

PREVENTING INJURIES FROM FALLS IN OLDER PEOPLE

Background information to assist in the planning and
evaluation of local Area-based strategies in New South Wales

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NSW HEALTH DEPARTMENT

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March 2001

Foreword

Better health care, better nutrition and healthier lifestyles enable us, as a population, to live longer than the generations before us. As a result, the number of older people in our population is growing and will continue to do so over the decades ahead. Preventing injuries due to falls among older people is a vital part of maintaining health, independence and quality of life in our later years.

While falls occur during all stages of life, the health impact of falls is greatest in those people over 65 years. We have a growing understanding of what factors increase the risk of fall injuries in older people and what can be done to reduce the risk. Planned and coordinated action to reduce the problem of fall injuries among older people in New South Wales is a responsibility of all who work with and care for older people.

The NSW Health Department has embarked upon three major initiatives to address the prevention of falls among older people: Falls Prevention 2000 for metropolitan areas, a parallel strategy for rural areas and the development of a fall injury prevention policy for NSW Health. These initiatives serve to strengthen partnerships among Area Health Services as well as between Area Health Services and their communities. These partnerships aim to ensure access to falls prevention activities is provided for those older people at greatest risk of fall injuries.

This resource has been developed to assist planning of fall prevention initiatives by those organisations brought together as part of Falls Prevention 2000. It is a simple, practical guide, outlining our current understanding of the problem and what works for its prevention. It also provides tools for planning and ideas for implementation at the local level.

I commend this resource to all stakeholders who come together to address the prevention of falls in older people and I wish everyone the greatest success in these endeavours.



Michael Reid
Director-General
NSW Health

Executive summary

Introduction

Falls are a major cause of morbidity and mortality in older people, and preventing falls in older people is both a national and state public health priority. In 1997/98, in NSW 16,951 persons aged 65 or over were hospitalised for more than one day due to falls. This represents a 12% increase over the past eight years. The total cost of falls in this age group in NSW during 1997 was around \$302 million. By 2051, if the rate of falls remains unchanged, this total cost will soar to around \$644 million (in current values) because of the changing demographics of our population. The group in which increases will be greatest will be women over 75 years of age.

Older people who have sustained a fall are more likely to show a fear of falling again, increased anxiety, loss of confidence, decreased activity, and increased dependence. It has been estimated that 40% or more of hospitalised fallers over 65 years are discharged to nursing home care, and a further 10% require home services.

Aims of the report

This report seeks to provide falls injury prevention planners with a context for their work. The specific aims of this report are to:

- provide a review of the evidence pertaining to the causes of and countermeasures to falls in older people.
- identify effective and promising approaches to the prevention of falls in older people that can be implemented at the local level.
- identify priority strategies for intervention at the local level in NSW.
- suggest a list of considerations for planning, implementing and evaluating falls prevention activities.
- assist local stakeholders identify potential roles in the prevention of falls in older people.

Causes of falls

The causes of falls in older people are multifactorial, involving a combination of intrinsic (or personal) factors and extrinsic (environmental or external) factors. It is uncommon to find a single cause of a fall, and the combination of risk factors is different for different people. Intrinsic factors include: deteriorated health, mobility and strength associated with aging, lack of exercise leading to impaired balance, gait, flexibility and strength, some medications or combinations of medications, wandering behaviour (e.g. in residential care settings), impaired cognition or confusion, and impaired visual acuity. Extrinsic factors include: inappropriate footwear, extended stays in hospital, people traffic, unfamiliar environment within residential care settings, activities of daily living (for example, bed making, gardening, dressing, shopping) and environmental hazards such as uneven or loose surfaces, poor lighting, and slippery floors.

While the risk of falling escalates from around 65 years of age, the root of the problem appears to lie in patterns of exercise and diet in earlier years that interact with the process of aging and with the environments in which the older people live.

Countermeasures for falls

The report presents a brief overview of the available evidence on a wide variety of countermeasures for falls in older people and considers the 'settings-based' opportunities for intervention currently part of the national approach to falls prevention planning: older people living independently in the community; those in residential care such as nursing homes and hostels; and older people accessed through acute care settings such as hospitals and rehabilitation centres.

While the evidence on effective strategies is still emerging, particularly for the supported care and acute care settings, there are some promising directions that can be taken in all three settings. In summary, the proven and promising strategies for each of the settings are as proposed to be:

- for older people living independently within the community – exercise to enhance flexibility, strength, balance and gait, population-based multi-strategic interventions, and nutritional strategies – particularly calcium and Vitamin D supplementation.
- for older people in supported residential care – individual assessment and tailored interventions, hip protectors for those at high risk of falling, medication management, vitamin D and calcium supplementation, and exercise.
- for older people in contact with acute care settings – personal and environmental assessments and tailored programs linked with home care following hospitalisation, and ambulatory alarms on older persons in general and in orthopaedic wards.

Current directions for NSW Health

The Injury Prevention Policy Unit, NSW Health has recently proposed a model for preventing falls among older people in NSW. This model has been developed in line with available evidence and the current framework for action being developed by the Commonwealth Department of Health and Aged Care in its focus on the three population groups at risk, described above. It proposes a focus on enhancing opportunities for older people to increase their levels of physical activity or exercise (and extending the targeted age group to those over 40 years of age). Strategies for those living independently within the community include creating a place for exercise within their lifestyles – including workplaces, and, for older individuals (those 75 years and over), focusing on harm minimisation to prevent accelerated supported care that often results from a fall. For those living in supported residential care strategies the proposed focus is on residents with early dementia who are mobile and at high risk of falling, working with organisations that provide care to conduct risk assessment, calcium and vitamin D supplementation, gentle exercise and where indicated, hip protectors. For older people accessed through acute care settings the focus is proposed as being on gentle exercise, medication management, risk assessment for high risk, post operative patients and management of medications and the home environment while recovering.

The report provides an ‘ideas list’ for consideration in planning intervention at the local level for each of the three settings for reaching older people at risk of falling. The lists covers possible strategies and potential partner organisations, available resources and gaps in the evidence to be mindful of in selecting strategies as well as in planning evaluation.

The potential role of local Areas in preventing falls has been outlined in Section 6. It covers aspects of understanding the size and nature of the problem in the local community, identifying and working with local partners, identifying areas of focus, planning for evaluation, building capacity to undertake falls prevention, addressing sustainability and evaluation and reporting.

Conclusion

The focus of efforts to address falls prevention in older people needs to be on using the best available evidence, working collaboratively with other sectors that may hold the key to effective change in this area, and evaluating and sharing the outcomes of new initiatives. It is clear that with our aging population, the cost of this problem is destined to rise and we need to respond to the growing sense of urgency in identifying and resourcing effective injury prevention strategies.

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Section 1

Introduction

This report has been developed collaboratively by the Australian Centre for Health Promotion (University of Sydney) and the Injury Prevention Policy Unit, NSW Health Department in consultation with Area Health Services and other stakeholders in preventing falls in older people, to assist in developing and strengthening the practice of falls prevention in older people living in NSW.

The report provides:

- background data on the significance of the problem of falls among older people in NSW.
- a review of evidence on risk factors for falls among older people in NSW.
- a brief overview of current evidence concerning effective intervention strategies.
- suggested approaches to planning falls prevention activities at the local level.

The risk factors for falls in older people are varied and somewhat interdependent. In line with this, approaches to the prevention of falls in older people are varied and often multi-factoral. Perhaps in part to keep planning manageable and focused, over the past decade falls prevention efforts have been evolving into one of three largely settings-based approaches:

1. those targeting older people living independently in the community.
2. those in residential settings caring for older people (such as nursing homes and hostels).
3. those which focus on older people in acute care settings – such as hospitals.

Each of these areas of focus carries with it strengths and limitations in terms of implementation issues, impact and opportunities for achieving sustainability. By targeting the ‘well older people’s group’ the focus is on reaching a large proportion of older people who are generally at lower risk of a fall injury and who are more autonomous in their choices of products, environments and activities. While these factors pose some challenges in achieving measurable outcomes, interventions at this level can potentially reduce the

rate of falls in the short-term as well as longer-term, as this cohort moves into the ‘frail-aged’ years. Within a regulated setting such as a hostel, nursing home or hospital, there is a greater focus on tailored assessment and prevention programs and on modifying the policies and practices of the organisation which provides the environment and services for a smaller number of older people, who are generally at a much higher risk of a fall-related injury.

While the evidence on effective strategies is still emerging, particularly for the supported care and acute care settings, there are some promising directions that can be taken in all three settings. This report emphasises falls prevention strategies targeting older people living independently within the community, since we currently have stronger evidence on effective interventions pertaining to this setting. The focus of our planning needs to be on using the best available evidence, working collaboratively with other sectors that may hold the key to effective change in this area, and evaluating and sharing the outcomes of new initiatives. It is clear that with our aging population, the cost of this problem is destined to rise and we need to respond to the growing sense of urgency in identifying and resourcing effective injury prevention strategies.

The evidence used in producing this report has been drawn from multiple sources – epidemiological studies and surveys, the empirical literature, opinions gathered from experts operating in policy development and or research institutions, and from practitioners in the Areas of NSW. The role of the authors of this report has been to distill from the information gathered, the identification of strategies for which there is consensus of support, and/or evidence regarding the feasibility and effectiveness of these strategies to potentially lead to reductions in fall related injuries in NSW. In combining the sources of evidence in this way, it is expected that the report will be of practical assistance to practitioners, policy makers, ‘partners’ in falls prevention, consumers and researchers in being better informed on the status of injury prevention, and in determining future areas for action.

Aims

In broad terms, the report aims to provide falls injury prevention planners with a context for their work.

The specific aims of this report are to:

- provide a review of the evidence pertaining to the causes of and countermeasures to falls in older people.
- identify effective and promising approaches to the prevention of falls in older people that can be implemented at the local level.
- identify priority strategies for intervention at the local level in NSW.
- suggest a list of considerations for planning, implementing and evaluating falls prevention activities.
- assist local stakeholders identify potential roles in the prevention of falls in older people.

The target group for interventions recommended in this report are older residents of NSW, that is, people aged 65 years and over. While some interventions, such as exercise and strategies to prevent osteoporosis, may best begin in the decades before this age group, the risk of injury due to falling escalates rapidly for those aged 65 years or over. It is also recognised, that within this target group there exists sub-groups including the 'well-aged' over 65 years, and the 'frail aged', who are generally older (over 75 years), and who comprise a greater proportion of those older people found in residential institutional settings. The strategies recommended in this report take into account the differences in intervening with these groups.

Section 2

The significance of falls in older people in NSW

Falls are a major cause of morbidity and mortality in older people, and preventing falls in older people is both a national and state public health priority. For the purpose of this report, a fall is defined as any event in which a person loses balance, trips, slips, or drops from a height to the floor or ground. This definition includes two essential elements of falling – the involuntary motion of the person and the consequence of hitting the floor or another object.

This section provides a brief overview of the most recent available data on:

1. Hospitalisations associated with falls in NSW - available from NSW Health inpatient statistics data¹
2. Less serious falls (including those without injury) and factors associated with the falling event - from four population surveys:
 - the *NSW Health Promotion Survey, 1994*²
 - the *NSW Health Department Falls Campaign Baseline Survey, 1994*³
 - *Australian Bureau of Statistics Supplementary Survey, 1995*⁴
 - the *1999 Older People's Health Survey*⁵

It should be noted that while some of these data were collected some years ago now, they are still the most recently available data on factors associated with all falls (not just those resulting in hospitalisation) among older people in NSW.

3. Costs and project costs of falls in older people to the year 2051.⁶

The following dot points provide a summary of the main data points from each of these sources.

Size and severity of the problem

- In NSW, 17-20% of people aged over 65 years reported falling over a 12-month period as reported on the 1994, 1995 surveys.^{2,3,4} In the *1999 Older People's Survey* 26.8% of people aged 65 years and over reported a fall in the previous 12 months.
- Approximately 12% of people aged 65 or over reported incurring an injurious fall over a 12 month period^{3,4} and 8.6% reported at least one fall requiring medical attention.⁵
- In 1997/98, in NSW 16,951 persons aged 65 or over were hospitalised for more than one day due to falls. This represents a 12% increase over the past eight years.¹
- The rate of injuries due to falls increases with age – with 22% of people aged 65-69 years in the 1999 survey reporting a fall in the previous 12 months, compared with 36% of those aged 85 years or over.
- Among older people, females are more likely to fall than males, and have about twice the hospitalisation rates of males.³ Across all age groups, self-reported falls occur almost equally among males and females (49% males and 51% females) – however, among those aged 60 years or over, 75% are among women and 25% among men.² Nearly a third (31%) of all older female injuries were falls-related, while only 16% of all older male injuries were falls-related.³
- Fear of falling is common with the *1999 Survey* indicating over one quarter of respondents indicated they were 'somewhat' or 'fairly' afraid of falling. This moderate level of fear of falling (no one reported being 'very' afraid) was more common among females (37%) than males (17%).⁷

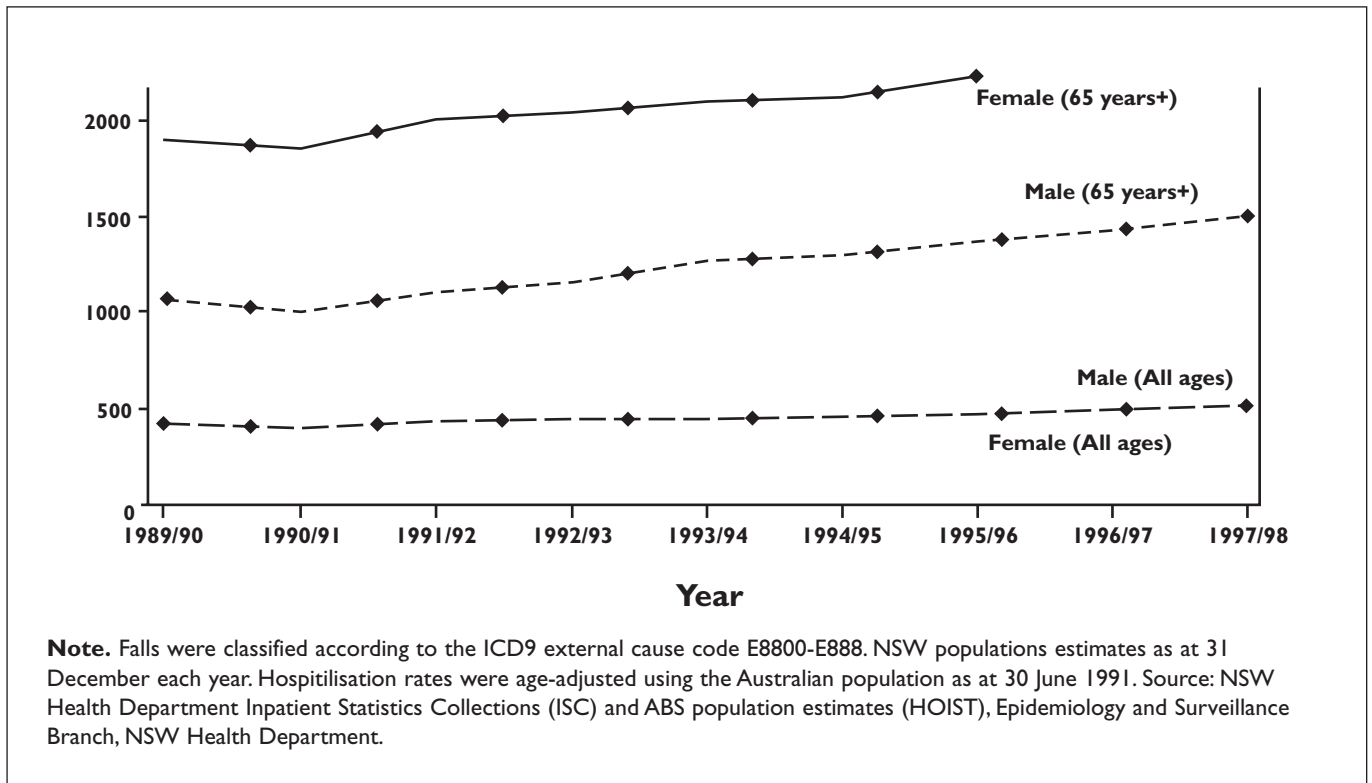


Figure 1. Age adjusted hospital separations due to falls by gender, for person 65 years and over, NSW, 1989/90 – 1997/98.⁸

Factors associated with the falling event

- The ground surface (uneven, cracked or slippery) contributed to over one-third of the reported falls, while 20.3% stated that they ‘overbalanced or their legs gave way’.⁹
- For females, the fall was more likely to occur inside the home, while for males the fall was more likely to occur outside the home. Nearly one-third (29.7%) of females sustained a fall while ‘just walking’, followed by activities of daily living such as domestic work (16%) or shopping (11.9%). Over a quarter of males (26.2%) sustained a fall while engaged in maintenance or gardening work, and 13.8% fell while ‘just walking’, or while going up or down steps or stairs.⁹
- The *NSW 1994 Health Promotion Survey* indicated 6% of falls were to people born overseas from a Non-English Speaking Background, and 1% were among people of Aboriginal or Torres Strait Islander background.

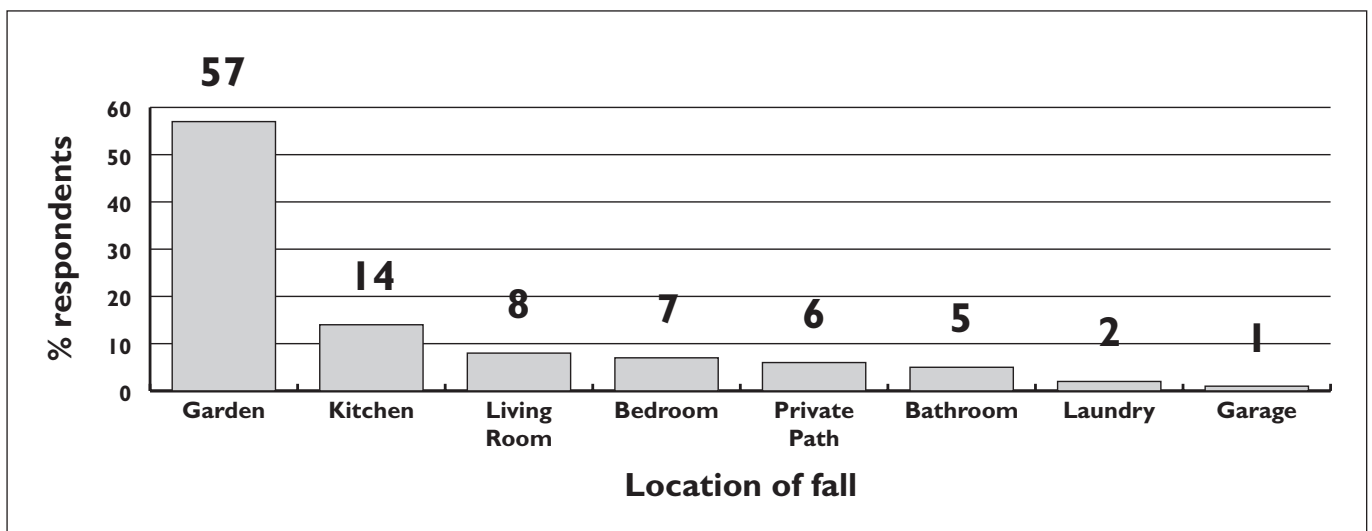


Figure 2. Percentage of falls in the home and garden by place of occurrence (rural regions of NSW - 1994)¹⁰

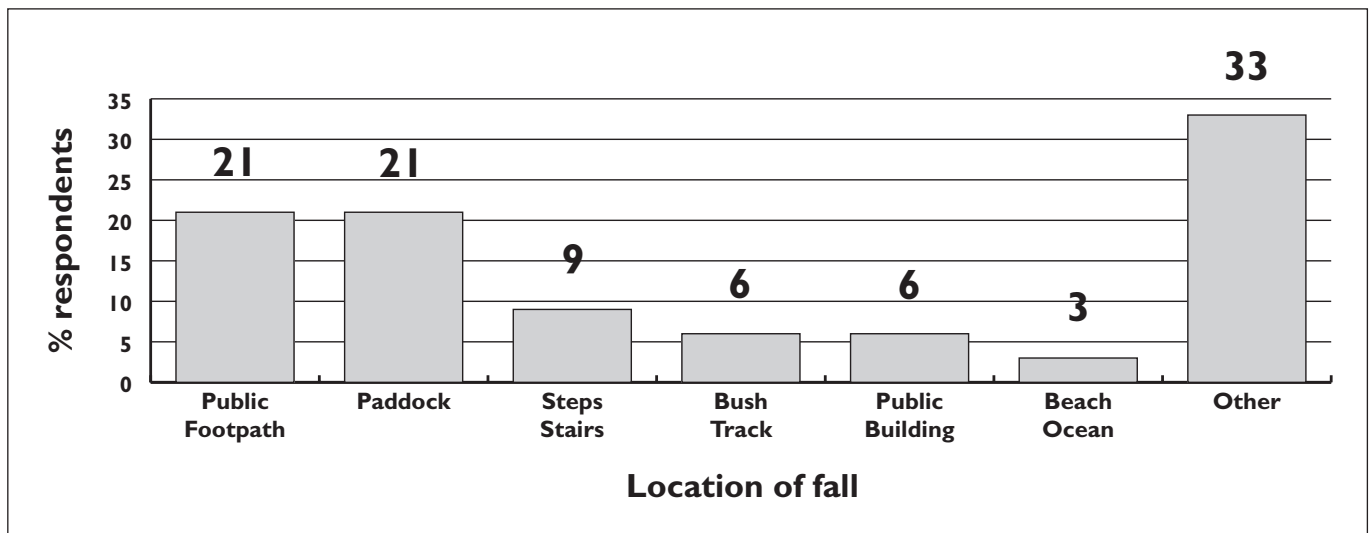


Figure 3. Percentage of falls outside the home and garden by place of occurrence (rural regions of NSW - 1994) ¹⁰

Consequences of falling

- In NSW during 1992–93, for falls requiring hospitalisation, the major injuries sustained were fractures to hips (31.4%), upper limbs (17.6%), spine and trunk (13.2%) and lower limbs (10.8%).¹¹
- Fracture of the neck of femur, which occurs in approximately 1% of falls, is typically the most serious injury related to falls.
- Of those older people who sustain a hip fracture, many never regain their pre-fall level of functioning. Older people who have sustained a fall are more likely to show a fear of falling again, increased anxiety, loss of confidence, decreased activity, and increased dependence.¹²
- A common sequela of falling is the inability of the injured person to get up without help. If the injured person is unable to get timely help, this may result in serious physical morbidity, including dehydration, pressure sores, rhabdomyolysis, and pneumonia.¹³
- It has been estimated that 40% or more of hospitalised fallers are discharged to nursing home care, and a further 10% require home services.¹³

Table 1 shows by Area Health Service and gender, the rate of hospital separations due to falls in residents aged 65 years and above. In the NSW Health Promotion Survey, both the number of residents aged 65 years and over, and the prevalence of falls were too low to calculate the prevalence by Area.

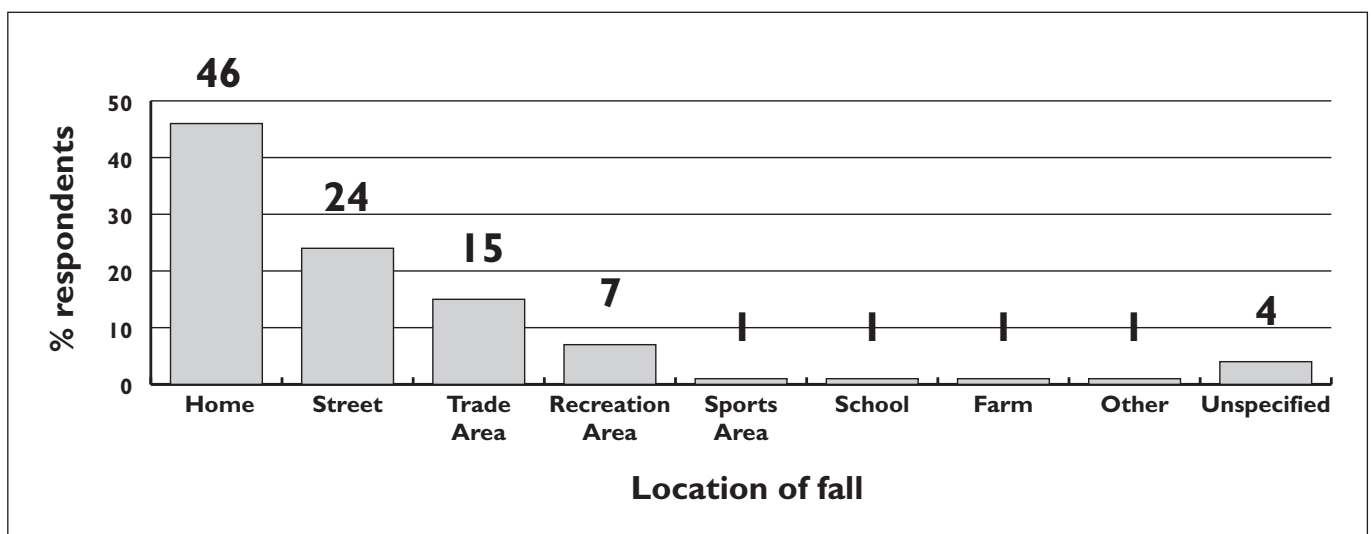


Figure 4. Setting of injuries due to falls, NSW adults aged 60 years and over (Source NSW 1994 Health Promotion Survey)¹⁴

Area Health Service	MALES		FEMALES	
	Rate Ratio (Compared to state average)	Rate/1000 Males	Rate Ratio (Compared to state average)	Rate/1000 Females
Western Sydney	125.3*	1295.4	119.7*	2229.1
Northern Sydney	116.6*	1154.3	116.5*	2169.5
Central Sydney	122.4*	1265.4	104.1	1938.6
South-East Sydney	114.9*	1152.6	101.6	1892.0
Mid Western	114.1	1151.1	112.1	2087.5
Macquarie	111.6	1153.7	102.9	1916.2
Greater Murray	104.5	1080.1	110.6	2059.6
STATE TOTAL	100.0	1033.8	100.0	1862.2
Central Coast	95.5	987.3	105.5	1964.6
South-West Sydney	95.0	982.1	97.2	1810.1
Wentworth	94.0	971.8	104.2	1940.4
New England	80.7	834.3	108.2	2014.9
Mid North Coast	84.4*	872.5	89.5*	1666.7
Northern Rivers	80.8*	835.3	80.3*	1495.3
Illawarra	72.7*	751.6	75.6*	1407.8
Southern	71.6*	74.3	78.7*	1465.6
Hunter	74.9*	774.3	76.1*	1417.1
Far West	61.6*	636.8	84.4	1571.7

* denotes statistically significantly different from the state average (Note: some non-significant values may be further from the state mean but smaller population sizes account for the lack of statistical significance.)

Table 1. Hospital separations fall rates/100 000 people aged 65 years (1997/98) NSW, by gender and Area Health Service¹⁵

Cost of falls¹⁶

- In 1997, 190,700 hospital bed days utilised by older people for treatment of a fall. Approximately 50,500 of these were by males and the rest (140,200) by females.
- Projections incorporating Australian Bureau of Statistics data on population trends indicate that by the year 2051 the total figure will more than double (441,000 bed days due to falls in older people in NSW).
- The total cost of falls in this age group in NSW during 1997 was around \$302 million.
- By 2051, if the rate of falls remains unchanged, this total cost will soar to around \$644 million (in current values) because of the changing demographics of our population. The group in which increases will be greatest will be women over 75 years of age.
- In concrete terms, the total additional number of bed days required equates to 800 additional hospital beds every day of the year (or the equivalent of four two hundred bed hospitals) and there will be a need for 1,200 additional nursing home places.

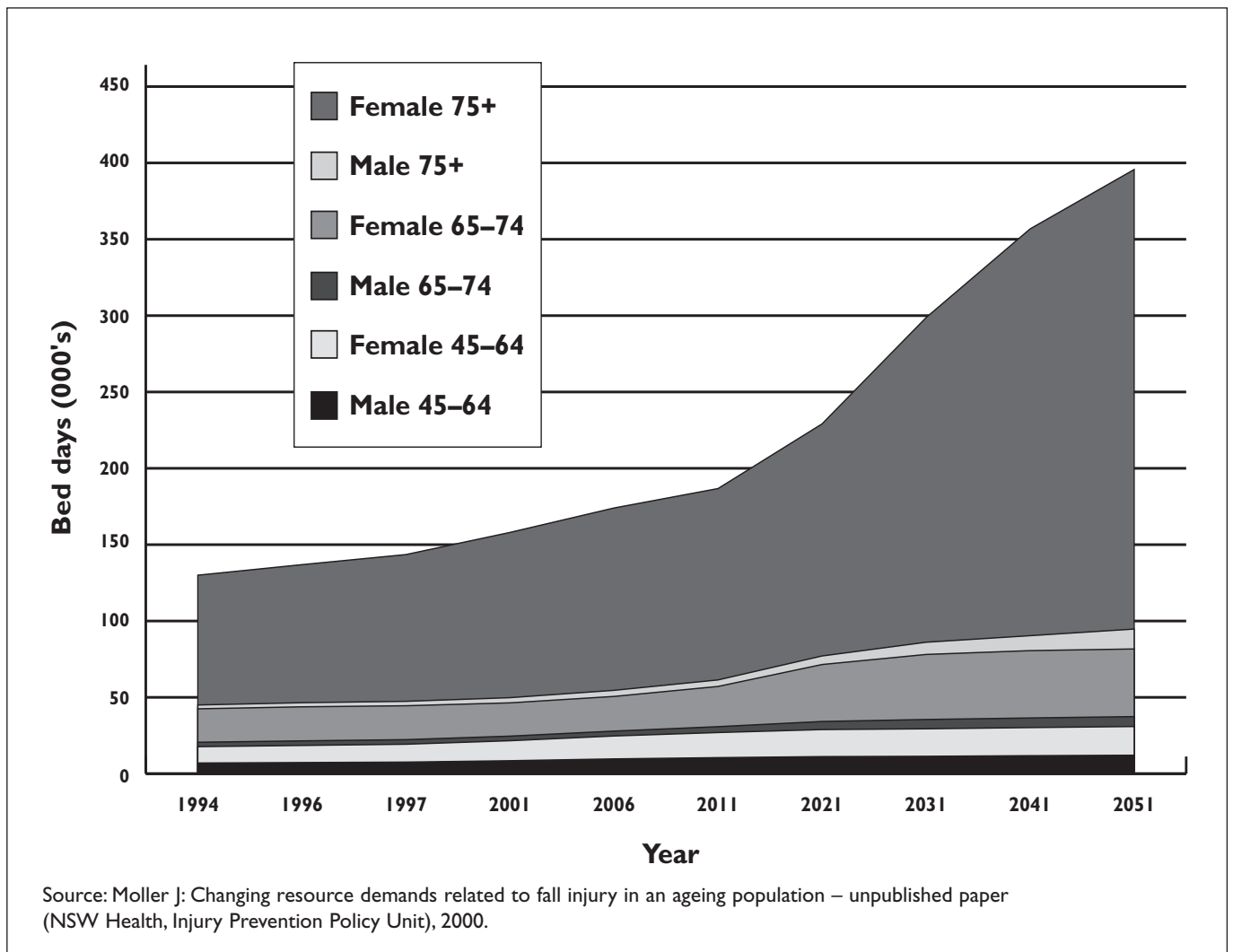


Figure 5. Projected trends in public hospital bed days to treat falls by age group and gender (based on ABS Series I population projections)

The data summarised above point to the urgency to address falls in older people with adequate resources, planning and the use of the best available data and evidence of effective strategies. They also point to the

need to take a long-term public health approach targeting, in particular, all women who will reach the age of 75 during the next 50 years.

Section 3

Causes of falls and injuries from falls in older people

This chapter discusses the evidence concerning risk factors for falls and injuries related to falls in older people. To date, most of the available evidence in this area concerns falls among older people living independently in the community. There is, however, a growing body of evidence concerning risk factors for falls and injuries associated with falls among older people living in assisted residential care or within acute care settings.

There is often debate about whether the focus of planning should be on preventing falls in older people or preventing injuries resulting from falls in older people. The risk factors for these two outcomes (preventing falls or preventing injuries due to falls) are generally shared for the 'pre-event' phase (ie before the fall event has occurred). However, risk or protective factors relating to the moment of impact with the ground (sometimes called the 'event' phase), or the period after the fall ('post event' phase) are associated with the injury outcome and its severity. For the purposes of planning and evaluation, the distinction is significant when considering some interventions that may actually increase the chance of a fall (such as promoting physical activity) but which serve to reduce the likelihood of injury or the severity of injury (eg through improved strength and balance). In this case, the measurement by which to examine the effectiveness of the intervention should be changes in injury outcomes rather than changes in instances of falling.

Approximately 20% of all falls in older people are likely to result in seeking medical attention, about 10% are fractures and 5% are hip fractures. Hip fractures, in particular, often result in significant long-term disability, major lifestyle changes and for some older people, the move from independent living to one of residential care.¹⁷ In the event of a fall, the 'hardness of the ground' and the strength of the bones, for example, may determine whether or not an injury is incurred, and the length of time until assistance arrives may determine the outcome of the injury in terms of damage incurred.

The causes of falls in older people are multifactorial, involving a combination of intrinsic (or personal) factors and extrinsic (or environmental or external) factors (see Table 2). It is uncommon to find a single cause of a fall, and the combination of risk factors is different for different people. The risk of falling increases with the number of risk factors.^{18 19} While the risk of falling escalates from around 65 years of age, the root of the problem appears to lie in patterns of exercise and diet in earlier years that interact with the process of aging and with the environments in which the older people live.

Intrinsic or personal factors	Extrinsic or environmental factors
<ul style="list-style-type: none"> • Deteriorated health, mobility and strength associated with aging • Certain medical conditions: for example, Parkinson’s disease, dementia, depression, osteoporosis, osteoarthritis, cataracts, glaucoma, low blood pressure, incontinence. • Reduced peripheral neurosensation • Lack of exercise – linked with poor muscle tone and strength and low bone density • Fatigue • Wandering behaviour (e.g. in residential care settings) • Impaired cognition or confusion – being uncertain of the environment or activity being undertaken • Impaired visual acuity • Impaired gait and balance • Prior history of falling • Alcohol use • Medications or medication mixes affecting balance, vision and alertness (for example, sedatives/tranquillisers, hypnotics, anxiolytics) • Polypharmacy, which produces undesirable interactions between medications 	<ul style="list-style-type: none"> • Inadequate footwear • Uneven or loose surfaces (for example, cracked footpaths, loose pebbles or stones) • Inadequate lighting • Slippery floors • Time of day • Being hospitalised for 19 days or more • People traffic –one or two others in the way or crowds • Poor step and stairway design and repair • Height of chairs and beds (too high or too low) • Unfamiliar environment within residential care settings • Activities of daily living (for example, bed making, gardening, dressing, shopping) • Unsecured floor coverings and rugs • Housing and floor plan (for example, external toilet and laundry, steps, rooms too small for walking aids)

Table 2. Factors involved in falls and fall injuries in older people ^{20, 21, 22, 23, 24, 25, 26, 27}

The following review summarises the evidence for some of the above major risk factors identified through epidemiological studies.

Intrinsic factors

Intrinsic factors are personal factors or those factors that are peculiar to the individual and ‘go with’ the individual wherever they go. Not all of these factors are amenable to change, but all are important in assisting in identifying individuals or groups of individuals at greatest risk of falling.

Aging and health

With increasing age there can be a decline in physical and mental functions that increase the risk of falling. For example, poor balance, gait and muscle tone, decreased functional ability, poor vision and reduced

mobility have been associated with an increased risk of falling and recurrent falling.²⁸ In general, frail older people are at the highest risk of falling, and of suffering an adverse outcome.

Pre-existing medical conditions

Acute and chronic diseases in older people have been shown to increase the risk of falling.²⁹ Cardiovascular conditions (for example, stroke, cardiac arrhythmia), Parkinson’s disease, dementia, depression, arthritis, cataracts and other vision problems have been associated with an increased risk of falling. Tinetti et al., have found that the number of chronic diseases increases the predicted risk of falling in older people.³⁰ Older people who suffer from multiple chronic and/or acute conditions may also be at added risk of falling due to medications that increase hypotension and balance disorders.

Medications and polypharmacy

There is a relationship between the use of medications and falling, including inappropriate prescribing, misuse, underuse or overuse of pharmaceuticals prescribed by physicians or bought over the counter.³¹ There are a number of drug or medication interactions that increase the risk of falls for older people.³² For example, the use of psychotropic drugs such as antipsychotics, antidepressants, and benzodiazepines has been found to be positively associated with an increased risk of falls, and an increased risk of fractures. Multiple medication use (polypharmacy) and medications that cause postural hypotension, balance disorders and cardiovascular insufficiency have also been linked with an increased risk of falling.^{33 34} However, many studies investigating the relationship between medication use and falls have been observational and the findings may be confounded by the possible presence of multiple chronic and acute diseases, age-associated alterations in how the drug is absorbed and processed together with other possible factors such as non-compliance and self-medication.³⁵ Therefore, the evidence must be treated with caution in terms of identifying the contribution of individual medications to the risk of falling.

A history of previous falls

People who have sustained a previous fall are at a higher risk of falling.³⁶ It has been estimated that older people with a history of falling are two and a half to three times more likely to fall in the next 12 months than older people without a prior fall history.^{37 38} In addition, a previous fall may reduce mobility in older people, resulting in the development of medical problems and loss of strength, joint mobility and reflexes.³⁹ A history of multiple falls has also been found to be associated with sustaining a hip fracture.⁴⁰ Feelings of frustration, helplessness and fear may limit the faller's mobility and increase fear of falling again.⁴¹

Bone density and osteoporosis

There is a continuous inverse relationship between bone density and the risk of fracture.⁴² While bone density has not been shown to be linked with the risk of falling, diminished bone density increases the risk that a fracture will occur if a fall occurs.^{43 44} Deteriorating bone density has been extensively studied in relation to injuries resulting from falls. Bone density rises to a peak at ages 35 to 40 years in both

sexes, although men generally have a higher bone density than women. After about the age of 40 there is a steady loss of bone density at the rate of about 1-2% per year, with women experiencing 10 years of accelerated loss after menopause.⁴⁵ As a result, women are more likely than men to have osteoporotic bones, and are more likely to suffer a fracture following a fall.

Immobilisation

Immobilisation leads to a reduction in bone density and muscle mass. A history of immobilisation, such as in the case of prolonged illness requiring bed rest, has been associated with a two - to fivefold increase in the risk of hip fracture.^{46 47}

Extrinsic factors

Extrinsic factors are those factors external to the individual. These factors are not peculiar to the individual but they act upon the individual depending upon the circumstances that brings the person together with these factors.

Footwear

Inappropriate footwear has been cited as a contributory factor in home falls.⁴⁸ Footwear that fits poorly, has worn soles, is not laced or buckled when worn, or has high heels, has been associated with a higher risk of falling.^{49 50 51} To date, no study has identified the 'safe shoe'.

Home environment

Between 25% and 75% of falls in older people involve an environmental component.⁵² Although most falls occur in or around the home, it has yet to be demonstrated conclusively which factors in the home environment increase the risk of falling.⁵³ Generally, the more hazards in the home, the higher the risk of falling. The following home hazards that have been identified (but as yet individual levels of risk have not been identified for them):⁵⁴

- stairs
- obstacles and spills on the floor
- loose rugs and carpets with loose edges
- poor illumination and absence of night lights in halls, bedrooms and bathrooms
- an absence of accessible light switches at room entrances

- appliance cords that run across the floor and present a tripping hazard
- step stools in the kitchen
- items being stored in high cupboards
- bathtubs and shower recesses that have become slippery
- low furniture (for example, beds and chairs)
- slippers and other poor footwear
- garden paths that have become cracked or slippery with moss
- hard floor surfaces
- non-use of walking aids in and around the home.

A significantly higher risk of multiple falls has been found among older people who report that features of their home (such as poor lighting, low seats) made it difficult to carry out 'activities of daily living'.⁵⁵

However, in some cases, the activities themselves may pose the greater risk (for example, climbing ladders, standing on chairs to reach high cupboards). Some authors have suggested that extrinsic or environmental factors are more important risk factors in healthier, active older people, while intrinsic or host factors play a greater role in falls in the frail older person.⁵⁶

'Long lie'

The 'long lie' refers to the situation where the older person who has fallen remains undiscovered on the ground or floor for more than one hour following a fall.⁵⁷ The long lie following a fall has been associated with a high mortality rate in older people.^{58,59} In one UK study, it was found that half of those who experienced a long lie after a fall died within six months of the event, even if the original fall did not result in an injury.⁶⁰

Risk factors in residential care settings

Few studies have identified risk factors specific to falls among older people in residential care settings. It is commonly accepted that most falls are the result of a combination of risk factors working together. It has been reported that the commonest location of fall in residential care is in residents' bedrooms, followed by bathrooms and passageways – with falls commonly linked with difficult conditions such as walking in the dark, slippery surfaces, cluttered walkways and insecure items to hang onto.⁶¹ One study has identified that fall rates among older people in nursing homes increases following relocation to a new facility – possibly linked with unfamiliarity with the new environment.⁶²

Risk factors in acute care settings

There is also little documented research into the environmental risk factors for falls in older people in acute care settings. Mitchell and Jones (1996) identified that environmental factors linked with the risk of falling in acute care settings include:

- use of restraints
- ward positioning and hazards
- length of stay and
- time of day – with night time being of highest risk.⁶³

The following chapter addresses the evidence for various countermeasures for falls in older people. Evaluation studies of interventions addressing the risk factors amenable to change have been increasing in number. While there is no one clear solution or combination of strategies, some strategies are emerging as better investments at the current time.

Section 4

Evidence on countermeasures

This section presents an overview of the proven and promising strategies to prevent falls and fall injuries in older people. Currently there is more evidence on countermeasures directed at older people living independently in the community, than in residential or acute care settings. These latter two settings have only recently been the subject of intervention trials, hence further work in these areas must particularly be accompanied by evaluation measures.

Research in all settings has been limited by the multiple factors involved in falls in older people – people of different ages, health status and mobility fall for different reasons and the strategies have typically and appropriately involved a mix of strategies. However, the strongest evidence we have available to date might be summarised as:

- for older people living independently - increasing muscle strength, flexibility and bone density and improving balance and gait, through exercise, with promise also in multi-strategy programs including exercise components.
- for older people in residential care – gentle exercise, nutritional enhancement with calcium and Vitamin D supplementation, hip protectors for those at high risk of falling and tailored risk assessment programs.
- for older people access through acute care setting – medication management, hip protectors and home assessments for post-hospital period.

Modifying intrinsic risk factors

Much of the stronger evidence emerging from the falls prevention literature concerns the modification of intrinsic risk factors – or characteristics of the older person at risk of falling. With an increase in sedentary living among many people as they get older, it is not surprising to see associated reductions in muscle strength and flexibility and increasing difficulties associated with balance and gait among older people – apart from other associated factors linked with aging such as vision problems and medical conditions.

Exercise to enhance muscle strength, flexibility, balance and gait, nutritional changes to promote greater bone strength and better medication management are among the most promising strategies in terms of available evidence to date. With an emphasis on individual risk reduction through population approaches, the focus in planning needs to be on increasing motivation and access to these lifestyle changes.

Exercise

The relationship between exercise or physical activity, falls and injuries due to falling is complex. There is growing evidence that participation in regular exercise improves balance,⁶⁴ mobility and reaction time,⁶⁵ and can reduce the risk of injury following a fall.^{66 67 68} Exercise has been shown to increase bone mineral density in post-menopausal women⁶⁹ and in people aged over 70 years.⁷⁰ Research establishing links between exercise and a reduction in injuries is still scarce but recent reports are encouraging. The following exercise regimes have been shown to be associated with a reduction of falls or fall related injuries in older people:

- ten to twelve weeks of group gentle exercise (with a randomised controlled trial as the research design) – focusing on improving balance, endurance, strength and flexibility showed a trend for reduced multiple falls among high compliers.⁷¹
- an individually tailored program organised by general practitioners of physical therapy in the home of women over 80 years of age living in the community where the subjects were randomly assigned to an intervention group or a home visit/social interaction only group. The intervention group received an individual assessment, was given an 80 minute exercise program, three follow-up visits and then telephone encouragement to exercise and walk. At one year follow-up, the proportion of older women injured (particularly when examining serious injuries) as a result of a fall was lower in the exercise group compared to the control group.⁷²

- six weeks of low to moderate intensity exercise indicated (through pre-post measures on one group) a trend toward a reduction in falls for the six months following the intervention compared to prior the intervention.⁷³
- a 15 week Tai Chi group session was found to reduce the risk of multiple falls by 48% (demonstrated through a randomised controlled trial) compared to computerised balance training or social/information program control group.⁷⁴
- combined strength and endurance training, three times per week for six months resulted in nearly half the risk of falling in the six months following the program compared to just strength or just endurance training of the same intensity.⁷⁵
- observational studies have shown that habitual exercise can reduce the risk of hip fracture by about half.⁷⁶

There is a paucity of studies examining the effectiveness of group exercise programs on fall risk among older people in residential care, although there is evidence of functional gains,⁷⁷ and muscle strength and increased spontaneous activity levels.⁷⁸ No studies of sound design have been reported on the impact on falls due to walking programs for older people in residential care.⁷⁹ Within hospital settings there is little research on exercise regimens for older patients and their potential for reducing the risk of falling. Further research is needed in these two settings, where older people are at elevated risk of injuries due to falls.

Health benefits from exercise and physical activity

In addition to the evidence on strength and balance resulting from increased levels of physical activity, health and social benefits of participation in moderate physical activity for older adults have been reported.⁸⁰
^{81 82 83 84} Regular physical activity is now regarded as a key strategy to maintain good health and reduce the risks associated with chronic diseases.⁸⁵ There are numerous accounts in the literature of the benefits of regular physical activity and reducing sedentary lifestyles.^{86 87 88 89 90} Studies report improvements in health related quality of life for adults engaged in a regular walking program;^{91 92 93} with walking regarded as being an acceptable, accessible exercise activity, particularly among population subgroups with a low prevalence of leisure-time physical activity.

Medication management

Suggestions for reducing the risk of falls in older people linked with medication use include:

- using the lowest effective dosage of a medication specific to the symptoms.
- urging supervision and the use of walking aids while such medications are being taken.
- decreasing chronic use of medications.
- limiting the prevalence of multiple medication use in older people.
- conducting regular reviews of all patients' medications with a view to withdrawing medications that are not absolutely necessary.⁹⁴

In addition, some researchers have suggested that educating older people about the risks of falling associated with medication use may be helpful.⁹⁵ Programs that aim to decrease the use of sedatives and tranquillisers have resulted in a reduction in the number of hip fractures sustained by residents in a US nursing home.⁹⁶

Reducing osteoporosis, enhancing bone density

Although most strategies for the prevention of osteoporosis are aimed at a younger population, osteoporosis prevention, identification and management remains a major component of prevention of injuries related to falls in older people. While there is a continuous inverse relationship between bone density and the risk of fracture, mass screening for low bone density is not currently advocated.⁹⁷ In part, this is associated with the paucity of high quality current data on costs and cost-effectiveness that would allow the identification of an appropriate screening strategy. However, the National Consensus Conference on osteoporosis identification and management suggested that individual assessment is appropriate where risk or other factors indicated significant risk.⁹⁸ Screening for osteoporosis, therefore, may be of use in people aged over 60 years who have a family history of osteoporosis, a history of falling, and/or other risk factors for falling.

Although screening of bone mineral density does not currently offer a good indication of who is most at risk of a fracture following a fall, strategies that aim to increase the bone mineral density of the ageing population may reduce the incidence of fracture

following a fall. These strategies focus mainly on menopausal women and include hormone replacement therapy (HRT), smoking cessation, exercise, reducing excessive alcohol consumption, and nutrition supplementation. It should be noted, however, that trials examining weight training and calcium intake have indicated small effects on bone density and there have been no community-based long-term trials conducted to determine the effectiveness of exercise, and education programs on fracture rates.⁹⁹ While exercise may have falls reduction benefits beyond increasing bone density, including increasing bone strength independent of bone density, further research is clearly warranted in this area.

Hormone replacement therapy (HRT) and other anti-resorptive agents

Several studies have demonstrated a protective effect of postmenopausal HRT on subsequent fractures of the wrist and hip.^{100 101 102} Some studies have suggested that oestrogen supplements may stop menopausal bone loss and maintain bone density for at least 15 years, and can reduce fracture risk by up to 50%.¹⁰³ The issue of risks and benefits associated with HRT, however, needs to be resolved before an informed decision can be made about the use of HRT in injury prevention.

Other effective anti-resorptive therapies include bisphosphonates (etidronate, alendronate, pamidronate) and selective oestrogen receptor modulators (raloxifene). The former have been shown to reduce both vertebral and hip fractures while the latter have reduced only vertebral fractures.¹⁰⁴

Nutrition: vitamin D and calcium supplements

The evidence for nutritional factors in the development of osteoporosis has been building over recent years. The major nutritional factors associated with bone loss and with hip fracture are calcium and vitamin D. A study conducted in France, which assessed the impact of calcium and vitamin D supplementation on hip fractures, found a reduction in hip fractures in institutionalised elderly people but not a comparable effect among those living in the community.¹⁰⁵ This finding is believed to be linked with the fact that institutionalised people suffer greater vitamin D deficiency because they have little exposure to the sunlight.

One review has suggested that increasing dietary calcium has the greatest effect in improving bone mass in those with a low bone density and in those who have low calcium intake (<400 mg/day).¹⁰⁶ Vitamin D takes part in the active transport of calcium across the gut and also is involved in regulating bone metabolism, but there may be vitamin D resistance in the gut of those aged over 70 years.¹⁰⁷

Most controlled trials of new agents have used calcium as baseline therapy, thus it is currently advised that calcium supplements be used in conjunction with vitamin D or other active agents.¹⁰⁸ Reasoning tells us if an older person is under weight or under nourished, their risks of injury are greater due to frailty and lack of adipose tissue covering the bone. Until further evidence is available, it would appear that underweight and under nourished risk factors need to be addressed on an individual basis

Modifying extrinsic factors

As noted in the section on risk factors extrinsic factors are those factors external to the individual – the products and environment to which the older person is exposed. These factors are not peculiar to the individual but they act upon the individual depending upon the circumstances that brings the person together with these factors.

External hip protectors

Most hip fractures are related to direct trauma to the hip. Protection of the hip bone itself, by reducing the amount of energy absorbed by the bone, reduces the incidence of fracture. The use of an external hip protector has been found to lead to a reduction in fractures of the neck of femur following a fall.¹⁰⁹ Although hip protectors do not prevent a fall from occurring, they may reduce the severity of the fall, and may therefore be helpful in the management of high-risk people (for example, those with osteoporosis or those who fall repeatedly). In one study of the effectiveness of hip protectors, the relative risk of hip fracture following a fall was reduced from 3.3 to 0.46 in women and 3.1 to 0.29 for men.¹¹⁰ Compliance with wearing hip protectors is an essential factor in the effectiveness of external hip protectors. One study has shown high acceptability and wearing rates for the protective garment.¹¹¹

Alarms and alerting systems

Alarms and alerting systems are designed to promote speedy assistance, and thus reduce the amount of time that someone who has fallen lies unaided. They do not prevent falls or injuries per se, but may be important factors in the post-fall phase, either by reducing the 'long lie', or by increasing the faller's confidence. Many nursing homes and residential care settings have installed 'help buttons' close to the ground. An ambulatory alarm, designed to be secured to the thigh of the older person and activated when the leg moves by 45 degrees, was found to reduce falls by 45% in a general medical ward and by 33% in an orthopaedic ward in less than one year.¹¹² However, such a device would have limited usefulness in the community setting.

Development of social support networks with friends, neighbours, and relatives, involving regular social visits and routines, may represent a cheaper alternative to alarm systems for those living at home, although they will not necessarily reduce a 'long lie' significantly.

Home modification

As most falls in older people occur in and around the home, the correction of hazards within the home has the potential to reduce the frequency and severity of falls in older people.¹¹³ While home modification has been included in many multi-strategic programs, the evidence of this as an effective strategy, or sub-strategy, is not strong. There is promise, however, in using existing infrastructures such as home care services or aged care assessment teams (ACAT) to conduct brief environmental hazard assessments and develop tailored modification programs for the older people they visit.

One study, a randomised controlled trial, reported that significantly fewer subjects (36%) in the intervention group had fallen over a twelve month follow-up compared to the control group (45%).¹¹⁴ The intervention consisted of home visits by an occupational therapists using a standardised assessment tool and modification of environmental hazards. All subjects were telephoned two weeks after the visit to further encourage the modifications if needed. The most commonly recommended modifications were the removal of loose mats, the use of non-slip mats for the bath, advice on safer footwear and on how to more safely perform certain activities around the home. The authors concluded that the study provides the best evidence to date, that home modifications might prevent falls. However, they cautioned that the

modifications alone may not have been the sole contributing factor – since the intervention group also reported fewer falls away from home during the same interval and there was a fairly high non-compliance rate (from 30-50% at the 12 month follow-up). It is noteworthy that most of the subjects were recruited into the program while in an acute care hospital and home visits by an occupational therapist were not part of their usual care.

Upon reviewing falls prevention options where resources are limited, Gill (1999)¹¹⁵ concludes that there is greater value in addressing intrinsic factors in older people at high risk of falling than environmental hazards.

Environmental modifications for residential care settings

Falls within residential care settings are linked with the degree of mobility of the residents¹¹⁶ and clearly environmental modifications need to be undertaken as appropriate for the population in care. Environmental modifications to nursing home environments are known to include: carpeting in high traffic areas and non-slip floor surfaces elsewhere, better lighting, bed stabilisers, lowered bed heights and the use of electronic warning devices and increased proximity to the nurses station. However, none of these has been investigated for their contribution to falls risk reduction (Ray et al, 1997b - as cited in National Ageing Research Institute, draft 2000).¹¹⁷

Modifying acute care settings

Efforts to address environmental hazards as a cause of falls in older people in hospital settings have included reduced bed heights, call bell systems, lighting and floor covering, and reduction of physical restraints. While the evidence suggests these approaches offer promise, it has been ascertained primarily through descriptive and retrospective study designs. There are no reported strong studies such as randomised controlled trials.

Footwear

Despite a lack of conclusive evidence on the efficacy of the 'fall-resistant shoe', there is obvious plausibility in avoiding shoes with high heels, no tread, or those that are loose or ill-fitting. Strategies for improving footwear worn by older people have included developing recommendations for selecting shoes and

education programs to increase awareness of appropriate footwear. However, in general, interventions have generally been ineffective in promoting the wearing of sturdy shoes. Availability, access and cost, as well as foot problems, difficulty in putting them on, reluctance to make changes, and lack of knowledge about their importance, are potential barriers to older people changing their footwear.¹¹⁸ Interventions that include a focus on reducing falls due to wearing inappropriate footwear need to include education about the ways in which shoes contribute to falling. They should also cover the importance of wearing sturdy shoes when engaged in activities of daily living, as well as details about the characteristics of a sturdy shoe (including costs, availability, and acceptability). It has been suggested that footwear programs may need to be developed separately for the very old (over 85 years) and frail, and for different sexes.¹¹⁹

Combining intrinsic and extrinsic approaches

Risk assessment and multi-factorial targeted interventions

There is strong evidence to support the approach to falls prevention of individual risk assessment of falls risk and the tailoring of strategies to address specific risk factors.¹²⁰ A Cochrane review of combined tailored strategies including behaviour modification to reduce risky behaviours and environmental hazard modification found, using pooled data from two studies, a 20% (significant) reduction in the number of fallers, but no significant reduction in the number of falls resulting in injury.¹²¹ The review also reported similar outcomes when examining broader interventions with older people living within the community.

Risk assessment and targeted multi-factorial interventions among older people at 14 nursing homes was evaluated for its impact on falls and injurious falls.¹²² Findings indicated a 19% (significant) reduction in falls and 31% non-significant reduction in injurious falls.

It would appear that such programs offer promise, particularly with those older people at higher risk of falling – with nursing homes and emergency departments being appropriate points of access to those at higher risk.

Population-based multi-factorial approaches

An alternative approach to address multiple risk factors simultaneously is the health promotion/population-based intervention of a multi-strategy approach. Such an approach does not lend itself to randomised controlled trials since it is delivered at a community, rather than individual, level. Evidence of the effectiveness of this approach is growing, but as yet, has not developed to the point of being able to assess the contribution of specific components of the multi-strategy program.

A prospective cohort study comparing randomly selected samples from intervention and control communities was undertaken on the East Coast of Australia.¹²³ The community-based intervention targeting independently living older people over 60 years of age was conducted over four years and addressed the multiple risk factors of unsafe footwear, poor vision, inappropriate medication, balance or gait, insufficient exercise and environmental hazards. With acknowledged limitations of the study, there were two independent measures of the program's impact: a 22% lower incidence of self-reported falls and a 20% lower fall-related hospitalisation rate in the intervention area compared to the control area. There were concomitant indications of relative increase in intervention subjects adopting a preventive attitude and increased participation in falls prevention activities. The findings from this single study provides promise for the population approach to multi-strategic falls prevention programs targeting older people living independently within the community.

A multi-strategic approach has been pilot tested with another group of older Australians - hospital patients over 60 years of age.¹²⁴ The program consisted of the use of a standardised falls-assessment tool, the use of an alert system where indicated, prevention components of patient education programs and staff education to enhance falls assessment and prevention. The mean monthly fall rates (falls per 1,000 bed days) changed from 7.77 six months prior to the program and 4.42 for the six months following the program ($p=0.056$) that approached statistical significance. In another study, older people were recruited into an intervention or control group following presentation at an emergency department following a fall (hence a high risk group). Results indicated that the risk of falling was (significantly) reduced by about 60% in the

intervention group, and the risk of recurrent falls was also significantly reduced to by approximately the same degree.¹²⁵

Summary of proven and promising strategies

The implementation of falls prevention programs is gaining momentum.¹²⁶ In general, the review presented in this section of this report suggest that

many falls are preventable, falls prevention strategies should be developed in view of the sub-group of older people being targeted, and there is greater weight of evidence for the effectiveness of programs that focus on intrinsic risk factors and those that are multi-strategic or act simultaneously to reduce multiple risk factors. Below is a summary table of the proven and promising countermeasures for fall injuries among older people residing in the community, residential and acute care settings.

Community	Supported Residential Care	Acute Care
<ul style="list-style-type: none"> • Exercise to enhance flexibility, strength, balance & gait • Population-based multi-strategic interventions • Osteoporosis prevention and treatment • Improved vision (via wearing hat/sunshade and not wearing bi-focals) • Nutritional strategies – particularly calcium and Vitamin D supplementation • Hip protectors for recurrent fallers 	<ul style="list-style-type: none"> • Individual assessment and tailored interventions • Hip protectors for those at high risk of falling • Medication management • Vitamin D and calcium supplementation. • Exercise 	<ul style="list-style-type: none"> • Personal and environmental assessments and tailored programs linked with home care following hospitalisation • Ambulatory alarms on older persons in general and in orthopaedic wards • Hip protectors

Table 3. Summary of proven and promising countermeasures for fall injuries in older people residing in the community, residential care and acute care settings

Section 5

Priority falls prevention strategies for the local Areas of NSW

NSW Health future directions for falls prevention in older people

At the time of printing, a proposal has been forwarded for consideration by NSW Health for a policy on preventing falls in older people in NSW. Below is an outline of the model for planning falls prevention activities within NSW over the next few years that is being proposed. The model reflects the current framework for action being developed by the Commonwealth Department of Health and Aged Care in its focus on three population groups at risk:

1. people who live independently within the community
2. older people who are in supported residential settings (such as nursing homes and hostels)
3. older people who come into contact with the health system through the acute care system – as a result of a fall or any other medical condition.

The proposed NSW model, based on the available evidence, has extended the targeted age group of those living independently within the community to people in their 40's. Without a change in the rate of falls in older people, the current number of hospital bed days

due to falls in among those over 75 years old will double by the year 2051 as a result of changing demographics (Moller 2000).¹²⁷ The most promising prevention strategy for reducing the number of injuries due to falls lies in increasing flexibility, muscle strength, and bone strength through increasing the level of exercise. The focus of future initiatives in falls reduction should include an emphasis on promoting exercise as a routine lifestyle choice among those who will be in this high risk category (over 75 years) within the next few decades.

Below is a summary of the main considerations and areas of emphasis raised in the state strategy in planning people local falls prevention local areas. Effective falls-related injury prevention programs serve to bring about sustainable changes in the risk factors associated with falls in older people. It is therefore important that programs focus on changes in public policies, in environments and settings, in the behaviour and organisation of health care services, and in community attitudes that determine older people's capacity to reduce their risk of falling and of sustaining an injury. The following section provides some ideas on program strategies and partners to address each of the target areas covered in the matrix, above.

	Community	Supported Residential Care	Acute Care
40-64 year olds	Create a place for exercise within their lifestyles – including workplaces. Nutrition	Early dementia – mobile and at high risk. Work with organisations providing care – risk assessment, gentle exercise.	Risk of fracture is low – but opportunity to access group more open to change in lifestyle
65-74 year olds	Preventive maintenance – regular exercise plus a change to gentle exercise Nutrition	Work with organisations providing care – focus on hip protectors, gentle exercise. Calcium & vitamin D supplementation	High risk post operative – focus on gentle exercise, medication management, risk assessment
75 years or over	Harm minimisation – prevent accelerated supported care that often results from a fall. Gentle exercise	High dementia, high risk although activity is lower. Work with organisations providing care.	High risk – focus on medication, and home environment while recovering.

Planning local interventions – ideas for strategies, partners and resources

The following section provides a brief list of ideas, partners, resources and gaps in the current knowledge base that may be helpful in developing local strategies and evaluation plans. The tables are intended to provide ideas rather than posing as a prescriptive ‘cookbook’. It is not intended to be comprehensive, but to aid discussions you may have with local partners in expanding, refining or developing local initiatives in the major areas of focus within NSW which include:

- increasing physical activity (or exercise) to reduce falls and falls injury among older people living in the community
- multi-factorial approach to preventing falls in older people living in the community
- preventing falls injuries in high-risk populations: residential institutions
- planning hospital-based falls prevention activities.

Increasing physical activity to reduce falls and falls injury among older people living in the community

There is growing evidence that participation in regular exercise improves balance,¹²⁸ mobility and reaction time,¹²⁹ and can reduce the risk of injury following a fall. The strongest evidence comes from trials on older people living independently within the community. It should be noted that many of the trials have been with selected subjects and there have been few community-based trials of exercise promotion. With many established facilities, services and other infrastructural supports for promoting exercise within the community, the challenge is to ensure that these are made accessible, appropriate and attractive to older people. Below are some ideas for planning to increase physical activity opportunities for older people within local communities.

Table 4. Planning to increase physical activity at the local level - summary

Ideas /strategies	
	<ul style="list-style-type: none"> ● Establish connections with access committees in local councils to improve facilities for older people across the whole local area ● Link falls prevention strategies with other municipal plans eg community safety plans and social plans ● Link planning with national and NSW Health physical activity policies and strategies (see available resources) ● Work with Department of Sport and Recreation/Councils to develop and implement walking program (and/or safe routes for walking) for older people, or to develop cycle ways/shared pathways ● Encourage local fitness centres and senior citizens’ organisations to conduct gentle exercise programs and healthy lifestyle courses ● Encourage introductory level gentle exercise classes ● Encourage local gyms and senior citizens’ organisations to conduct gentle exercise programs and healthy lifestyle courses ● Use local talent to promote falls prevention message in media stories and use these as key influences to advocate falls prevention measures in the community ● Work in collaboration with existing local groups to establish a pattern of exercise eg carers groups, social groups, aged day cares, day hospitals etc. ● Work in collaboration with physiotherapists, continuing care consultants and community health workers to establish home based programs

Table 4. Planning to increase physical activity at the local level - summary continued

<p>Ideas /strategies</p>	<ul style="list-style-type: none"> • Work in connection with GPs and other health care providers to develop clinical pathways/ care plans and approaches to ‘at risk’ assessments/discharge planners • Encourage local bus companies to provide access to fitness centres etc • Encourage shopping centres to open their premises before and after hours as safe walking circuit areas • Development of a gentle exercise video 	
<p>Potential partners</p>	<p>Local government Recreational clubs/gyms Dept. Sport and Recreation Senior citizens’ organisations Service clubs General practitioners Aged day care Dept of Housing Retirement villages Veteran Affairs</p>	<p>Home & Community Services Health Care providers Sporting organisations Local bus companies Shopping Centres Department of Veterans Affairs Fitness NSW NAGE TAFE (fitness leaders course)</p>
<p>Gaps in the evidence</p>	<ul style="list-style-type: none"> • Relative impact of different types of exercise on the risk of falls in older people • Acceptability to older people of different types of exercise • Duration and intensity of exercise to significantly impact on fall injury rates • Impact of exercise programs in concert with other strategies such as calcium supplementation, changes to footwear or medication 	
<p>Available resources</p>	<ul style="list-style-type: none"> • (Videos) ‘Tai-chi for over 55s’ and Tai-chi for people with arthritis’ Contact: Tai-chi Production/Tai-chi for Arthritis (Tel. (02) 9533 6511) • Falls Prevention Package for Retirement Villages. Arthritis Foundation (NSW affiliate Tel. (02) 9683 1622) • Physical Activity for Older Adults: A simple guide to getting active. NSW Department of Sport & Recreation • Bauman A, Brown, W, Owen, N (2000). Getting Australians Active: Best practice for the promotion of physical activity (Manuscript under review). • Australian Sports Commission (2000). Active Australia: A national plan 2000-2003, Canberra ACT. • Strategic Inter-Governmental forum on Physical Activity and Health (SIGPAH), Developing an Active Australia: A work plan for 2000-2003. A working document of the strategic Intergovernmental forum on Physical Activity and Health (SIGPAH) www.health.gov.au/pubhlth/strateg/pp/ • Motivating People Over 50 to Participate in Physical Activity: Central Coast Area Health Service, 1999 	

A multi-factorial community-based approach to falls prevention

The community-based interventions have acquired considerable support in the falls prevention movement. This is not surprising since it employs best practice approaches in health promotion and injury prevention – in adopting the approach of working in close consultation with community groups as partners in the planning and implementation process and addressing multiple risk factors simultaneously –

such as unsafe footwear, poor vision, inappropriate medication, balance or gait, insufficient exercise and environmental hazards. Evidence for the impact of this approach however is still limited to a few studies – ‘though indicating positive outcomes for the groups targeted (independently living older people over 60, and those over 60 who had been hospitalised). A multi-factorial approach clearly offers promise and warrants trialing with other geographic and demographic groups of older people.

Table 5. Planning a multi-factorial community-based falls prevention program - summary

Ideas /strategies	Assessment and modification of intrinsic/personal risk factors	
	<ul style="list-style-type: none"> • Work with general practitioners, Aged Care Assessment Teams and home care workers to promote use of assessment tools and encourage referrals to local services – exercise programs, vision checks, review medication, footwear assessments etc. • Work with local media, senior citizens groups, service clubs to raise awareness of the need to assess own risk factors • Work with local pharmacists and optometrists to promote medication and vision assessments 	
	Assessment and modification of the safety of the environment	
	<ul style="list-style-type: none"> • Work with home care services or aged care assessment teams (ACAT) to conduct brief environmental hazard assessments and develop tailored modification programs • Encourage local government to adopt a systematic approach to identifying, assessing and controlling public environmental hazards • Suggest gradual inclusion of falls-safe features in current council buildings and facilities • Encourage falls-safe features in residential developments specific to older people • Suggest local government change fees associated with building applications designed to improve access or prevent falls • Conduct a campaign to promote safe bus travel by older people • Encourage local building industry to include more safety features 	
Potential partners	Review of the circumstances surrounding any previous falls	
	<ul style="list-style-type: none"> • Focusing on high risk individuals who have fallen previously and developing assessment and tailored risk factor specific interventions • Work with local service clubs. Hardware stores to assist those at high risk with the installation of grab rails, non-slip mats etc in the bathroom • Home Care type programs (DVA) 	
	General practitioners Local government Geriatricians Home care workers Local retailers (eg footwear, hardware) Media	Local optometrists Physiotherapists Dept of Housing Occupational Therapists Community Health Centre Building industry

Table 5. Planning a multi-factorial community-based falls prevention program - summary continued

Potential partners	Aboriginal Medical Service Senior citizens' organisations State Transit Authority Local pharmacists	Dept. Veterans Affairs Aged Care Assessment Teams Dept. Sport & Recreation NSW Ambulance Service
Gaps in evidence	<ul style="list-style-type: none"> • Relative contribution of different approaches to falls risk reduction • Translation of existing models (such as North Coast Stay on Your Feet program) to other areas/ populations • Contribution of assessment and tailored program to falls reduction versus the impact of the interaction with the health professional 	
Available resources	<ul style="list-style-type: none"> • Falls Prevention Package. Arthritis Foundation • Stay on Your Feet Program resources: information booklet, resources for the media (community service announcements), an action plan (contact: Northern Rivers Area Health Service) • (Video) Staying On: living at home safely, Queensland Health, 1991 	

Preventing falls injuries in high-risk populations: residential institutions

In residential institutions, the most common factors associated with falls injuries include beds, floors and flooring materials, chairs, crutches, canes and walkers and stairs and steps. Older people living in residential institutions may be considered a higher-risk

population, and the setting provides a more controlled environment for intervention and evaluation. Some of the strategies that can be implemented in the institutional setting are similar to those suggested in previous sections, while other strategies, such as the use of hip protectors are mostly only appropriate for this setting.

Table 6. Planning residential based falls prevention activities – summary

Ideas/strategies	<ul style="list-style-type: none"> • Provide training to aged care staff regarding falls prevention awareness • Work with GPs in the use the Falls Risk Assessment and Management Form (pp 14-15, Shanley- see available resources) • Work with residential aged care team to develop tailored plans for those at high risk of falling • Promote use of hip protectors and other protective clothing for those at high risk • Provide gentle exercise classes and physical assessment for all residents • Conduct an environmental audit of potential hazards (pp 40-43 in Shanley – see available resources) • Develop a strategy to creating a falls-safe environment • Encourage vitamin D and calcium supplementation for all residents • Work with GP to reduce the risk of falls through medication management • Educate residents in risk management • Conduct incontinence management programs
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Table 6. Planning residential based falls prevention activities – summary continue

Potential partners	Hostels Nursing Homes Geriatricians ACAT ACCP Accredited Pharmacists	Residential Care Staff General practitioners Dept. Vets Affairs Physiotherapists Occupational therapists Residents
Gaps in evidence	<ul style="list-style-type: none"> • Factors associated with compliance with recommendations such as hip protectors, exercise programs and nutritional changes • Optimal exercise regimens for significant reduction in injuries due to falls • Magnitude of impact of alarms on preventing injuries due to falls 	
Available resources	<ul style="list-style-type: none"> • A comprehensive resource for planning falls prevention strategies in residential aged care settings is provided in 'Putting Your Best Foot Forward: Preventing and managing falls in aged care facilities'. Chris Shanley – Centre for Education & Research on Ageing, Commonwealth of Australia, 1998 (Tel. (02) 9767 7670, or Fax. (02) 9767 5419) • Falls Prevention in Nursing Homes. A multi-strategic approach. Western Sydney Area Health Service. 	

Planning hospital-based falls prevention activities

Preventing falls among older people in acute care or sub-acute care (eg rehabilitation) makes sense since this group is at high risk of falling and high risk of complications from a fall, they are a somewhat 'captive and motivated' target group often needing to make changes upon returning home, and there is a duty of care issue in providing patients with a safe stay in hospital or other health care setting. Little sound research has been done, however, to report on the effectiveness of different approaches to preventing

injuries due to falls among older people in acute care and sub-acute care settings. Promising strategies include conducting personal and environmental assessments and developing tailored programs that are linked with home care following hospitalisation, the use of ambulatory alarms on older persons in general and in orthopaedic wards, and reduction in the use of restraints. Other strategies that need to be evaluated exercise prescription to prevent deconditioning, improve or maintain mobility and balance training, minimising bed rest except where medical conditions require otherwise, medication management.

Table 7. Planning hospital based falls prevention activities - summary

Ideas /strategies	<ul style="list-style-type: none"> • Provide training to aged care staff regarding falls prevention awareness • Conduct and environmental audit of potential hazards for patients within the hospital • Use a personal risk assessment tool to identify those at high risk of falling upon returning home • Develop links with home care services, occupational therapists, etc to develop tailored programs to reduce the likelihood of falls and associated injuries affecting older people whilst they in the hospital setting and/or a continuing care model for high risk older people • Provide education for patients and family about risk factors
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Table 7. Planning hospital based falls prevention activities - summary continue

<p>Ideas /strategies</p>	<ul style="list-style-type: none"> • Move beyond education and awareness raising towards a more systematic approach to identifying those at risk of falling, reducing their risk of falling and reducing the risk of injury from falls that cannot be prevented • Conduct patient risk assessment completed on admission and repeat prior to discharge • Develop a ward care plan and policy and implemented accordingly • Conduct group and individual ward exercise program • Continuing care plan implemented by GP and multidisciplinary team as part of the Enhanced Primary Care Package program¹⁵ • Establish a hospital multidisciplinary falls team • Evaluate any of the above falls prevention strategies/programs within selected hospitals/wards 	
<p>Potential partners</p>	<p>Hospitals Emergency Departments Hospital home support staff ACCP Accredited Pharmacists</p>	<p>NSW Transcultural Aged Care Service Geriatricians</p>
<p>Gaps in evidence</p>	<ul style="list-style-type: none"> • All falls prevention strategies in acute care and sub-acute care (rehabilitation) warrant further evaluation. It is highly recommended that all implemented strategies in this area be accompanied by an evaluation plan. 	
<p>Available resources</p>	<ul style="list-style-type: none"> • Falls Risk Assessment Tool (FRAT): Peninsula Health Care Network (Tel. (03) 97881260)¹³⁰ • Falls Prevention Clinical Pathway: Aged Care Unit, Canberra Hospital (Tel. (02) 62442774)¹¹³ 	

Section 6

Planning Area-based interventions

Injury prevention activities that are well-planned, integrated with existing systems, and address multiple causes are likely to be more successful and more sustainable than those that are not. Effective interventions are based on good information about the problem and the characteristics of populations affected, careful analysis of the environmental and behavioural determinants of the problem, and assessment of the evidence for action. Effective interventions have clear goals, engage communities, involve partner organisations from other sectors, and evaluate appropriately both the quality and effectiveness of the intervention.

At the Statewide level the Injury Prevention Policy Unit, NSW Health has taken responsibility for:

- Developing a policy for the prevention of falls in older people in NSW. As identified in Section 5, this policy asserts the importance of addressing falls prevention in view of projected health care costs associated with falls in older people over the next fifty years. It sets out the model for making investments in falls prevention activities in community, residential care and acute care settings.
- Investing in Falls Prevention 2000 for Metropolitan Areas. This partnership with metropolitan Area Health Services will provide a concerted strategy for ensuring that access to activities designed to reduce fall injury is provided for the 'at risk' groups, together with a communication strategy to promote this access. The program will be coordinated by Western Sydney Area Health Service.
- Developing a similar program for rural areas.

Identifying the potential roles for Area Health Services in the prevention of falls

This section identifies factors that need to be considered in choosing countermeasures and covers some potential roles and responsibilities of Area Health Services in the prevention of falls in older people. Table 8 proposes a set of elements of injury prevention, which can be used as a checklist during the planning and reviewing of a falls prevention program.

Table 8. Examples of the roles and activities that can be undertaken at local Area level to prevent falls in older people

STAGE	POSSIBLE LOCAL AREA ROLES AND ACTIVITIES
Planning	
Understand the size and nature of the problem in your Area	<ul style="list-style-type: none"> • Construct a socio-demographic profile of local community • Examine local hospital data – the Public Health Unit will assist in identifying what is already available and what needs to be extracted from other sources • Determine health care costs and overall significance of falls in the local community – this will be valuable in gaining attention and funds from key agencies • Work with nursing homes, general practitioners and hospitals to provide sentinel surveillance of falls • Collect qualitative data through focus groups and consultations with older people, health professionals
Identify and work with local partners	<ul style="list-style-type: none"> • Contact key organisations and individuals involved in service delivery to older people: e.g. health care, residential care, local government, recreational facilities, community services, housing, community groups clubs and associations, to identify current level of activity and interest in falls prevention. This can be informally or through a formal/standardised process such as an audit • Consider establishing an intersectoral planning group – or sub-groups for different areas of focus (i.e. be wary of spending people’s time discussing projects not within their area of interest) • Involve older persons’ groups in the planning and implementation of the project • Focus on those partners where the commitment is real – i.e. there are signs of uptake of the issue into their business plans, policies or there are offers of contributions to the project in terms of resources, personnel and/or money • Develop a map of services and products for older people to assess needs and opportunities • Use existing community resources to access ‘hard-to-reach’ groups: for example, conduct mobile falls prevention programs in rural areas
Identify area(s) of focus	<ul style="list-style-type: none"> • Based on needs, opportunities and available evidence select area(s) of intervention for the target group(s) – community, residential and/or acute care • Where evidence is not strong for selected strategies, ensure that evaluation is a significant component of the project(s) • Each partner organisation should be part of the process of identifying roles and responsibilities for components of the intervention – ensure they see the relevance and value of their contribution • Keep the intervention simple and manageable within the timeframe and resources available • Select strategies that have in-built features to achieve sustainability – work with existing infrastructures, policies, facilities and services – that can continue the work after the program has ceased
Plan for evaluation	<ul style="list-style-type: none"> • Clearly define project objectives • Establish a system to monitor activities being undertaken as part of the intervention – including inputs (time, money and resources) and reach (participation, coverage) • Develop measures of process, impact and outcomes to assess the value of the project

Table 8. Examples of the roles and activities that can be undertaken at local Area level to prevent falls in older people

STAGE	POSSIBLE LOCAL AREA ROLES AND ACTIVITIES
Planning	
Plan for evaluation continued.	<p>Measures of process may include:</p> <ul style="list-style-type: none"> - program reach 'who knew about the program?' - how well the program was implemented - a record of costs involved in implementing the program
	<p>Measures of impact may include:</p> <ul style="list-style-type: none"> - changes in physical activity levels - changes in knowledge of home hazards - changes in attitudes towards physical activity - development, implementation of policies and regulations relating to falls - evidence within the community of an increase in provision of exercise routes, classes programs - environmental changes: for example, number of hostels and nursing homes undertaking environmental assessments and safety modifications
	<p>Measures of outcome may include:</p> <ul style="list-style-type: none"> - rate of falls in community dwelling older people before and after the intervention - rate of falls-related injury in community dwelling older people before and after the intervention - Budget for collection of follow-up data at appropriate intervals throughout the project - Produce a baseline report describing current level of preventive activity, attitudes, (of target groups and key organisations) as well as current level of risk factors for falls and incidence of falls among older people in the community. Select a few 'meaningful' key indicators (that will help map progress rather than attempt to measure everything).
	<p>For more detailed information on issues involved in program planning and evaluation, the reader is referred to other publications ^{131 132 133}</p>
Implementation	
Work with partners	<ul style="list-style-type: none"> • Keep enthusiasm for the program alive through good communication channels, providing feedback on all events and evaluations, having a project newsletter and celebrating milestones • Monitor commitment levels of partner organisations on an ongoing basis (through surveys, discussions during meetings, interviews) and develop strategies to address waning interest • Keep things flexible to include additional local providers of services willing to participate in the project
Build capacity to prevent falls	<ul style="list-style-type: none"> • Conduct training sessions for other health professionals: for example, increasing awareness in the local Area of the significance of falls, alternatives to pharmaceutical treatments and medication management • Raise awareness of older people of falls risks and falls prevention strategies through education of older people in the community or through clinical interactions • Develop and conduct of clinical assessment of older people in contact with the health care system for gait and balance, vision, physical and psychological health, and pattern of medication use
Monitoring progress	<ul style="list-style-type: none"> • Regularly revisit monitoring and evaluation strategy to ensure that all information is being collected as planned • Revisit objectives to ensure strategies continue to address them

Table 8. Examples of the roles and activities that can be undertaken at local Area level to prevent falls in older people

STAGE	POSSIBLE LOCAL AREA ROLES AND ACTIVITIES
Implementation	
Monitoring progress	<ul style="list-style-type: none"> • Keep alert to opportunities to reach disadvantaged groups • Develop progress reports and press releases to keep decision makers and the community informed about the progress of the project • Disseminate information on new and existing products and materials that can reduce falls injuries
Addressing sustainability	<ul style="list-style-type: none"> • Work with local councils, nursing homes, hospitals, service clubs to ensure program is taken up within existing business plans and future activities • Assist these organisations in policy development • Provide key influencers in the community (eg. GPs, media, community leaders, recreations services) with training and resources to expand their capacity to address falls prevention • Identify resources, training and other 'outputs' that can be developed or utilised to extend the aims of the project beyond its funded life
Program conclusion	
Evaluation and reporting	<ul style="list-style-type: none"> • Ensure program resources allow for the final evaluation and report writing • Report on the things that worked well and those that did not • Note all signs of project sustainability as well as measured changes on key indicators • Provide a list of clear recommendations for future similar initiatives • Disseminate the report to all partners involved in the project • Provide feedback to the community on how the project went • Share the report with colleagues through meetings, conferences, journals and newsletters

Section 7

Conclusion

Several factors have come together to create both the opportunity and the imperative to build new, and strengthen existing, partnerships in the prevention of fall injuries among older people.

- We are faced with escalating health care costs associated with fall injuries among older people due to our aging population. If the rate of fall injuries remains unchanged, by 2051 we could expect the number of hospital beds days to more than double the current number. This means we would need 800 extra hospital beds in NSW alone – or the equivalent of two new 400 bed hospitals.
- We have a strong knowledge-base of the size and cause of the problem of falls in older people and a growing understanding of what works in preventing falls.
- In addition to the years of activities and coordination in falls prevention by local Area Health Services and other stakeholders, there has been recent broadening of the recognition of the problem. This recognition has been aided by the 1999 International Year of Older Persons (IYOP), a funded commitment to the issue by the Commonwealth Department of Health and Aged Care (1999-2002) and the NSW Health initiative: Falls Prevention 2000, for metropolitan areas and a parallel strategy for rural areas.

Current approaches to preventing fall injuries among older people take into account the multi-faceted nature of the causation of falls as well as the three key settings in which we have contact with older people: as independent residents within the community, through supported residential care (such as hostels and nursing homes) and through the acute health care system. Therefore, it stands to reason that there is no one approach to falls prevention – but a myriad of options that need to be considered in a coordinated way by stakeholders in the health and well-being of older people.

For those older people living independently within the community, the evidence suggests that the most promising strategies include increasing physical activity (or exercise) to enhance flexibility, strength, balance and gait; population-based multi-strategic

interventions; nutritional strategies (particularly calcium and vitamin D supplementation); initiatives to improve vision and preventing and treating osteoporosis. Through coordinated planning at the local level, access to these activities can be enhanced for older people at greatest risk of a fall injury.

Supported residential settings provide a more ‘captive’ target group where individual assessments and policies and programs can effectively reach those at greatest risk. For this group, greatest promise has been found to lie with individual assessments and tailored interventions; medication management; hip protectors for those at high risk of falling; gentle exercise promotion and vitamin D and calcium supplementation.

Less research has been done on interventions targeting older people accessed through the acute health care system. Promise has been found, however, in providing personal and environmental assessments with tailored programs linked with home care following hospitalisation; ambulatory alarms on older persons in general and in orthopaedic wards and hip protectors for those older people considered at high risk of falling.

The way forward in the prevention of fall injuries in older people rests with widespread recognition that many falls are preventable and that coordinated planning at the local level. Falls prevention strategies should be developed in view of the sub-group of older people being targeted. There is greater weight of evidence for the effectiveness of programs that focus on intrinsic risk factors and those that are multi-strategic or act simultaneously to reduce multiple risk factors.

Effective local programs will be those developed alongside: the identification of local needs, opportunities and partners; awareness of central policies and initiatives; as well as knowledge of and access to existing resources that can be used or adapted. It will be vital that all initiatives are developed in light of current evidence of effective strategies and the current gaps in our understanding of what works. Where evidence is employed or innovation is accompanied by planned evaluation, and opportunities to share local experiences and evaluation outcomes are sought, then we can expect to impact the problem of fall injuries among older people.

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