Chapter 2: General Falls Prevention Strategies

2.1 Principles Of Prevention

The identification of those at risk of falling is essential in terms of directing both falls prevention and the development of long term management strategies. Falls in the elderly are rarely due to one overwhelming intrinsic or extrinsic factor. Falls can occur due to any acute medical illness but often occur in a situation where people have pre-existing multiple factors that increase their risk for falling. These include deteriorating physical/physiological changes that may occur with age (decreased strength, balance, mobility, vestibular, somatosensory and visual function) as well as deteriorating mental function (reaction time, depression, anxiety, delirium and dementia) (8). More important factors include the multiple pathological states that may involve a variety of systems (cardiac, neurological, musculoskeletal and sensory systems) and the influence of medications (6, 8). This combination of physiological change and disease results in the development of risk factors such as visual impairment, impaired function, sedative usage, postural hypotension, decreased lower limb strength and impaired balance and gait. Evidence has shown that the risk of falling is increased as a result of the number of risk factors (4, 12, 25, 26). Tinetti found the annual risk of falls increased from 27% in those with no or one risk factor to 78% in those with four risk factors (26).

The most common intrinsic factors related to falls presentations are gait disturbances, syncope, central nervous system lesions, postural hypotension and dizziness (16). Some risk factors such as muscle strength, medication side effects and hypotension are reversible. Others such as long standing neurological conditions are less likely to be modifiable. Risk factors such as visual impairment need accurate assessment to determine if reversible pathology is present.

Figure 3. Common Causes Of Falls In Older Patients Presenting To The Emergency Department
(Adapted from 16)

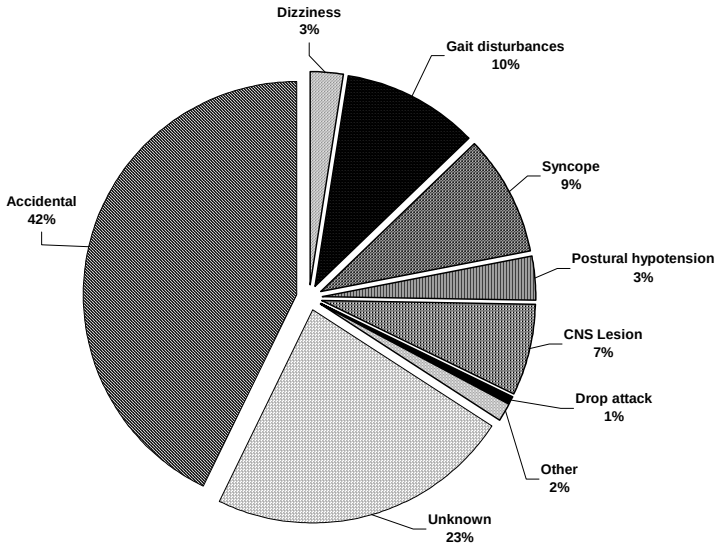

Table 1. Other Commonly Recognised Intrinsic Factors

- Deteriorated health, mobility and strength
- Medical Conditions – e.g. Parkinson's Disease, dementia, depression, cataracts, glaucoma, osteoarthritis.
- Reduced neurosensation
- Lack of exercise - poor muscle tone, diminished strength and reduced bone density.
- Fatigue
- Syncope (implicated in 2-10% of falls) (8)
- Dizziness (implicated in 5-20% of falls)(8)
- Wandering behaviour
- Impaired cognition / confusion
- Impaired gait / balance (implicated in 10-25% of falls) (8)
- Prior history of falling
- Alcohol use
- Medications affecting balance, vision or alertness.
- Polypharmacy interactions (6, 13)

The cause of the fall, and predisposing risk factors for falls and injury, needs to be investigated after the initial treatment of any acute injury sustained by those who have fallen. Reversible medical and surgical factors need to be addressed following accurate assessment and diagnosis. In particular, treatment of cardiovascular disorders including carotid sinus hypersensitivity should be explored (27). Rehabilitative interventions and environmental changes are often required to assist people in returning to their previous level of functioning.

2.2 Identification of Intrinsic Factors And Multidisciplinary Collaboration

The development of a system for the identification of fallers and intrinsic factors for falls is required. The community dwelling elderly have the highest mortality rate for home accidents with falls being responsible for most of these incidences (28). A study by Graham and Firth (1992) revealed that while the incidence of home accidents in people aged 65 and over was high, few events were reported to medical services. The main contact for patients reporting home accidents was their General Practitioner (GP) or emergency departments (29).

There is evidence that geriatric problems are not well identified and are very prevalent in the community. William and Taylor reviewed the literature on previous unidentified problems and reviewed current practices in England to improve screening in elderly populations (30, 31). In summary these reviewers found that screening was best conducted on an opportunistic basis when patients visited their practitioners and that functional assessment should be the primary objective of screening in older people. As eighty-five percent of the older population visit their GP at least once a year, the chances for opportunistic screening in General Practice are substantial. Further evidence of the prognostic importance of functional screening was provided by a study performed in 1995. Functional assessment of basic activities and cognitive ability was more predictive than diagnosis for outcomes such as the probability of requiring care and mortality (32).

A study by Bula et al., (1995) suggests that physician cooperation may increase elderly patients' adherence to preventative program strategies (33). The Royal Australian College of General Practitioners (RACGP) have published guidelines for preventative activities in general practice.

Based on conclusions of a Cochrane review (34) which states that multidisciplinary screening of falls risk factors is likely to be beneficial to falls prevention, these guidelines make recommendations that GP's screen their patients for falls risk factors, acknowledging that falls are largely preventable and interventions have been shown to reduce falls rates (35).

A multi-disciplinary approach is required to identify fallers and ensure effective implementation of falls prevention and management strategies. Ideally a multidisciplinary team such as an Aged Care Assessment Team (ACAT) would consist of physiotherapists, occupational therapists, nurses, social workers, podiatrists, dieticians and geriatricians. This team links with general practitioners as well as a range of medical specialists including rehabilitation specialists and orthopaedic surgeons. It is important for these services to collaborate to identify appropriate patients for interventions. As patients who present to their GP are receptive and trusting toward advice and recommendations given to them, GP's are in a position of great influence when it comes to promoting better health options (35). All health care providers can work together to provide appropriate and coordinated multidisciplinary interventions.

2.21 Multidisciplinary Interventions

A large number of preventive community based intervention programmes based on risk factors have been established and evaluated. The best evidence for the efficacy of interventions to prevent falling has emerged from large well conducted randomised controlled trials, and from meta-analysis of these trials. The most effective strategies identified from such trials have utilised the multifaceted and multidisciplinary approach. The following is a summary from the Cochrane review, which analysed eighteen trials and one pre-planned meta-analysis (24).

Significant protection against falling was apparent from interventions which targeted multiple, identified risk factors in individual patients (odds ratio 0.77; 95% confidence interval 0.64 to 0.91), and from interventions which focused on behavioural interventions, targeting environmental hazards plus other risk factors (odds ratio 0.81; 95% confidence interval 0.71 to 0.93). The Cochrane review also found that group exercise intervention, untargeted exercise and health education or health education alone did not reduce the number of falls. Behavioural interventions, targeting risk factors including environmental hazards, and targeted interventions following health screening, were both found to be effective (24).

Another review of falls prevention by the NHS Centre (36) included 36 randomised trials. The conclusion was similar to Cochrane with up to a 37% reduction in fall events found. The FICSIT (Frailty and Injuries: Cooperative Studies of Intervention Techniques) trials took place in a number of settings in North America, and used a variety of multidisciplinary interventions (37). Province performed a pre-planned meta-analysis of data from seven individual FICSIT trials, which included an exercise component. Following the meta-analysis and the Cochrane review, a number of the FICSIT studies have been individually published and have shown intervention affects (38).

Since these reviews a number of additional randomised controlled trials have been completed. McMurdo randomised volunteers to either a group taking calcium (1000mg) or exercise combined with calcium. There was a modest increase in bone mineral density in the ultradistal forearm in the exercise group with a decline in the calcium group. There was a decrease in the number of falls in the exercise group between 12 and 18 months (39). Schimway-Cook, in a nonrandomised trial reproduced Tinetti's work with a multidimensional program based on exercise, balance, mobility and falls risk in community dwelling patients, with a self reported history of 2 or more falls in the previous 6 months. The fully compliant exercise group decreased their falls risk by 33% (40). A multidisciplinary falls clinic was reported to find that 77% of patients seen had no further falls at one year (41).

Campbell et al., in a randomised controlled trial studied the effectiveness of an individualised home exercise programme of strength and balance retraining exercises in reducing falls and injuries in elderly women identified in general practice. The results of this study were supportive of exercise in community dwelling women aged 80 years and over. After one year there were 152 falls in the control group opposed to 88 falls in the exercise group. The mean rate of falls was lower in the exercise than the control group (0.87 (1.29) v 1.34 (1.93) falls per year respectively; difference 0.47; 95% confidence interval 0.04 to 0.90)(42).

A randomised controlled trial with a full factorial design was carried out by Day et al to assess the effectiveness of group based exercise, home hazard management, and vision improvement in falls prevention in older people. The results of this study proved most favourable for group based exercise for preventing falls (rate ratio 0.82; 95% confidence interval 0.70 to 0.97, P=0.02), with further falls reduction being the result of home hazard management and reduced vision management interventions (43).

Many of the above-mentioned intrinsic factors have been targeted within these multifaceted intervention studies. In order to facilitate the early identification of intrinsic factors it is optimal that all elderly patients presenting to the health service are assessed during their presentation. Currently, there is insufficient evidence to support the use of any particular tool for assessment in the range of clinical environments in which the elderly present**.**

GUIDELINE

Elderly persons presenting to Health Care providers should be assessed in terms of the presence of intrinsic risk factors and the subsequent risk of falls. Identified risk factors should be investigated, managed and / or referred to specialist multidisciplinary aged care providers.

Level I Evidence

2.21 Exercise

The elderly are known to be at an increased risk of falls as a consequence of the diminished strength, mobility and muscle tone caused by a sedentary lifestyle with a lack of exercise. Whilst the evidence is accumulating that exercise alone can have a positive effect against the risk of falling (24), there is more evidence to support its efficacy as part of a range of multi-disciplinary interventions.

Exercise has been demonstrated to improve balance (44), mobility and reaction time (45) and reduce the incidence of fall related injury (6, 46-48). In addition to the physical benefits of increased exercise participation in physical activity can also have a positive effect upon quality of life and social interaction (6).

Campbell conducted a randomised control trial in women aged over 80 years who were allocated to either participate in a six month home-based customised exercise program run by physiotherapists, or to receive usual care. Assessments at 12 months demonstrated a decreased incidence of falling, increased level of physical activity / balance and a diminished fear of falling in the exercise group as compared to the control group (42). A home based professionally prescribed, balance retraining, muscle strengthening and walking program was reported to be of likely benefit (34).

GUIDELINE

Individualised exercise programs for the elderly can improve balance, mobility, reaction time and reduce the incidence of fall related injury.

Level I Evidence

2.22 Pharmacology

There is a relationship between medication use and falls in the elderly, especially in cases of misuse, inappropriate prescriptions and under or over use of either prescribed or over-the-counter medications (49). It is important to note however, that many studies that have investigated the relationship between medication use and falls have been observational, and the findings may have been confounded by a wide range of other variables associated with the elderly cohort (6, 50).

Further research, particularly in terms of strategies to improve compliance and sustainability of medication withdrawal, is warranted in the clinical setting (46). In conjunction with a home-based exercise program, Campbell et al (1999) carried out a randomised controlled trial to assess the effectiveness of psychotropic medication withdrawal in falls reduction in the elderly. Seventeen general practice groups were involved in the random selection of 93 patients aged 65 years and older. Results at a 44 week follow-up showed that those in the medication withdrawal group had less falls, 17 (30%), than those who continued taking their regular psychotropic medication, 40 (70%). Although there is a significant reduction shown in these figures, the small sample size cannot support definitive statements regarding the association with a reduction in falls and psychotropic medication withdrawal. However, the results of this study do justify further research in this area (51). Gillespie et al., further advocates the gradual withdrawal of psychotropic medication as an intervention likely to be beneficial in the prevention of falls in the elderly (34). Reduction in medications was also found to be of benefit in two other multifaceted studies (9, 15).

GUIDELINE

Adverse effects of medications are a potentially reversible factor in reducing falls risk and should be included in multi-disciplinary falls interventions.

Level II Evidence

2.23 Bone Density

Although bone density is not an obvious risk factor of falling, the risk of fracture is directly related to a decreased bone density (6, 52-54). Whilst reduced bone density has been demonstrated to be associated with aging, immobilisation has been demonstrated to cause a further 2-5 fold reduction in bone density and muscle mass (6, 55). Strategies that improve bone mineral density may therefore be significant in reducing the incidence of fracture following a fall (6). Prior research has not been able to consistently demonstrate a significant effect on bone density occurring following the institution of either weight training and calcium intake (6, 52). However a recent review as found a positive effect of weight bearing exercise on bone density (56). Some studies that have examined the incidence of post-fall fractures have shown a decreased fracture risk with the use of hormone replacement therapy and other anti-resorptive agents (eg. bisphosphonates and selective oestrogen receptor modulators) (6). Evidence-based medicine has shown that treatment, initiated at a T score of –2 or less in women post menopausal for at least 2 years, can reduce the risk of fracture. A single trial has shown that treatment initiated at a T score of –2 or less in men (>30 years), can reduce the risk of fracture (57-59). Bisphosphonates and calcitonin have also been found to reduce steroid induced bone loss (60).

GUIDELINE

Osteoporosis should be identified and treated. Secondary causes of osteoporosis should always be excluded or treated.

Level I Evidence

2.24 Nutrition

The evidence suggests that nutritional factors can play a role in bone density and the development of osteoporosis (6). Some 30 per cent of community dwelling individuals over the age of 60 are reported to be malnourished (46). Although an effect has been demonstrated between vitamin D and calcium supplementation, and a reduction in fractures amongst the elderly in long term residential care, a similar effect has not been demonstrated as strongly amongst the community dwelling elderly (46, 47). This phenomenon is considered as being linked to the reduced sunlight exposure amongst those in long term residential care (6). Improvements in nutritional intake have been proven to be beneficial amongst those who are underweight or under nourished, by increasing bone density and maintaining sufficient adipose tissue to cover the bone, resulting in fewer falls related injuries (6).

GUIDELINE

Treatment of malnutrition can assist in maintaining bone mineralisation, reducing the risk of osteoporosis and minimising the risk of falls related injury.

Level II evidence

2.3 Extrinsic Factors and Behavioural Change

Since the extrinsic factors are external to the individual there is a significant opportunity to modify them, subsequently reducing their effect upon the risk of falling. In some studies more than one third of falls have been caused by extrinsic factors (16).

Table 2. Commonly Identified Extrinsic Factors

- inadequate footwear
- uneven, loose or slippery surfaces
- poor lighting
- time of day
- hospitalisation > 19 days
- people traffic
- inadequate steps – poor design or uneven surface
- height of furniture
- unfamiliar environment
- activities of daily living (e.g. bedmaking, gardening, shopping)
- unsecured floor coverings / rugs
- poor housing design / floor plan (external toilet, hallways / steps too small) (6, 13)

Assessment of elderly people within their home environment has shown promise with randomised control trials, demonstrating a significantly reduced falls risk in participants seen by an occupational therapist for assessment and modification of environmental hazards (61). This falls risk reduction also occurred outside the home. The author concluded that the trained therapist might have been able to institute behavioural change as well. Unfortunately, compliance with recommendations has been less than optimal and has shown a decrease in time (46).

GUIDELINE

All patients discharged from hospital following a falls related admission should have a home visit by an occupational therapist to assess for and modify environmental hazards and behaviour.

Level II evidence

2.31 External Hip Protectors

Hip fractures generally result from direct trauma to the hip bone occurring as a result of the fall (6). Hip protectors assist, not by reducing the risk of falling, but by absorbing some of the force to reduce the risk of fracture (62). The evidence suggests that significant reduction in fractures can be made when compliance with wearing the protective garment is maintained (62-65). Most of the available evidence for effectiveness is for residents in aged care facilities (66).

GUIDELINE

Hip protectors can be useful in minimising hip fractures amongst those who are at high risk of injury from falls.

Level I evidence

2.32 Home Modification

The NSW Health Department reports that somewhere between 25-75% of all falls involve an environmental component. Most falls occur in or around the home, thus placing those with more hazards in the home at a greater risk of falling (6). Elderly patients who report the cause of their fall as being something within their home environment (e.g. poor lighting, unsecured rugs), are significantly more likely to have subsequent falls if home modifications are not implemented (67). Therefore, there is evidence to support the importance of home visitation by health care providers to identify and facilitate the modification of potential risk factors (8, 68).

Whilst numerous hazards within the home have been identified as posing a risk to the elderly, the individual levels of risk have not been determined (6). In terms of its relative importance as a modifiable risk factor, there is evidence to suggest that there is greater value in addressing intrinsic risk factors in those at high risk of falling, as opposed to modifying environmental hazards (69). However, some non-randomised studies have seen significant reductions in falls amongst healthy individuals (70). A number of positive multifaceted studies included home hazard modification with behavioural change and exercise (71, 72).

GUIDELINE

When home hazards have been identified as being a causative factor in a fall, it is important to address modification of these hazards to reduce the potential for subsequent falls.

Level III evidence

2.33 'Long Lie'

Patients who remain on the floor for more than one hour following a fall have a higher morbidity and mortality rate than those who do not experience a 'long lie', independent of the initial injury severity (54, 65). The use of personal alarms is aimed at reducing the duration that the fallen person remains unaided. Whilst the applications are most obviously for use in long term residential and aged care settings, the development of social support networks involving regular contact can potentially reduce the adverse effects related to falls going unnoticed.

GUIDELINE

The elderly who have remained on the floor for greater than one hour post-fall should have living arrangements and social support assessed.

Level IV evidence

2.34 Footwear

Footwear that is poorly fitting, has worn soles, is inadequately fastened or has high heels is often identified as being a contributory factor in falls amongst the elderly (73, 74). Research has not, however, identified an appropriate 'safe' shoe (6).

The literature suggests that there is some resistance to interventions designed to promote the wearing of sturdy shoes, in terms of reluctance to make change, lack of knowledge regarding the importance of footwear, difficulty in putting shoes on and availability, access and cost (6, 74).

GUIDELINE
Assessment of footwear needs to be included in falls risk assessment.
Level IV evidence

2.4 Conclusion

The evidence provides a greater weight for the effectiveness of programs that are designed to modify intrinsic risk factors in addition to those that are multi-strategic or simultaneously act to reduce multiple confounding variables (6). Since older people present with falls from independent living in the community, supported residential care and long term care facilities, there is no one approach that will provide optimal falls prevention. Rather, there is a multitude of options that must be considered using a systematic approach by all practitioners involved in the care of the elderly.

It is essential that local programs, based on the scientific evidence, are developed to meet the specific needs of the community within locally available resources. Such implementation must be accompanied by strategic evaluation to measure its effectiveness in reducing the problem of fall injuries amongst the elderly.