What Works To Prevent Accidental Injury Amongst Older People

Report to the Health Development Agency

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Section 1: Background and Rationale

Over 50% of accidental injury deaths, and over 60% of serious accidental injury, occur in people aged 65 and over. Older people have a higher risk of accidental injury resulting in hospitalisation or death than any other age group. Falls (62%), traffic accidents – RTAs (13%) and fire and flames (3%) are the causes of the highest rates of accidental injury mortality amongst older people. Falls are the most important cause beyond age 75, and are by far the most important cause for people aged 85 and over, with 78% of accidental injury deaths recorded as falls. Falls (71%) are also the leading cause of serious accidental injury (resulting in admission to hospital for 4 or more days) amongst people aged 65 and over. RTAs account for 2% of serious accidental injury admissions for people aged 65 and over. Excluding medical and surgery-related injury, other external causes are responsible for less than 2% of admissions.

Almost half the deaths from injuries (and the majority of non-fatal accidental injuries) in people aged 65 and over occur in the home, over a quarter on the street or highway and almost a fifth in residential institutions. The proportion of injury deaths, as well as accidental injury requiring medical care, occurring in the home or residential accommodation increases with age.

Fracture was the diagnosis given in around 40% of injury deaths, and over half of injury admissions; the most commonly recorded injury was fracture of the lower limbs.

Priorities for the prevention of accidental injury amongst older people include falls and osteoporotic fracture, road traffic accidents, and domestic fires.

1.1 Falls and osteoporotic fractures

Falls are a major problem amongst older people. Rates of fall injury in people aged 65 and over increase ‘exponentially’ with age. Rates of hospitalisation for falls injury are approximately twice as high for women as for men. Without effective intervention, demographic trends alone will result in substantial increases in the number of falls, falls injuries, and fall-related deaths amongst older people.

The following rates of falling (per year) have been found:
- 1 out of 3 people aged 65 and over living in the community.
- 1 out of 2 people aged 85 and over.
- 1 out of 2 people living in institutions.
- 1 out of 2 people with dementia.
- 2 out of 3 people living in nursing homes.

Falls are the most important type of accident in and around the home amongst older people. 75% of falls-related deaths occur in the home, and it has been estimated that 60% of falls to people aged 65-74 occur in the home, and 85% for people aged 85 and over.

The rate of falling does not appear to increase for older people living in areas of deprivation; however, there is a geographic variation in falls injury and mortality rates as well as variations in preventive activity.

The consequences of falling include death, injury (the most serious of which is fracture of the proximal femur), institutionalisation, fear (of a future fall), decreased activity, functional deterioration, social isolation, depression and reduced quality of life.

Factors related to falling have been classified into two types: intrinsic and extrinsic factors. Intrinsic factors are states or traits of an individual that increase their risk of falling. They are more
important among the older groups, eg. people aged 80 and over. Extrinsic factors are social and physical factors that relate to the external environment. Falls among people aged 65-74 are more likely to be due to extrinsic factors than for those aged 75 and over. The changing interaction between the older person and their environment as they age is important.

**Extrinsic factors**

The size of the impact that environmental factors have on the risk of falling amongst older people is uncertain. Some have reported that between a third and a half of falls among community dwelling older people are due to environmental causes. Others have reported that 20% of falls are due to major external factors (ie. those that would cause any healthy adult to fall). Falls amongst older people most often occur whilst standing, or walking on level or uneven surfaces.

The evidence is unclear regarding the precise role the environment has in increasing the risk of falls. Some have suggested that many different parts of the external environment are associated with falls - studies have found over 50 different potential hazards:
- 2 or more hazards can be found in most older person’s homes
- 2 or more hazards can be found in 60% of bathrooms

Others have found that most falls that occur are not associated with these hazards.

Specific environmental factors associated with increased falls (injury) risk include bathtubs and showers without grab bars and non-slip mats. Other factors that may be associated include loose carpets, poor lighting, and steps and stairs that are not clearly distinguishable and are without rails / banisters.

**Intrinsic risk factors**

The main classes of intrinsic factors that influence the risk of falling are: strength, balance, gait, physical performance, physical functioning, underlying ill-health/medical conditions, sensory declines, medicine use, and mental functioning. There is a complex causal net linking risk factors and falls occurrence. Intervening against predisposing impairments simultaneously protects against functional dependence as well as falls and incontinence.

It is estimated that syncope or loss of consciousness is responsible for 5% of falls in older people. This problem shares risk factors with those for falls involving little external force.

**Physical activity and function**

Much of the information below comes from the Allied Dunbar National Fitness Survey and the Health Education Authority (HEA) Survey on Activity and Health (Skelton 1999a). An important aspect of maintaining function and protecting against falls is physical activity. Physical activity declines with age. Only 1 in 6 women and 1 in 4 men aged 50 and over take the recommended amount of physical activity to benefit their health (ie. 30 minutes of moderate intensity activity on at least 5 days a week). By the age of 74, only 1 in 7 people take enough physical activity to benefit their health. Two in 5 of all men and women over 50 are sedentary (ie. do less than 30 minutes of moderate intensity activity less than once a week). The proportion of sedentary women increases with age from around 1 in 3 women aged 50-54 to 2 in 3 women aged 80 and over. Additionally:

- 1 in 3 women and 1 in 4 men over 70 are unable to walk 400 metres on their own.
- 1 in 2 women aged 70-74 do not have a power/weight ratio of the lower limb sufficient to climb a 30cm step without help.
- 1 in 4 women and 1 in 14 men aged 50 and over are unable to climb stairs easily.
• 1 in 4 women and 1 in 14 men aged 70-74 do not have sufficient knee extension (quadriceps) strength/weight ratio to be confident of getting out of a low chair without using their arms as well.

A proportion of this disability is due to disuse rather than disease. The declines in strength, endurance, and muscle power result in physical functioning dropping below the threshold where activities of daily living become difficult and then impossible to carry out. When strength, muscle power, flexibility and co-ordination, and balance decline, functional capacity are compromised; the older person may be less able to prevent a slip, trip or stumble becoming a fall. After a fall, many older people find getting off the floor impossible, and so if help cannot be summoned this will lead to a long lie.

It is possible for many to regain this lost functional ability relatively quickly. Regular, appropriate physical activity and specific, tailored exercise directly improves functional activity and activities of daily living. In people aged 75 and over, a 27% increase in muscle strength was achieved in 3 months.

**Osteoporotic fracture**

Osteoporosis is defined as a ‘progressive systemic skeletal disease characterised by low bone mass and microarchitectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture (WHO 1994). The prevalence of osteoporosis in the UK stands at approximately three million people.

The clinical significance of osteoporosis lies in the fractures that arise. In the UK, osteoporosis results in over 200,000 fractures each year, causing severe pain and disability to individual sufferers at an annual cost to the National Health Service (NHS) of £1.7 billion. More than one-third of adult women will sustain one or more osteoporotic fractures in their lifetime. Lifetime risk in men is approximately half that in women.

Common fractures include vertebral compression fractures and fractures of the distal radius and the proximal femur. Hip fractures alone account for more than 20% of orthopaedic bed occupancy in the UK, and the majority of the direct health service cost of osteoporosis.

The ageing of the UK population will give rise to a doubling of the number of osteoporotic fractures over the next 50 years if changes are not made in present practice. Although bone mineral density (BMD) is an important determinant of fracture risk, many other factors, including liability to fall and type of fall, also contribute to the risk. The aetiology of osteoporotic fractures is therefore multifactorial and strategies to tackle osteoporosis need to take these factors into account.

Prospective studies have shown that the risk of fracture increases progressively with decreasing BMD. Systematic review of observational studies indicates that the risk of fracture increases approximately twofold for each standard deviation decrease in BMD. The predictive value of BMD for fracture is at least as good as that of blood pressure for stroke. Bone mass in later life depends on the peak achieved at skeletal maturity and subsequent age-related bone loss. Twin studies suggest a strong genetic effect on bone density and important environmental influences include hormonal status, exposure to steroid therapy, physical activity, dietary calcium intake, and smoking.
1.2 Motor vehicle related accidental injury

Among people aged 65 and over, motor vehicle traffic accidents were responsible for 13% of deaths from accidents in 1999 and 2% of serious accidental injury admissions in 1999/2000. In 1999, 859 people aged 60 and over died on the roads of Great Britain, and 5,038 were classified by the police as seriously injured. Despite an increase in the number of people aged 60 and over, the number of older road users killed fell 41% from a baseline of the 1981-85 average, serious injuries fell 38%, and total casualties fell 6.5%. Casualties in the over 80s have increased 47% which is a reflection of the 59% increase in this population over that period.

Amongst those killed or admitted to hospital as a result of vehicle-related accidents, the older person was most likely to be injured or killed as a pedestrian, less frequently as a driver or a passenger, and far less frequently as a cyclist or motorcyclist. Data collected by the police indicates that 37% of older road users aged 60 and over killed or seriously injured are pedestrians. For people aged 80 and over, 61% of all traffic-related injury occurs to pedestrians. The majority of older road users are injured on roads in built-up areas during the day (ie. between 9:00 and 17:00).

For all travelers except bus passengers, people aged 60 and over are under-represented among road accident casualties of all severities (mainly slight). For all travelers, except pedal cyclists, people aged 60 and over are over-represented among road accident fatalities. The reason for this difference is the increasing fragility of people as they age. People aged over 80 are about six times as likely to be killed in a given accident as someone aged 20-50.

Over 90% of pedestrian casualties are sustained whilst crossing the street. Older people have particular problems crossing roads with four or more lanes. Factors that increase the risk of accidental injury amongst pedestrians include traffic speed, crossing design, and the judgement and road experience of the older person. Slightly higher proportions of accidents to older pedestrians occur on a pedestrian crossing than younger pedestrians.

Older drivers have different types of accidents to younger drivers. A larger proportion of accidents resulting in injury to older drivers are due to collisions with another vehicle, often occurring at intersections and often involve a failure to yield right-of-way. They are less likely than younger drivers to have drunk alcohol before driving.

As a person ages, the number of medical factors that increase the risk of accidents in older drivers increases. Specific problems relating to older people are their decline in visual performance, medical problems, slowed neurological response, decreased muscle strength and range of motion, and reduced trunk and neck mobility. Additionally, many medicines impair driving ability. Risk indicators include a history of falling.

Dominant road accident issues for older people are:

a) despite under involvement of older people in traffic accidents that result in slight casualties, older people are more likely than other age groups to be killed in traffic accidents;

b) from age 70, pedestrian fatalities outnumber car occupant fatalities.
1.3 Domestic fires

Among people aged 65 and over, there were over 219 fire-related deaths and 3,000 casualties in the UK in 1999. The majority of these were accidental fires in dwellings. Fire, flames, heat and hot substances were responsible for 3% of accidental injury deaths in 1999, and 1% of serious accidental injury admissions to older people in 1999/2000. The rate of death and serious injury increases with age, with those aged 80 and over are at substantially greater risk. Older people are less likely to have fires but are much more likely to be killed or injured if they do. Survey data tend to show that there are more fires where people live on lower incomes, or in rented accommodation.

Major causes of fire death amongst older people were smoking (53 deaths), heating (particularly space heaters: n=34), cooking (n=31, 13 of which were chip pan fires). Electric blanket fires led to 11 deaths among people aged 65 and over in 1999, accounting for almost half of all deaths from electrical fires in this age group (n=24). Leading causes of non-fatal injury were cooking, smoking, electrical appliance fires and heating. Findings from the British Crime Survey in the year 2000 suggest that 60% of domestic fires are cooking related, with heating fires and electrical fires making up a further 10% each.

Almost all (82%) of the fatal injuries resulting from clothing fires occurred in people aged 60 and over and many of these were over 70. Loose fitting or flowing garments, especially dresses, skirts and nightdresses, are most frequently mentioned in clothing related fires resulting in serious or fatal injury. The most common materials involved were cotton, nylon and cotton-polyester mix. Wool and denim were rarely involved. It has been suggested that the reasons for the increased rates of serious and fatal injuries amongst older people resulting from clothing fires are the following:

- They are less aware that their clothing has caught alight;
- They often lack the capabilities to extinguish the fire;
- They are often alone and so no one is at hand to help put out the fire;
- The impact of burns is far more serious for an older person.

Across all ages, there were 474 electric blanket fires attended by the Fire Brigade in 1999 resulting in 12 deaths and 200 injuries. Older people aged 65 and over have 6 times the national average rate of fatal injury and twice the national average for non-fatal injuries resulting from electric blanket fires (Sambrook 1999). Around 99% of these fires are believed to involve blankets that are more than 10 years old.

The following factors have been found to put an older person at particular risk of burns: physical disabilities, psychiatric illness, impaired vision and smell, alcohol use, drug / medicine use, and smoking. Extrinsic risk factors for burns include flammable garments and flammable furniture, the absence of smoke alarms, gas cookers for cooking, as well as older people living in poverty and / or in rural areas.

Fire-related case-fatality rates are highest in older people. Factors associated with this death rate were age, burn extent and depth, smoke inhalation, predisposing factors, delayed medical management, and the development of complications after admission. The case fatality rate is higher for people living in rural rather than urban areas, and delay in management is partly responsible for this. For non-fatal injury, factors affecting length of stay in hospital include extent of the burn, pre-existing medical conditions, and the development of complications after admission. The mean length of stay for burn injuries in England amongst people aged 65 and over was 15 days in the 1999/2000 financial year.
Section 2: Effective interventions – evidence-based statements

2.1 Fall Prevention Measures – Single interventions

A recent review of randomised controlled trials (RCTs) concluded that exercise is effective in lowering risk in selected groups (people who are at risk) and should form part of falls prevention programmes (Gardner 2000).

Individually tailored home exercise programmes focussing on muscle strengthening and balance retraining (specified muscle groups and balance activities) were found to reduce falls in women aged 80 and over living in the community:

(a) when administered by a qualified physiotherapist - and was found to be sustainable over 2 years (FG-II, Campbell 1999a).
(b) when delivered by a trained district nurse from a home health service based in a geriatric assessment and rehabilitation hospital (Robertson 2001a).
(c) when delivered by trained nurses based in general practices (Robertson 2001b).

Exercise based on Tai Chi forms can reduce falls in older people (HPW-1, FG-II, HoL).

Most exercise programmes without other interventions do not reduce falls in unselected community-living older people (FG-I).

There is no evidence that exercise programmes for nursing home residents, who are not at increased risk of falling, reduces falls (FG-II).

Withdrawal of psychotropic medication significantly reduces the risk of falling but permanent withdrawal is difficult to achieve (Campbell 1999b).

2.2 Fall Prevention Measures – Multi-faceted interventions

Programmes based on falls risk factor assessment and tailored intervention (most of which include some form of exercise), in selected groups of at-risk older people, reduce falls (FG-I). Assessment can be made by a variety of health care workers or volunteers, in a variety of settings (HPW).

Attention to postural hypotension, number of medications, balance, transfers and gait is particularly effective (FG-II).

Interventions should be targeted at both intrinsic and environmental risk factors for individual patients (HoL).
2.3 Fall Prevention Measures – Home assessment

Reviews have reached contradictory conclusions regarding the evidence for the effectiveness of home assessments:

Little evidence exists in favour of the effectiveness of preventive home visits to older people living in the community. In only two trials were the interventions aimed at subjects with specific risk factors (van Haastregt 2000a).

Multifactorial home assessment of older people at risk, with advice, referrals or other actions aimed at dealing with the hazards observed, had no effect (van Haastregt 2000b).

Home assessment of risk with education in the areas identified but without direct intervention or further referral does not reduce falls (FG-I).

Home assessment and surveillance can reduce falls in frail older people. This can be carried out by a variety of health care workers or volunteers (HPW-1).

Home assessment of function, with education in risk areas, and referral to the patient’s GP reduces falls (FG-III).

Identification of patients who attend A&E because they have fallen, with subsequent medical and OT assessment and with referral and follow-up, reduces falls (FG-II).

A programme of health promotion reduced the rate of falls-related hospitalisation (Kempton 2000). The health promotion intervention included awareness raising, community education, policy development, home hazard reduction, media campaigns, and working with health professionals. The programme addressed footwear, vision, physical activity, balance and gait, medication use, chronic conditions, plus home and public environmental hazards.

A community health programme reduced the rate of lower limb fractures in women but not men (Poulstrup 2000). The community health programme included:
- information about risk factors,
- home visits to 70-74 year olds with assessment and intervention by district nurses,
- home visits to 75-79 year olds with assessment and intervention by general practitioners,
- information on and identification of falls risk factors among older people who regularly receive assistance from home-helpers (many aged 80+).

The evidence is uncertain regarding whether assessment and modification of the home on its own is effective in reducing falls or falls injury amongst older people (PCC-DH).

Older people with a history of falling recently discharged home from hospital who had an assessment of environmental hazards in the home by an occupational therapist (experienced in care of older people), with supervision of the necessary home modifications, had lower rates of falling than a control group (Salkeld 2000).
2.4 Fall Prevention Measures – The residential setting

There is no evidence that exercise programmes for nursing home residents, who are not at increased risk of falling, reduce falls (FG-II).

Assessment of residents after falling with recommendations for specific preventive measures decreases falls (FG-II).

Assessment of residents after falling by a nurse practitioner, including laboratory test, electrocardiogram, and 24-hour Holter monitoring, with probable cause and therapeutic recommendation to the primary physician, decreases hospitalisations (Rubenstein 1990).

There is evidence that falls risk assessment and modification in residential homes can reduce some risk factors for falling (postural hypotension and poor visual acuity), with weak evidence of a reduction in the rate of falling (McMurdo 2000).

For patients on elderly care rehabilitation wards, there is weak evidence that the rate of falling is less when there is vinyl flooring in the bed area compared with carpeted flooring (Donald 2000).
2.5 Osteoporosis and related factors

The following interventions have been found to be effective for fracture prevention in postmenopausal osteoporotic women, with the following grades of evidence (RCP 2000).

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Spine</th>
<th>Non-vertebral</th>
<th>Hip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alendronate</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Calcitonin</td>
<td>A</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Calcitriol</td>
<td>A</td>
<td>A</td>
<td>Nd</td>
</tr>
<tr>
<td>Calcium</td>
<td>A</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Calcium + Vit D</td>
<td>Nd</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Cyclic etidronate</td>
<td>A</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Hip protectors</td>
<td>-</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>HRT</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Physical exercise</td>
<td>Nd</td>
<td>B</td>
<td>B</td>
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<tr>
<td>Raloxifene</td>
<td>A</td>
<td>Nd</td>
<td>Nd</td>
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<tr>
<td>Risedronate</td>
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</tr>
<tr>
<td>Tibolone</td>
<td>Nd</td>
<td>Nd</td>
<td>Nd</td>
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<tr>
<td>Vitamin D</td>
<td>Nd</td>
<td>B</td>
<td>B</td>
</tr>
</tbody>
</table>

Nd=not demonstrated

Grading of evidence (relates to evidence of efficacy regardless of effect size):

Grade A:  
- meta-analysis of RCTs or from at least one RCT
- from at least one well designed controlled study without randomisation.

Grade B:  
- from at least one other type of well-designed quasi-experimental study
- from well designed non-experimental descriptive studies, eg. comparative studies, correlation studies, case-control studies.

Consult the Royal College of Physicians guidelines (RCP 1999, RCP 2000) for a description of the evidence for each of the above.

In the absence of any established treatment for pre-menopausal women with osteoporosis, such people should be referred to specialist centres for investigation of possible underlying causes and advice on management (RCP 2000).

Recent data suggests that some agents are also effective treatment for osteoporosis in men. Consideration should be given, therefore, to referral to a specialist centre for investigation of underlying causes and advice on further management (RCP 2000).

Other views of the evidence-base relating to osteoporotic fracture have also been presented (HPW, HoL) and evidence-based statements from these sources are given below.

Bisphosphonates:
- reduce the incidence of new fractures in older women with pre-existing vertebral fractures
- reduce bone loss and prevent fractures in postmenopausal women on corticosteroids (HPW-1, HoL).

Alendronate sodium prevents non-vertebral fractures in women with osteoporosis aged 42-85 who have been menopausal for at least 4 years (HoL).
Calcitonin appears to be effective in preventing osteoporotic fractures in 68-72 year old women with low bone density (HPW-2).

**Calcium and vitamin D:**

- Calcium and vitamin D **supplements can reduce fractures** in older women in nursing homes (HPW-1).
- Vitamin D and calcium **supplements in older people living in the community** result in reduced bone loss and less fractures (HPW-1).
- There is weak evidence that a **dietary increase** in calcium and vitamin D will result in fewer fractures (HPW-2).

There is evidence that **Hormone Replacement Therapy (HRT)** is associated with fewer fractures, less heart disease and more breast cancer (HPW-3).

There is consistent evidence from observational studies that **physical activity** is protective against **hip fracture** (HoL, Greg 2000). The association appears to be present from childhood to adult age, and has been seen in many different countries in spite of their very different hip fracture rates. To be among the physically active appears to reduce the risk of later hip fracture by up to 50% (Joakimsen 1997).

Observational study evidence suggests that **thiazide diuretic** users have a 20% reduction in fracture risk and that long-term use may reduce fractures by a similar amount (HoL).

There is weak evidence that **stopping smoking** may reduce osteoporotic fractures (HPW-2).

### 2.6 Fracture prevention - reduce energy of impact

**Hip protectors** can substantially reduce hip fractures in older people in **nursing homes**. However compliance, particularly in the long term, is poor (HPW-2, FG-II, HoL). This conclusion is based on 5 trials of low to moderate quality (Parker 2000)

Amongst **frail older people** either resident in **geriatric long-stay facilities** or supported by outpatient care units whilst **living at home**, the use of hip protectors reduces hip fractures (Kannus 2000).
2.7 Road traffic accidents

Avoiding alcohol before driving prevents road traffic accidents (HPW-1).

Rehabilitation course for drink driving offenders reduces repeat offending with a probable reduction in the number of alcohol-related crashes (HPW-1).

There is observational study evidence that a reduction in the permitted Blood Alcohol Concentration to 50mg/100ml will lead to a reduction in injuries (HPW-1).

The use of random breath testing, accompanied by a high level of publicity, will lead to a reduction in injuries. To be most effective, breath testing should be intensive (HPW-1).

Strategies that increase the use of seat belts will result in less severe injuries (HPW-1).

Stricter enforcement of speed limits will result in fewer injuries (HPW-1).

Safer design of roads and roadside environments will result in fewer injuries (HPW-1).

Based on a meta-analysis of observational studies, roadside guardrails and crash cushions will reduce injury severity (HPW-1).

Observational studies found that traffic calming measures resulted in a small reduction in total casualties (HoL).

Based on a meta-analysis of 17 observational studies, permanently switched on lights on cars can reduce daytime road traffic accidents (HPW-2).

Area-wide traffic management schemes, targeted at areas with high injury rates, will reduce pedestrian injury rates. The provision of crossing patrollers, measures to redistribute traffic, and design of roads to reduce speed, are effective in reducing pedestrian injuries (HPW-1).

There is evidence that fitting all vehicles with pedestrian protection features, as well as outlawing ‘bull bars’, reduces pedestrian deaths and serious injuries as well as cyclist deaths (HPW-1).

Reduction of risk to older pedestrians as well as disabled people can result from the following interventions (PCC-DH):
- traffic calming
- low speed limits (eg. 20mph zones)
- pedestrian areas in town and city centres
- priority walking routes
- placement of pedestrian crossings on common routes to minimise deviations for older people
- pedestrian crossings that are designed to meet the needs of slow walkers
- median refuges at crossings
- narrowing crossing places
- reduced kerb heights at crossings
- audible signals and stippled stones at crossings to alert the visually impaired.
The following Interventions to prevent accidental injury, which are likely to have benefits for all car occupants but all of which are relevant for the older car occupants, have been suggested (PCC-DH):

- the use of seat belts
- the use of cars with airbags, and with side impact protection
- improved headlight design, adjustment, and cleanliness on all cars to minimise glare
- a change to the use of automatic transmission cars to reduce the complexity of the driving task (made well in advance of any cognitive decline)
- junctions, signals, traffic signs, and road markings designed to take account of the more limited capabilities of some older drivers
- replacement of junctions with roundabouts where cost-effective
- provision of right-turn lanes, and lighting at junctions where possible
- improved road lighting
- reduction of speed
- traffic calming measures in urban areas
- enforcement of speed limits
- roadside improvements including the removal of obstacles or replacement with ‘forgiving’ obstacles
- provision of conflict-free overtaking opportunities
- increasing shoulder width and lane width
- identification and correction of health and physical functioning problems (for drivers) including:
  - vision
  - review of medicines and adjustment where appropriate
  - identification of joint stiffness and exercise to increase range of movement
- encouragement for older drivers to have eyesight tests at least every 2 years
- provision of advice to drivers about the particular problems of:
  - alcohol and of tiredness for the older person
  - the dangers of some medications and / or their interactions
  - avoidance of difficult driving situations
  - planning for the time when they would need to give up driving.
2.8 Fire reduction

There is strong evidence that the use of smoke alarms will reduce burn injuries. There is only weak evidence that the free distribution of smoke alarms will reduce fire deaths (HPW-2, HoL, DiGuiseppi 1999a, 1999b).

Effective smoke alarms for older people are most viable when they are hard wired or include a battery with at least a 10-year lifetime (PCC-DH).

There is weak evidence that the replacement of electric blankets that are over 10 years old would prevent many electric blanket fires (Sambrook 1999).

There is weak evidence that clothing fires amongst older people can be reduced through the use of electric rather than gas hobs, and use of an electric kettle to make hot drinks rather than the hob (PCC-DH).

There is evidence from a non-randomised trial that a reduction in smoking prevalence would reduce deaths from fire (HPW-2).

Evaluation of a number of small scale initiatives, using before-after methods and surveys, provides evidence that community-based interventions can be effective in reducing fire-related injury (Schadenman 1990, Kulenkamp 1994, Rossomando 1995).
Section 3. Strategic approaches to prevention

3.1 Falls and falls-related injury

At the local level, currently falls prevention ranges from no provision to the provision of selected services. These include:
- assessment and follow-up of older people who have fallen and attended A&E, general practice, or other primary care services to prevent future falls;
- discharge planning aimed at reducing the risk of future falls;
- incorporation of falls risk assessment into the over 75 health check in general practice with follow-up for people at increased risk;
- targeted exercise programmes provided for people at risk of future falls;
- home safety checks and ‘handyperson’ schemes aimed at repairing or making improvements to the home environment.

The Government’s health strategy identified accidental injury prevention as a priority and the NHS Plan recognises older people as a priority group. One of the most important causes of injury morbidity and mortality is falling, and so this has been, and will remain, a major focus. One of the most serious consequences is a fracture, particularly of the femur. The recent National Service Framework for Older People (NSF-OP) sets a standard for assessment and effective treatment aimed at falls and fracture reduction. The approach described below is in broad agreement with the National Service Framework for Older People (NSF-OP).

To prevent accidental injury and their sequelae amongst older people, potential strategies for prevention include:
- Reduce the risk of falls occurrence;
- Strengthen the older person’s bones (or reduce the amount of bone loss), so that if a fall does occur the risk of fracture is reduced;
- Reduce the energy of impact;
- Improve coping strategies following a fall.

The first of these leads to a consideration of the prevention of falls amongst older people, the second to the prevention and treatment of osteoporosis, and the third to the use of hip protectors and other strategies that reduce the transfer of kinetic energy to the body. Each of these will be considered in turn.

The literature on what works to prevent falls in older people have been summarised in a number of reviews and includes multiple risk factor assessment and intervention, exercise, and medication review. Based on published evidence of what is effective, DH funded guidelines for the prevention of falls and falls injury (FG) were developed. In addition, a trans-Atlantic collaboration, which included both the American and the British Geriatric Societies, resulted in the production of clinical practice guidelines (AGS 2001). These guidelines are, on the whole, consistent with each other.

The Royal College of Physicians in 1999 (RCP 1999) published clinical guidelines for the prevention and treatment of osteoporosis. The purpose of these guidelines was not to produce a working document for clinical practice, but to produce a framework from which local management protocols could be developed. Since their publication, some important randomised controlled trials (RCTs) have been published. The guidelines were updated in 2000 (RCP 2000) to take account of this new trial evidence. Additionally, an algorithm was produced, based on a distillation of the evidence-base, for the management of individual patients. There was no clear evidence
that population-wide screening was effective in reducing fracture incidence. For these reasons, the priority for prevention should be selective case finding.

Following the publication of the 1999 RCP guidelines, the National Osteoporosis Society produced a strategy document for osteoporosis for implementation by Primary Care Groups and Trusts (ie. Primary Care Organisations - PCOs) (NOS 1999). Updated guidelines for PCOs will be published by the National Osteoporosis Society in the summer.

Typically, for both falls and falls injury prevention, the approach will be in three stages:
- Identification of at-risk groups of older people
- Detailed assessment of older people within these groups to identify whether they are at increased risk of falling or fracturing
- Facilitate intervention to address the risk factors identified.

Identification of at-risk groups

In the absence of evidence to promote a population screening approach, a strategy that focuses on groups who are at high risk of falls and osteoporotic fracture seems most suitable. A number of criteria could be used but the following are likely to be effective in identifying the highest risk groups:

- Older people who seek medical attention for a fall
- Recurrent falls over the past year
- People experiencing gait / balance problems
- People living in institutions
- Recent low trauma fracture (which is an independent predictor of future fractures)
- Diagnosis of osteoporosis / low bone density (which is a strong predictor of future fractures)
- People with major risk factors for osteoporosis.

A lower limit for age of 70 years is proposed for 2 reasons. The risk of falling increases with age, and most falls risk assessment tools and interventions have been trialed in people over this age.

Detailed assessment of high risk individuals

Falls-risk assessment

An assessment for falls risk has been published in the DH sponsored Guidelines for the prevention of falls in older people (FG). The assessment tool has been derived from sound randomised controlled trials that have shown a reduction in the risk of falling or falls injury. It has not been formally validated -- no assessment tool that encompasses this range of risk factors has. However, it is being used increasingly for the assessment of falls risk. The AGS/BGS (AGS 2001) guidelines also propose an assessment based on a similar set of risk factors. The risk factors included in both proposed assessment tools include the following:

- History of falling
- Medication review
- Postural hypotension
- Vision
- Walking/gait
- Balance

It is recommended that, should a positive response be found in regard to any of the above risk factors, that the appropriate management strategy be implemented. This could include direct intervention by the person making the assessment, if qualified, but would more likely involve
referral to the appropriate professional. Direct evidence of the effectiveness exists for the assessment and management of falls risk for people identified in the following ways:

- Attendance at A&E for a fall
- Living at home but with one or more risk factors for falls, including a fall in the last year
- Living in a nursing home (US) and who has recently fallen.

**Osteoporosis assessment - Bone densitometry**

Measurement of bone mineral density (BMD) predicts future fracture as reliably as blood pressure predicts stroke and significantly better than serum cholesterol predicts myocardial infarction. Like blood pressure measurement, BMD measurements have high specificity (that is the number of false positives is low) but relatively low sensitivity (that is the number of false negatives is high). The sensitivity is approximately 50%; therefore, half of all osteoporotic fractures will occur in women said not to have osteoporosis. It is because of this that BMD measurements are most helpful in a selective case finding strategy where the need for the test is dependent on clinical risk factors. In this way, the sensitivity of the test to predict fracture is increased (RCP 1999).

Measurement of BMD should be performed if an individual has an osteoporotic fracture, or fulfills other criteria for bone densitometry, listed in the National Osteoporosis Society guidelines for primary care (NOS 1999). Local availability is likely to determine the measurement technique used although it is recognised that dual-energy X-ray absorptiometry (DXA) is most appropriate. BMD thresholds for intervention have been published and these should be interpreted with the guidance of a local clinician who has expertise in densitometry and osteoporosis.

**Intervention**

Following identification of high-risk individuals, intervention has to occur to reduce both fall risk and treat osteoporosis to reduce injury and fractures.

**Modification of falls-related risk factors**

The evidence-based statements and recommendations in the falls prevention guidelines (FG) have been operationalised for use in the field. Based on the assessment of the older person, the falls guidelines make recommendations of appropriate interventions and referral pathways (FG). In addition, it is recommended that those individuals with complex problems and who have multiple risk factors for falls should be referred to a geriatrician. Likewise, the AGS/BGS guidelines (AGS 2001) include an algorithm that summarises the assessment and management of falls risk.

Several of the risk factors identified using the fall risk assessment tool can be modified using exercise interventions. Exercise results in a number of favourable responses, and contributes to healthy ageing. The evidence has shown that some exercise programmes have been successful in preventing falls and falls injury. However, a number of exercise interventions evaluated using trials have not been effective in preventing falls in older people for one or more of the following reasons:

- they used exercise of insufficient duration;
- inappropriate intensity;
- insufficient frequency;
- the exercise was not specific for falls or falls injury prevention;
- they did not target people at risk of falling.

To be successful at falls and falls injury prevention, the exercise must be specific for purpose and progressive. Its effect differs according to the type of exercise, the exercise programme and the
target group of adults. No national guidelines have been produced which give detailed advice on exercise for falls prevention for use with older people. Recently, however, Skelton and Dinan (Skelton 1999b) have reviewed the literature and have produced a framework for falls and falls injury prevention. Subsequently, training courses leading to recognised qualifications for professionals working in the field of falls and fracture prevention have been developed by these authors in collaboration with others, funded by the Department of Health. Action is needed to ensure its delivery at a local level. The personal and professional skills of the instructor / exercise practitioner (or the person administering the programme) may be one of the most important aspects of the intervention.

The modification of a number of these falls-related risk factors involves referral to a physiotherapist or occupational therapist. Guidelines for the rehabilitation of older people have been produced that are specifically aimed at those professionals who receive referrals of older people who have recently fallen (Simpson 1999). The guidelines comprise two parts: assessment and treatment. They recommend that the assessment by the rehabilitation team should identify:
- impairments;
- environmental hazards;
- what coping strategies have been adopted following the fall;
- the psychological consequences of the fall;
- baseline characteristics against which the effect of the interventions can be judged;
- the extent to which the older person can co-operate with the proposed interventions; and
- signs and symptoms that need to be brought to the attention of their doctor.

The guidelines recommend that, based on the assessment, interventions are agreed with the older person to address the following:
- to increase the older person’s stability during standing, transferring, and walking through balance, strength, and flexibility exercises, as well as through the use of walking aids;
- with the older person’s consent, removing, replacing or modifying environmental hazards;
- teaching the older person to get up off the ground following a fall (which is often a problem for the older faller), to summon help, and to move about and keep warm whilst on the floor; and
- to encourage the person to cope with increasing threats to their balance and with increasingly difficult functional tasks.

Treatment of low bone density

The RCP guidelines update (RCP 2000) provides an algorithm for the management of low bone density in men and women over the age of 45 years. The algorithm has been distilled for the management of individual patients based on the evidence-based synthesis of the different interventions.

Reducing the energy of falls impact

In addition to reducing falls and improving bone strength, a further approach to fracture prevention is to reduce the impact force on the skeleton using external body shielding. Hip protectors have been shown to reduce hip fracture risk by over 50%. They are specially designed clothing which divert / absorb the force of an impact on the hip. The initial studies were carried out in nursing home residents, although one study involving community-dwelling older people has been published and other community-based studies are ongoing.
The main disadvantage of hip protectors are that they only work whilst they are worn and, because they can be uncomfortable, reduced compliance can limit their potential efficacy. Promotion to make older people aware of the prevalence, causes and consequences of hip fracture might motivate the older person to wear hip protectors despite the extra effort required and the discomfort caused by the protector. Increased compliance in the use of hip protectors can be achieved if additional support is given when the older person is starting to wear them. Parkkari and colleagues believe that the attitude of the staff in the institution was a crucial factor for reaching good compliance in their study (Parkkari 1998). This suggests that promotion of hip protectors to carers (including care staff), as well as adequate training in their use and benefits, may be one of the key factors to increase compliance.
3.2 Direct evidence of falls prevention from community-wide intervention

3.2.1 Australian North Coast ‘Stay on Your Feet’ (SOYF) Programme

There is evidence from a prospective study of an intervention area, matched to a control area, that a programme of health promotion reduces the rate of falls-related hospitalisation (Kempton 2000). The health promotion intervention includes awareness raising, community education, policy development, home hazard reduction, media campaigns and working with health professionals. The programme addressed footwear, vision, physical activity, balance and gait, medication use, chronic conditions, and home and public environmental hazards.

The programme targeted 80,000 community-dwelling older people aged 60 years and over resident on the North Coast of New South Wales. The total cost of the programme, including evaluation was A$600,000.

Programme reach was evaluated using annual cross-sectional, random sample telephone surveys. It was found that the programme resulted in increases in:
- having seen, read or heard about falls prevention
- having heard of SOYF
- seen a falls TV advertisement
- seen a falls newspaper item
- received a SOYF book
- received a SOYF calendar
- had a SOYF safety check
- involvement with any SOYF component.

One in 12 older people reported talking with someone about falls, with the most common advice being to take care to avoid risk factors. A third of these were with GPs, a quarter with family, and a fifth with other health workers. Eight percent attended exercise classes, and 6% talks by SOYF advisors. Three-quarters took up the offer of a free SOYF kit and book.

Knowledge, attitude and falls risk factor prevalence, as well as changes in falls incidence (using 12-month retrospective recall) were assessed in a prospective cohort study of 2,000 older people living in the area. People living in the intervention area had significantly increased awareness that falls are preventable, and of their risk of falling. Subjects in the intervention area who reported improved awareness of falls risk were less likely to take falls-related medications, and a greater proportion had better self-reported balance. Falls rates increased from 30% to 36% in the intervention area and from 28% to 41% in the control area. Rates of falls-related admissions were approximately constant during the intervention period in the intervention area, but increased in the control area. The difference between the two was statistically significant.
3.2.2 Velje (Denmark) Community-Based Falls Prevention Programme

There is evidence from an intervention trial amongst community-dwelling older people, which utilised a quasi-experimental design, that a community health programme reduces the rate of lower limb fractures in women but not men (Poulstrup 2000).

The intervention included:
- information about risk factors,
- home visits to 70-74 year olds with assessment and intervention by district nurses,
- home visits to 75-79 year olds with assessment and intervention by general practitioners,
- information on and identification of falls risk factors among older people who regularly receive assistance from home-helpers (many aged 80+).

The programme aimed to address:
- physical indoor and outdoor falls hazards
- illness and age-related changes which impact on dizziness and balance
- psychiatric illness that affects mood and activity levels, and which increases isolation
- use of medicines that increase dizziness and affect balance
- inadequate diet, particularly intake of fluids, vitamins and minerals
- inactivity
- gait disorders.

The target population was older people aged 65 and over living in the community. Written information was sent to all older people in the intervention area at the beginning of the intervention period. Further information about the prevention of falls injury was made available to older people through home visits and group meetings. It was estimated that 60-70% of older people were reached. Approximately half the elder group were visited and assessed. Advice and guidance on prevention was given to approximately a third of older people visited and changes to their physical surroundings, adjustment to medicines, and treatment of disease was carried out in approximately one quarter of older people.

The intervention utilised existing care staff. All the district nurses, general practitioners and home helps underwent training, at the beginning of the project and halfway through, in risk factor identification and management for the prevention of falls.

The outcome was self-reported falls resulting in attendance at a hospital, cross-checked with hospital records. The rate of any fracture in the intervention group was less than the control group, but the difference was not statistically significant. The rate of lower extremity fracture (including hip fracture) was significantly less in the intervention group compared with the control group. This finding appears to be solely due to the effect on women; no effect on men was observed.
3.3 Pedestrians and car occupants

Many road safety interventions are not confined to one age group but bring benefits to the whole community. Initiatives such as traffic calming and pedestrianised areas can reduce the casualty rates of all age groups.

**Pedestrians**

The important issue for older pedestrians is the amount of time available to cross the road. Since highway, road and street pedestrian facilities are generally based on young adult performance levels, many older people have difficulty walking at the 1.2 m/sec recommended by most traffic engineering manuals used in the design of pedestrian crossings. Moreover, engineers are often reluctant to introduce an across-the-board increase in signal times because of the likely disruptions to traffic flow. Technology now allows the green signal to match the time required by pedestrians to cross the road by tracking pedestrian movements through infrared detectors or other devices. This technology is the basis of PUFFIN crossings. An important strategy is the wider introduction of these types of crossing.

The Transport Research Laboratory (TRL) have estimated that the introduction of 20 MPH zones reduce pedestrian casualties (all ages) by 43%, and traffic safety schemes reduce pedestrian casualties by 25%. Additionally, the TRL have estimated a potential 50% casualty reduction through improved pedestrian facilities including priority walking routes, improved crossing facilities - located where the pedestrians need them, and timings attuned to the needs of the pedestrians (DETR 1997). The results from the Gloucester Safe City project also support this approach. Again, strategies that include these are likely to have an important impact for older pedestrians.

**Older drivers and car occupants.**

Vehicle manufacturers should make more efforts to consider the specific needs of older users in their designs. Designs that often encumber the older drivers and passengers are the doorframe height, width, and door aperture, seat height, doorsill height and floor well depth. Design changes are recommended to improve older peoples’ vehicle ingress and egress.

Some other specific design issue that should be addressed by vehicle manufacturers include:
- Seat belt design should be made more sympathetic to the needs of older people, including their increased frailty and restriction of movement.
- Air bags should be designed with the potential frailty of the older user in mind.
- Due to the difficulties that older people have in making right-hand turns, they are more likely to have side impacts. Improved side impact protection systems would benefit the older occupant.
- Power assisted steering can help older drivers control their vehicles more efficiently and safely.
- In-vehicle telematics (eg. collision avoidance systems) offer the potential for improved road safety.

Recommended infrastructure improvements to help the older driver include:
- use of one-way systems, prohibiting dangerous turns, separating traffic flows, and staggering decision processes through the use of roundabouts or offsetting crossroads;
- traffic signals allowing protected turns;
- improved road layout at intersections;
- better sign luminance;
- improved conditions for night driving, including increasing reflectivity of roadway delineation, signs and other road markings;
- larger signs (with symbols preferred to text);
- more relevant, conspicuous and timely information about required driving manoeuvres, complemented by advanced warning;
- speed reduction through road design or traffic controls where complex manoeuvres are required.

**All road users.**

**National Strategies**

Although the government’s road safety strategy *Tomorrow’s roads: safer for everyone* does not focus on the older pedestrians and car occupants specifically, the measures it is introducing are expected to improve the road environment for all users. The key elements are to: achieve driving speeds appropriate to conditions; make safety the main objective of improvements in the road infrastructure; reduce drink- and drug-driving; improve vehicle safety; and improve training and testing.

**Speed:** The government will develop a national framework for determining appropriate vehicle speeds on roads, and will ensure that measures are in place to achieve these. They propose to develop a new hierarchy of roads, defined by their function and quality, to facilitate the introduction of new speed restrictions.

**Road infrastructure:** The government will ensure that safety is a main objective in designing, building, operating, and maintaining roads. They will publish guidance about engineering for safer roads based on sound research, as well as using local transport plans to promote safer neighbourhoods.

**Drink- and drug-driving:** The strategy focuses on the reduction of drink- and drug-driving. This will be through targeted breath testing, increased publicity, increased penalties, rehabilitation, and possibly lower drink-drive limits. In regard to drug-driving, the emphasis is mainly on the effect of eliciting drugs whilst driving, rather than medicinal products. However, the use of a prominent symbol on the labels of medicines known to affect driving has been considered by the European Pharmaceutical Committee, who concluded that they are in favour of introducing a harmonised symbol.

**Vehicle safety:** The government is also determined to further address vehicle safety by encouraging improvement which: prevent accidents happening; protect car occupants in case of an accident; and which protect other road users. They will also help consumers choose safer vehicles, encourage better standards of vehicle maintenance; and better quality control by manufacturers.

**Training and testing:** The strategy also focuses on training and testing and aims to instil in young people the right attitudes towards road safety and safe driving. Some of the proposed activities aim to: raise the standard of tuition offered by driving instructors; improve the driving test; and enhance the status of advanced motoring qualifications.

Other strategic approaches the government could take include introducing policies that lead, for the whole population, to:

- more attractive public transport
- a net reduction in car journeys in urban areas
- an increase in the proportion of total journeys made on public transport through,
for example, pricing structure to encourage greater use.

Local Strategies

Local Authorities: Government guidance, aimed at Local Authorities, to make roads safer for pedestrians includes the following interventions: well-planned pedestrian routes, pedestrianisation schemes for town centres; adequate lighting; well-designed and positioned crossings; improved signal-controlled junctions; and traffic calming to reduce vehicle speeds in key areas. The government also encourages the development of ‘home zones’, where research-based engineering solutions and local transport plans are used to reduce speeds, promote safer roads and safer neighbourhoods.

Local authorities should use their increased powers to introduce 20mph zones, as well as more restrictive speed limits in residential areas, where appropriate.

They should ensure that road safety is accorded prominence in planning processes of local authorities and work together with other agencies towards jointly identified objectives and priorities. They should recognise as a priority the prevention of accidental injuries to the older road user and implement methods of prevention of accidental injury pertinent to older road users, including those described earlier in this section.

They should ensure that more extensive use of engineering techniques are used to produce speed reductions in residential areas where there are a significant number of older people. They should ensure that new housing is appropriately sited in relation to roads and amenities, that provision is made for pedestrians, and that new developments are designed and constructed to minimise exposure to hazardous roads.

When older people are no longer able to drive, they become more dependent on public transport. Local Authorities should implement traffic management schemes, which include the provision of adequate public transport, suitable for older people. Substantial concessions should be made available to the older person to encourage this.

Police forces: The police are obviously essential in enforcing legislation. In order to promote safety, they have a particular focus on improving compliance with maximum speed limits, as well as curbing drink- and drug-driving.

Health Authorities / Primary Care Groups: They should work with other agencies to facilitate interventions targeting risk factors for accidental injury to older pedestrians and older drivers related to health, disease and functional capacity.

Health Promotion / Primary Care: Primary care needs to become more informed in regard to the older driver in order to be able to give definitive advice to improve driving in older age:

- the desirability of using automatic transmissions cars in older age;
- increase vision within the car through additional mirrors;
- advice on sharing driving on long journeys and the need to take breaks;
- the best times to drive and places to avoid to minimise exposure to hazards;
- provide help in obtaining modifications to their car where necessary;
- be aware of health problems that affect crash risk;
- be aware of the effects of medicines on driving.
3.4 Domestic Fires

**National**

Observational study evidence indicates that a reduction in smoking prevalence would reduce fire injury and deaths. The use of smoke detectors reduces fire injuries and death. There is evidence from the USA that a smoke alarm give-away programme can achieve reductions in house fires. However, this work did not focus specifically on older people and evidence from a study in Camden suggests that give-away programmes alone are ineffective and require back up through installation. There is observational study (weak) evidence that the replacement of electric blankets that are over 10 years old would prevent many electric blanket fires.

The National Community Fire Safety Centre (NCFSC) was established in September 1998, and its principal aim is to develop a coordinated and sustained national strategy for delivering fire safety awareness and education. Working with the fire service, its representative organisations and the wider fire industry, the NCFSC is involved in a programme of action that includes:

- developing and evaluating a programme of national fire safety publicity campaigns to meet specific domestic fire risks and trends;
- providing a toolbox of community fire safety programmes and resources which can be used by brigades;
- establishing partnerships and networks with national and community-based organisations, agencies and other government departments, particularly targeting the hard-to-reach groups.

**National fire safety publicity campaigns.** Increasingly, the NCFSC will be working closely with brigades to combine national campaigns with more targeted activity, corresponding to the management of fire risk. The next major campaign on smoke alarms in September 2001 will specifically target older people, and will include joint initiatives with community organisations such as Help the Aged.

**Toolbox.** The Community Fire Safety Toolbox was launched in November 2000. It contains practical guidance and examples of best practice on the implementation and evaluation of community fire safety initiatives. The Toolbox module focussing on older people provides guidance on developing partnerships with other organisations and schemes, and best practice. The Toolbox is a ‘living’ document. Future plans include developing a Toolbox website, enabling all updates to be provided online.

**Partnerships and networks.** At the national level, the NCFSC has developed links with a variety of government departments and agencies, as well as other organisations such as RoSPA, CAPT and Help the Aged. A prime example of cross-government working is the recent joint DTI / Home Office publication on candle safety.

**Fire Brigades**

The Government initiative has resulted in the establishment of Community Fire Safety Units at brigade level, involving a large number of dedicated professionals with a range of experience and disciplinary backgrounds. All brigades now produce a strategic, data-driven Community Fire Safety Plan as part of the refocusing of the service. These plans outline clearly a programme of prevention activities. The focus is accidental dwelling fires, which is where most casualties occur.
Section 4: Final remarks

There is a substantial amount of evidence addressing what is effective in preventing falls, falls-related injury and osteoporotic fractures amongst older people. There is very little direct evidence relating to what is effective in reducing accidental injury to older pedestrians and car occupants. Nevertheless, there is a considerable body of work concerned with the prevention of road traffic crashes and related injury amongst adults, much of which is applicable to older ages. The evidence for the prevention of fire-related deaths and injury amongst older people is relatively sparse. Much work is still required to increase the evidence base.

In the area of prevention of accidental injury amongst older people, direct evidence relating to what is effective in getting research into practice is very sparse. Although inference has been made from evidence carried out in a research environment (ie. RCTs in small defined groups), as well as from the evidence on implementing guidelines and on interventions to change professionals' behaviour, this is no substitute for direct evidence. A large research agenda could be developed aimed at identifying effective delivery of accident prevention amongst older people in community and service settings.
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**Principal Sources**


Evidence grades:
- FG-I: Consistent findings in multiple randomised controlled trials (RCT) or meta-analysis
- FG-II: Single RCT or weak inconsistent findings in multiple RCTs
- FG-III: Limited scientific evidence, cohort studies, flawed RCTs, panel consensus


Potential benefit to health:
- HPW-1: beneficial – effectiveness clearly demonstrated
- HPW-2: likely to be beneficial – effectiveness not so firmly established
- HPW-3: trade-off between beneficial and adverse effects – effects weighed according to individual circumstances


Additional sources


