



falls in older people

**A review of evidence for prevention
from the UK focal point for violence and injury prevention**

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About the UK focal point for violence and injury prevention

The 49th World Health Assembly (1996) declared violence a major and increasing global public health problem. In response, the World Health Organization (WHO) published the *World Report on Violence and Health* and initiated a major programme to support and develop violence and injury prevention work globally. As part of this programme, each member state has designated a national focal point for violence and injury prevention. The network of focal points works with the WHO to promote violence and injury prevention at national and international levels, develop capacity for prevention, and share evidence on effective prevention practice and policy.

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A summary of evidence: successful or promising interventions to prevent falls

In the community

Exercise programmes: There is good evidence for the effectiveness of exercise programmes that encourage aerobic activity or improve strength, flexibility and gait in reducing the rate of falling among older people, particularly when activity types are combined.

Encouraging safety behaviours: Amongst those most at risk of falling, home safety interventions that assess risks in the home and recommend the use of safety equipment (e.g. stair rails, mobility aids) can reduce the number of falls experienced by older people.

Medical interventions: Supplementing the diet with Vitamin D can reduce the risk of falls and fracture, but only with higher doses, calcium co-supplementation and among those with lower levels of Vitamin D. Additionally, although research is limited, reviewing medication and minimising the use of drugs that increase dizziness and impair cognition (e.g. psychotropic drugs) can reduce the risk of falling.

Multi-strategy interventions: Although results have been inconsistent, both multi-component interventions and multi-factorial risk assessment and intervention have been shown to reduce numbers of falls.

In residential care or hospital

Medical interventions: Supplementing the diet with Vitamin D, and reviewing older people's medication, can reduce the numbers of falls among older people.

Multi-strategy interventions: Multi-strategy interventions, including multi-factorial interventions, can reduce the rate of falls and risk of falling when provided as part of a multi-disciplinary team.

Falls in older people are a significant public health concern, placing a considerable burden on health and social services each year. For instance, in 2008/09, there were over 400,000 hospital episodes for injuries caused by falls in England and Wales, of which almost 70% were for those aged 60 and over (1). Experiencing a fall can result in physical injuries such as bruising, sprains, fractures, head injury, or even death. However, there are wider psychological and social consequences that can be equally challenging, including loss of confidence, fear of falling, restricted physical and social activity, and loss of independence (2). For instance, experiencing a fall, or multiple falls, is a strong predictor of future admittance to a nursing or care home (3).

Certain groups of older people are more at risk of experiencing a fall than others. These include older populations (e.g. those aged 85+), females, and those from the least advantaged social groups (4). In addition, muscle weakness, problems with balance and walking, poor vision, and cognitive impairment can increase the likelihood of an older person falling (5,6). Some medical conditions have been associated with increased likelihood of falling, either through restricting mobility (e.g. arthritis) or affecting balance (e.g. cardiovascular disorders, diabetes, and Parkinson's disease) (6). Other identified risk factors include: the use of alcohol (6); certain medications (e.g. psychotropic drugs [7,8]); and environmental hazards in the home or care setting (e.g. loose carpets, absence of handrails, poor lighting [5,9]).

A range of interventions have been put into place to reduce or modify factors that increase the risk of falling (or risk of injury from falling) among older people, both within the community and within residential settings. This review considers evidence for the effectiveness of these initiatives.

Falls in older people in the UK: some facts

- An estimated 475,000 falls are recorded in general practices in the UK each year among people aged 60+ (4).
- The risk of mortality in older people following a fractured hip is roughly 11-23% at six months and 22-29% at 12 months from injury (10).
- In 2008, over 3,400 people died from a fall in England and Wales, of whom 80% were aged 65 or over (11).
- In 1999, the economic cost of falls in older people in the UK was estimated to be £300,000 per 10,000 population among 60-64 year olds, rising to £1,500,000 per 10,000 in those aged 75 or over. The total cost was £981 million (12).

1. Falls in the community

1.1 Exercise programmes

Exercise programmes aim to increase older people's mobility and stability. They encourage aerobic activities such as walking or cycling, or provide specific training to improve strength, balance, flexibility or gait. While they can be delivered on a one-to-one basis, they are often provided in a group setting within the community. Both individual and group programmes can reduce the incidence of falls in older adults (13-16), particularly when exercise activities are combined (17). One review found a 17% reduction in the rate of falling following their use (16). Although evaluations have been inconsistent (18,19), reduced rates of falling have also been found following the use of Tai Chi (17), which is thought to improve strength and balance. The inclusion of balance

training and higher levels of overall exercise are important for increasing the effectiveness of programmes (14,16).

1.2 Encouraging safety behaviours and the use of safety equipment

Education programmes for older people

Education programmes aim to improve older people's knowledge about the risks of falling, how risks can be identified, and safety behaviours that can be adopted. Initiatives may involve the dissemination of pamphlets and posters or one-to-one counselling, and can be presented by a health professional or by peer volunteers (20). The effects of education interventions alone on risks of falling or rate of falling among older people are unclear (17,20). However, they have been used successfully in combination with other activities (e.g. as part of multi-component interventions [20]).

Home safety interventions

Hazards in the home such as poor lighting, loose carpets and badly placed furniture increase the risk of a fall. To address this, home visits by a health professional (e.g. physical or occupational therapist) have been used to assess risks in the home and recommend safety equipment such as stair rails, night lights and mobility aids. Some programmes also help to implement recommendations. These programmes are effective in reducing the prevalence of hazards and increasing safety features and can be beneficial in reducing the number of falls, but only amongst older individuals most at risk of falling, not in the general older population (9,14,17,21). There is insufficient evidence to determine effectiveness in reducing injuries, which may be due to a lack of well designed large-scale studies that include environmental modifications (21). The success of

home safety interventions may be due, in part, to the visiting health professional. For instance, in addition to the recommended home modifications, professionals such as occupational therapists may encourage changes in behaviour that allow older people to live more safely (22).

The use of safety footwear

In the winter, icy conditions can increase the risk of falling outside the home. Although more research is needed, the use of safe footwear that improves walking stability has been found to reduce the risk of falling among older people with a history of previous falls. In the US, the Yaktrax Walker was a non-slip device designed to fit around a boot or shoe to provide multi-directional gait stability in outdoor winter conditions. The footwear was tested by fall-prone older people over the course of one winter, with the device being used as their primary outdoor footwear. Compared to controls, the risk of having an indoor fall was comparable. However, for outdoor falls, risks were lower (23).

1.3 Medical interventions

Review of medication

Among older people, the use of certain medications such as psychotropic drugs can increase drowsiness and dizziness and impair cognition, affecting stability and the risk of falling. One way of addressing this is through a medication review: checking the medication of those who have experienced a fall/are at risk of falling, and making alterations to prescriptions to minimise or withdraw specific drugs (24-26). Medication reviews have most often been used and evaluated among older people residing in care homes (see Section 2: Falls in residential care and hospital). Less is known about their use within the community. However, in

New Zealand, one study examined the effects of gradual psychotropic drug withdrawal among those aged 65+ taking psychotropic medication. Compared to those that continued their medication, gradual withdrawal significantly reduced the risk of falling at a 44-week follow up. Long term withdrawal may present more of a challenge; one month after the study ended almost half of the intervention participants had begun taking their medication once again (27).

Vitamin D supplementation

As a person ages, changes in diet (less variation), lifestyle (less opportunity for activity) and organ function (reduced ability to produce/metabolise Vitamin D) can reduce levels of Vitamin D in the body. This vitamin is important for strengthening bones and muscles and a deficiency can increase the risk of falls (through weakened muscles) and fractures. Across all settings (community and residential) supplementation of Vitamin D in the diet can reduce the risk of falling and fracture (28-31). However, supplementation may only be effective among those with lower Vitamin D levels (17), or when combined with calcium supplements (32,33). Furthermore, effectiveness appears to be dose dependent, with only higher doses (700-800IU/d or more) or those achieving a serum 25 hydroxyvitamin D concentration of >60nmol/l showing significant effects (29,34). Where this has been achieved, risk of falling in older people has been found to reduce by 19% (34).

Vision assessment and referral

Vision can deteriorate as a person ages, increasing the risk of falling (35). To address this, vision screening tests can be used, followed by referrals for treatment, provision of vision and mobility aids (e.g. glasses and canes), or home modifications such as better lighting. Research evaluating

vision assessment programmes is lacking and effects are unclear. In some instances, vision assessment and referral for glasses have increased the number of falls experienced (36). It is possible that older people need a substantial length of time to adjust to new glasses, or that improved vision may lead to behaviour change (e.g. greater activity) and more opportunities to fall (36).

1.4 Multi-strategy interventions

Exercise programmes, education, medication review and home safety initiatives are often combined to form one comprehensive programme that addresses many risk factors for falling at the same time. These are known as multi-strategy interventions. There are two types. *Multi-component* interventions combine three or four single interventions in the one, fixed programme, and provide this to all participants. *Multi-factorial* interventions assess patients for risks associated with falls, and provide different combinations of interventions depending on individual risks. Multi-factorial programmes are therefore tailored specifically to each participant, rather than applied to a group as a whole.

Multi-component interventions

Multi-component interventions differ widely in the number and type of elements included and it can be difficult to gain an accurate understanding of their effectiveness. Reviews and analyses of community multi-component interventions have found that they can reduce falls by 22% (37), and fall-related injuries by 6-33% (38). However, results likely depend on the components chosen and the population groups targeted. Thus, although positive results have been reported overall, there is as yet no clear understanding of which

components are most effective to combine.

Single or multi-strategy interventions: which are best?

Given the extra costs associated with multi-strategy interventions compared to single-strategy interventions, there has been some debate around whether they offer any additional benefits to elderly populations. A comparison of single and multi-strategy interventions in the community found that delivering single interventions to targeted populations is just as effective in reducing falls as multi-strategy interventions (multi-strategy interventions reduced falls by 22%, whereas single interventions reduced falls by 23% [37]). There are a number of possibilities as to why multiple interventions may offer no additional benefits to single programmes. In multi-strategy interventions, an interaction may occur between the components that reduces their individual effectiveness. Furthermore, it is possible that for older people, two or more interventions can cause confusion or simply too much change to cope with. Here, an older person may decide to adopt just one of the intervention types or adhere less to the full programme (37). The review concluded that for reducing falls at a community level, targeted, single interventions are the most acceptable and easily implemented method. However, at an individual level, multi-factorial interventions that assess the patient initially for risks may be the most suitable method (37).

Multi-factorial falls risk assessment and intervention

Multi-factorial risk assessments are usually carried out among individuals who have experienced a fall or among those thought to be at risk from falling. A range of factors are assessed, including: vision; medication; balance; neurological function; cardiovascular status; and home hazards. Results are used to generate an intervention tailored to the individual. Variation in assessment and components between interventions makes it difficult to gain

a clear understanding of effectiveness. Evaluations are often mixed (39) and effects unclear. In some instances, they have reduced the rate of falls in older people (14, 17, 40, 41). Multi-factorial programmes appear to be more effective for those with a history of falls, rather than non-targeted groups (14).

Community based multi-factorial interventions: an example

The Winchester falls project targeted those aged 65+ living in the community who had experienced two or more falls in the past year. It compared two prevention initiatives with usual care. Initiative one was based in primary care. A nurse assessed participants for risk factors, exploring medication, hypotension/dizziness, mobility, alcohol use, vision, home hazards, and social service needs. Patients were referred to appropriate health professionals where required (e.g. GP, occupational therapist, physiotherapist, optician, and council and social services). Initiative two took place in secondary care. Participants attended a one-stop multi-disciplinary clinic in a day hospital. They were assessed by a range of professionals (doctor, nurse, physiotherapist, occupational therapist) and referred to intervention if required. Over the next year, greater reductions in the proportion of people falling again, sustaining fractures, being admitted to hospital and dying were found for initiative two (compared with either initiative one or usual care). However, the percentage of patients recommended for medication changes differed between prevention initiatives (52% in initiative two and only 16% in initiative one), which may have contributed to the differences in effectiveness (41).

2. Falls in residential care and hospital

Falls can occur frequently in residential care and hospital settings. Although some residential and hospital interventions (e.g. exercise programmes, education, Vitamin D supplementation, and medication review) are similar to those implemented in the community, a number of additional initiatives have been employed specifically in these environments, including:

- *Physical restraints.* Restraints such as bed rails, belts and chair restraints are designed to prevent an elderly patient from falling. The use of bed rails in particular is much debated. Some badly designed and outdated bed rails have been found to cause injuries and even death, and their use is often regarded as restrictive and therefore unethical (42).
- *Use of an identification bracelet.* The bracelet is used by high-risk patients and is intended to increase both patient and staff awareness about falling (43).
- *Use of bed or fall alarm devices.* Bed alarm devices involve pressure sensitive pads on patient beds which trigger an alarm when a patient sits upright or leaves. An alternative but similar device is worn as a patch on the thigh that detects when a patient gets out of bed or stands up unassisted. The use of bed or fall alarm devices for high-risk patients can allow care staff to provide assistance in walking before a fall occurs (44,45).

2.1 Single-strategy interventions

The use of Vitamin D supplements has been associated with reduced falls (46), and in some instances, reduced fractures (47). Although evaluations have been inconsistent (46), some suggest that medication reviews can reduce falls among elderly care home residents (48). While exercise programmes decrease the number of falls occurring in hospital settings, the effects in care homes are less clear, with most evaluations showing little or no effect (46). The effectiveness of physical restraints, use of identification bracelets and fall alarm devices as single interventions in preventing falls or fractures is unclear (47).

2.2 Multi-strategy interventions

As with the community interventions discussed earlier, residential and hospital care interventions are often combined into comprehensive programmes that address more than one risk factor for falling. Components vary between initiatives and usually include an initial risk assessment. Multi-strategy programmes can reduce the number of falls among older people (47-50), and in some instances, the number of people falling and the number of recurrent fallers (50). For multi-factorial interventions specifically, when provided by a multi-disciplinary team, the use of these interventions can reduce the rate of falls and risk of falling (46).

Hospital based multi-factorial interventions: an example

In the North of England, a multi-factorial intervention was put into place within the elderly wards or units of a district general hospital. Nurses used an initial health screening checklist to assess risk factors for falls, which explored factors including vision, medication, blood pressure, mobility, footwear, bed height, position in ward and other environmental factors, and whether or not bed rails would be beneficial. This initial assessment was used to suggest targeted interventions or referrals. These included referral to an ophthalmologist or physiotherapist, a medication review, advice to relatives on replacing footwear, and the relocation and adjustment of beds in the ward. For the purposes of comparison, a control group received standard care. Comparing the six months periods before and after the intervention, there was a significant reduction in the risk of falls in the intervention wards (by 21%), and no reduction found in corresponding control wards (risk of falls increased by 12%) (49).

3. Summary

A wide range of interventions have been implemented to reduce and prevent falls in older people living in the community and residential care. Different content, target groups, settings, study designs and outcome measures used between initiatives means that results are often mixed and their overall effectiveness difficult to determine.

For the prevention of falls in the community, there is some good evidence for the use of exercise programmes, particularly when activities are combined. There is also some evidence for the use of Vitamin D supplementation when provided at high doses and to those with lower Vitamin D levels. Although outcomes are inconsistent, some promising

results have been reported for: home safety interventions when targeted at those most at risk of falling; review of medication; and multi-component and multi-factorial interventions. Outcomes for vision assessment and referral are unclear but have been associated with some negative effects, including an increase in the number of falls. Education for older people does not appear to reduce falls when used as a stand-alone intervention but may be effective when combined with other interventions.

For falls in residential homes and hospitals, the most promising interventions are use of Vitamin D supplements in the diet, medication reviews and multi-strategy interventions, including multi-factorial interventions when provided as part of a multi-disciplinary team. However, the effects of exercise programmes, removal of physical restraints, identity bracelets, fall alarm devices and changes to the physical environment remain unclear.

All references are included in the online version of this document, available from:

www.preventviolence.info and **www.cph.org.uk**

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