A and Muhlhauser I (2005). Increased use of hip protectors in nursing homes: economic analysis of a cluster randomized, controlled trial. *Journal of the American Geriatrics Society* 53(12):2153–2158.

318 Parker M, Gillespie L and Gillespie W (2004). *Hip Protectors for Preventing Hip Fractures in the Elderly*, John Wiley and Sons, Chichester, UK.

319 van Schoor N, Deville W, Bouter L and Lips P (2002). Acceptance and compliance with external hip protectors: a systematic review of the literature. *Osteoporosis International* 13(12):917–924.

320 Kurrle S, Cameron I, Quine S and Cumming R (2004). Adherence with hip protectors: a proposal for standardised definitions. *Osteoporosis International* 15(1):1–4.

321 van Dijk P, Meulenberg O, van de Sande H and Habbema J (1993). Falls in dementia patients. *Gerontologist* 33(2):200–204.

322 Singh S, Sun H and Anis A (2004). Cost effectiveness of hip protectors in the prevention of osteoporosis related hip fractures in elderly nursing home residents. *Journal of Rheumatology* 31(8):1607–1613.

323 Waldegger L, Cranney A, Man-Son-Hing M and Coyle D (2003). Cost effectiveness of hip protectors in institutional dwelling elderly. *Osteoporosis International* 14(3):243–250.

324 Colon-Emeric C, Datta S and Matchar D (2003). An economic analysis of external hip protector use in ambulatory nursing facility residents. *Age and Ageing* 32(1):47–52.

325 Kumar B and Parker M (2000). Are hip protectors cost effective? *Injury* 31(9):693–695.

326 Honkanen L, Schackman B, Mushlin A and Lachs M (2005). A cost-benefit analysis of external hip protectors in the nursing home setting. *Journal of the American Medical Geriatrics Society* 53(2):190–197.

327 Sawka A, Gafni A, Boulos P, Beattie K, Papaioannou A, Cranney A, Hanley D, Adachi J, Cheung A, Papadimitropoulos E and Thabane L (2007). Could a policy of provision of hip protectors to elderly nursing home residents result in cost savings in acute hip fracture care? The case of Ontario, Canada. *Osteoporosis International* 18(6):819–827.

328 Nowson C, Diamond T, Pasco J, Mason R, Sambrook P and Eisman J (2004). Vitamin D in Australia. Issues and recommendations. *Australian Family Physician* 33(3):133–138.

329 Bischoff-Ferrari H, Dawson-Hughes B, Willett W, Staehelin H, Bazemore M and Zee R (2004). Effect of vitamin D on falls: a meta-analysis. *Journal of the American Medical Association* 291(16):1999–2006.

330 Boland R (1986). Role of vitamin D in skeletal muscle function. *Endocrine Reviews* 7(4):434–448.

331 Binkley N (2007). Does low vitamin D status contribute to "age-related" morbidity? *Journal of Bone and Mineral Research* 22 (suppl. 2):V55–58.

332 Dukas L, Bischoff H, Lindpaintner L, Schacht E, Birkner-Binder D and Damm T (2004). Alfacalcidol reduces the number of fallers in a community dwelling elderly population with a minimum calcium intake of more than 500 mg daily. *Journal of the American Geriatrics Society* 52(2):230–236.

333 Sambrook PC, Chen JS, March L, Cameron I, Cumming R and Lord S (2004). Serum parathyroid hormone predicts time to fall independent of vitamin D status in a frail elderly population. *Journal of Clinical Endocrinology and Metabolism* 89(4):1572–1576.

334 Zeimer H, Hunter P and Agius S (2000). Association between vitamin D deficiency and dementia, residential care and non English speaking background. Australian Society for Geriatric Medicine Conference, Cairns, QLD.

335 Gillespie W, Avenall A, Henry D, O'Connell D and Robertson J (2004). Vitamin D and vitamin D analogues for preventing fractures associated with involutional and post menopausal osteoporosis. *Cochrane Database of Systematic Reviews* (3) Art. No.: CD000227. DOI: 10.1002/14651858.CD000227.pub2.

336 Heike A, Bischoff-Ferrari P, Willett W, Wong J, Stuck A, Staehelin H, Orav J, Thoma A, Kiel D and Henschkowski J (2009). Prevention of nonvertebral fractures with oral vitamin D and dose dependency: a meta-analysis of randomized controlled trials. *Archives of Internal Medicine* 169(6):551–561.

337 NHMRC (National Health and Medical Research Council) (1991). *Recommended Dietary Intakes for Use in Australia*, NHMRC, Canberra.

338 HHS (US Department of Health and Human Services) (1994). *Consensus Development Conference Statement. Optimal Calcium Intake*, National Institute of Health 12:1–31.

339 Bollard M, Barber P, Doughty R, Mason B, Horne A, Ames R, Gamble E, Grey A and Reid I (2008). Vascular events in healthy older women receiving calcium supplementation: a randomised controlled trial. *BMJ Online* doi 10.1136/bmj.39440.525752.BE.

340 Reid I and Bollard M (2008). Calcium supplementation and vascular disease. *Climacteric* 11(4):280–286.

341 Harwood R, Sahota O, Gaynor K, Masud T and Hosking D (2004). A randomised, controlled comparison of different calcium and vitamin D supplementation regimens in elderly women after hip fracture: the Nottingham neck of femur (NONOF) study. *Age and Ageing* 33(1):45–51.

342 Sherwin A, Nowson C, McPhee J, Alexander J, Wark J and Flicker L (1998). Nutrient intake at meals in residential care facilities for the aged: validated visual assessment of plate waste. *Australian Journal of Nutrition and Dietetics* 55:188–193.

343 Pasco J, Henry M, Kotowicz M, Sanders K, Seeman E and Pasco J (2004). Seasonal periodicity of serum vitamin D and parathyroid hormone, bone resorption, and fractures: the Geelong osteoporosis study. *Journal of Bone and Mineral Research* 19(5):752–758.

344 Holick M (2003). Vitamin D: a millennium perspective. *Journal of Cellular Biochemistry* 88(2):296–307.

345 Working Group of the Australian and New Zealand Bone and Mineral Society, Endocrine Society of Australia and Osteoporosis Australia (2005). Vitamin D and adult bone health in Australia and New Zealand: a position statement. *Medical Journal of Australia* 182(6):281–285.

346 Lips P, Graafmans W, Ooms M, Bezemer P and Bouter L (1996). Vitamin D supplementation and fracture incidence in elderly persons. A randomized, placebo-controlled clinical trial. *Annals of Internal Medicine* 124(4):400–406.

347 Trivedi D, Doll R and Tee Khaw K (2003). Effect of oral four monthly vitamin D3 (cholecalciferol) supplementation on fractures and mortality in men and women living in the community: randomised double blind controlled trial. *British Medical Journal* 326:469–474.

348 Graham K (1998). *Ask me About Nutrition — Resource for General Practice*, Darling Downs Public Health Unit, Toowoomba.

349 Cranney A, Guyatt G, Griffith L, Wells G, Tugwell P and Rosen C (2002). Meta-analyses of therapies for postmenopausal osteoporosis. IX: summary of meta-analyses of therapies for postmenopausal osteoporosis. *Endocrine Reviews* 23(5):570–578.

350 Klotzbuecher C, Ross P, Landsman P, Abbott T and Berger M (2000). Patients with prior fractures have an increased risk of future fractures: a summary of the literature and statistical synthesis. *Journal of Bone and Mineral Research* 14(5):721–739.

351 Nevitt M, Cummings S and Hudes E (1991). Risk factors for injurious falls: a prospective study. *Journal of Gerontology* 46(5):M164–M170.

352 Nguyen T, Sambrook P, Kelly P, Jones G, Lord S and Freund J (1993). Prediction of osteoporotic fractures by postural instability and bone density. *British Medical Journal* 307:1111–1115.

353 Ensrud K, Black D, Palermo L, Bauer D, Barrett-Connor E and Quandt S (1997). Treatment with alendronate prevents fractures in women at highest risk: results from the fracture intervention trial. *Archives of Internal Medicine* 157:2617–2624.

354 Osteoporosis Australia (2003). *Treatment for Osteoporosis.* http://osteoporosis.org.au/health_clinical.php (Accessed July 2009)

355 Kamel H, Hussain M, Tariq S, Perry H and Morley J (2000). Failure to diagnose and treat osteoporosis in elderly patients hospitalized with hip fracture. *American Journal of Medicine* 109:326–328.

356 Zochling J, Schwarz J, March L and Sambrook P (2001). Is osteoporosis under treated after minimal trauma fracture? *Medical Journal of Australia* 174:663–664.

357 Wells G, Cranney A, Peterson J, Boucher M, Shea B, Robinson V, Coyle D and Tugwell P (2008). Risedronate for the primary and secondary prevention of osteoporotic fractures in postmenopausal women. *Cochrane Database of Systematic Reviews* (1) Art. No.: CD004523. DOI: 10.1002/14651858. CD004523.pub3.

358 Stevenson M, Jones M, De Nigris E, Brewer N, Davis S and Oakley J (2005). A systematic review and economic evaluation of alendronate, etidronate, risedronate, raloxifene and teriparatide for the prevention and treatment of postmenopausal osteoporosis. *Health Technology Assessment* 9(22):1–160.

359 Meunier P, Roux C and Seeman E (2004). The effects of strontium ranelate on the risk of vertebral fracture in women with postmenopausal osteoporosis. *New England Journal of Medicine* 350:504–506.

360 Ebeling P, Phillips S, Sambrook P and Seeman E (2002). Preventing osteoporosis: outcomes of the Australian Fracture Prevention Summit. *Medical Journal of Australia* 176(S8):1–16.

361 Sambrook S, Oliver I and Goss A (2006). Bisphosphonates and osteonecrosis of the jaw. *Australian Family Physician* 35:801–803.

362 Ashe M, Khan K and Guy P (2004). Wristwatch-distal radial fracture as a marker for osteoporosis investigation: a controlled trial of patient education and a physician alerting system. *Journal of Hand Therapy* 17:324–328.

363 Khapra A and Rose S (2006). Drug injury in the upper gastrointestinal tract: effects of alendronate. *Gastrointestinal Endoscopy Clinics of North America* 16(1):99–110.

364 Baker D (2002). Alendronate and risedronate: what you need to know about their upper gastrointestinal tract toxicity. *Review of Gastroenterological Disorders* 2(1):20–33.

365 Barrett-Connor E, Mosca L, Collins P, Geiger MJ, Grady D, Kornitzer M, McNabb MA and Wenger NK (2006). Effects of raloxifene on cardiovascular events and breast cancer in postmenopausal women. *New England Journal of Medicine* 355(2):125–137.

366 Brown J and Josse R (2002). 2002 Clinical practice guidelines for the diagnosis and management of osteoporosis in Canada. *Canadian Medical Association Journal* 167:S1–S34.

367 Close J and Lord S (2006). How to treat: falls in the elderly. *Australian Doctor* (3 March): 27–34.

368 O'Neill S, MacLennon A and Bass S (2004). Guidelines for the management of post-menopausal osteoporosis for GPs. *Australian Family Physician* 33:910–917.

369 New South Wales Health (2005). *Fall Injury Among Older People - Management Policy to Reduce Falls in NSW Health*, New South Wales Health, Sydney.

370 American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention (2001). Guideline for the prevention of falls in older persons. *Journal of the American Geriatrics Society* 49(5):664–672.

371 Scheffer A, Schuurmans M, van Dijk N, van der Hooft T and de Rooij S (2008). Fear of falling: measurement strategy, prevalence, risk factors and consequences among older persons. *Age and Ageing* 37:19–24.

372 Queensland Health (2002). *Falls Prevention in Older People: Implementation Workbook to Accompany the Falls Prevention Best Practice Guidelines for Public Hospitals and State Government Residential Aged Care Facilities*, Queensland Government, Brisbane.

373 Sharaf A and Ibrahim H (2008). Physical and psychosocial correlates of fear of falling: among older adults in assisted living facilities. *Journal of Gerontological Nursing* 34(12):27–35.

374 Jung D, Lee J and Lee S (2009). A meta-analysis of fear of falling treatment programs for the elderly. *Western Journal of Nursing Research* 31(1):6–16.

