

## Guidelines for the prevention of falls in people over 65

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Older people frequently fall. This is a serious public health problem, with a substantial impact on health and healthcare costs.<sup>1</sup> These guidelines translate trial evidence about prevention of falls into recommendations that can be implemented in different settings, with the aim of reducing the rate of falls and injurious falls in people over 65 (see boxes<sup>2-3</sup>).

### Methods

We updated two previous systematic reviews to include any new evidence up to March 1998.<sup>4,5</sup> We electronically searched Medline for all randomised controlled trials and systematic reviews by using the terms fall(s), accidental falls, fracture, elderly, aged, older, and senior. We followed up relevant references in papers, and we contacted researchers in prevention of falls for information about other trial evidence and about studies from journals not catalogued by the National Library of Medicine. For inclusion, studies had to be randomised controlled trials of interventions designed to minimise or prevent exposure to the risk factors for falling (or fracture) in people aged 65 years or over living in either community or residential care. Outcomes had to include the number of people who had fallen or the number of falls or fractures. We excluded drug or dietary treatments for the prevention of fractures. Trials that fulfilled the inclusion criteria were reviewed and summarised by one of three reviewers. Evidence statements were drafted for each type of intervention. We assigned a methodology quality score to the trials according to the criteria used for the relevant Cochrane review, with the addition of sample size.<sup>4</sup> Evidence statements were graded according to the quality score and sample size. The grade of evidence was based on three categories originally developed for the national guidelines for acute back pain.<sup>6</sup>

Recommendations were made and graded by the development group, incorporating the strength of evidence with the additional considerations of applicability to, and feasibility within, health and social care in the United Kingdom. A recommendation can have a lower but not higher grade than the linked evidence statement.<sup>7</sup>

A multidisciplinary development group met to discuss the scope of the guidelines and the evidence review, to consider subsequently evidence summaries and possible recommendations, and to review finally recommendations in the light of reviewers' comments. The absence of a physiotherapist or exercise specialist

### Summary points

Multifaceted interventions reduce falls in older people (those over 65)

Home assessment of older people at risk of falls without referral or direct intervention is not recommended

Assessment of high risk residents in nursing homes with relevant referral is effective

Evidence from well designed single trials shows that assessment and modification of risk factors of older people who have presented to an accident and emergency department after a fall and the provision of hip protectors in residents of nursing homes are effective

in the development group was partly mitigated by their inclusion among the reviewers.

To test the acceptability of the guidelines to potential users and their feasibility in different care settings, we piloted them in two general practices, a residential home, and a general hospital. Changes were made to the presentation of the guidelines after the pilot. As prevention of falls in older people is an active research area, we recommend that these guidelines are revised by March 2001.

### Evidence and recommendations

We have grouped evidence and recommendations by type of intervention and the trial settings in which they were tested: exercise interventions alone, multifaceted interventions, and assessment in the community or a residential setting. The recommendations are based on 21 trials. Where trials can be classified into two groups, they are included in both relevant sections.

### Definition of a fall

A fall is a sudden, unintentional change in position causing an individual to land at a lower level, on an object, the floor, or the ground, other than as a consequence of sudden onset of paralysis, epileptic seizure, or overwhelming external force<sup>2</sup>

*General practice*  
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**Target groups for guidelines****Care professionals**

Staff working within a primary, community, accident and emergency, or residential care setting (for example, general practitioners, physicians and health visitors caring for elderly patients, accident and emergency staff, practice nurses, community psychiatric nurses, care managers, social workers, residential care workers)

**Clients**

Ambulant people over 65 living either at home, in a residential home, or in a nursing home (patients in hospital and bedbound individuals are excluded)

As studies on falls exclude patients with severe dementia, our recommendations do not apply to this group<sup>3</sup>

**Exercise interventions alone**

We identified eight trials of exercise interventions. One trial studied a series of exercises and training in gait and transfers in semi-independent residents of long stay nursing homes, but showed no reduction in the rate of falls among this high risk group.<sup>8</sup> Another trial studied individually tailored programmes of physical therapy for women over 80 and found a significant reduction in the rate of falls.<sup>9</sup> In another trial, three different types of supervised exercise were devised for people with mild deficits in strength and balance.<sup>10</sup> When the results from all three groups were combined, the risk of falls was reduced.

Five trials included unselected (after exclusion of severe comorbidity) older people.<sup>11-15</sup> Only one of these trials, a study of t'ai chi, found a reduction in the number of falls, which was almost half among the t'ai chi compared with control group.<sup>11</sup> The other studies showed no significant change in the number of falls between intervention and control groups.<sup>12-15</sup>

Data from four of the above studies were pooled in a Cochrane review, which concluded that exercise alone does not reduce the rate of falls.<sup>4</sup> A preplanned meta-analysis of three published trials on exercise and unpublished data from four other trials in the Frailty and Injuries: Cooperative Studies of Intervention Techniques Group showed a decreased rate of falls among patients who received training in exercise and balance when compared with controls.<sup>16</sup> This effect was not significant if trials that included other interventions were excluded, but training in balance did still decrease the rate of falls.

A more recent trial testing the effect of brisk walking on osteoporosis in women with a history of fracture found that the cumulative risk of falls was higher in the intervention than control group.<sup>17</sup> The results from the trials of exercise on its own cannot support a

**Evidence weighting<sup>6</sup>**

A Consistent findings in multiple randomised controlled trials or a meta-analysis

B Single randomised controlled trial or weak inconsistent findings in multiple randomised controlled trials

C Limited scientific evidence, cohort studies, flawed randomised controlled trials, panel consensus

recommendation of exercise programmes for preventing falls in unselected older people, with the exception of t'ai chi. Exercise, however, is a component of several multifactorial programmes for prevention of falls and has other health benefits. All the included trials used falls as an outcome measure; cardiovascular effects and other benefits were not evaluated.

**Evidence statements**

*Unselected groups*—most exercise programmes without other interventions do not reduce the incidence of falls in unselected older people living in the community. (Evidence weighting A, see box.)

*Selected group (women over 80)*—individually tailored exercise programmes administered by a qualified professional reduce the incidence of falls in a selected high risk group living in the community. (B)

*Selected group (mild deficits in strength and balance)*—exercise programmes reduce the risk of falls in a selected group of older people living in the community. (C)

*Balance training*—T'ai chi classes with individual tuition can reduce the number of falls in older people. (B)

**Recommendations**

*Unselected groups*—with the possible exception of training in balance (t'ai chi), exercise programmes for prevention of falls in unselected older people living in

**Grading of recommendations<sup>6</sup>**

\*\*\* Directly based on grade A evidence

\*\* Directly based on grade B evidence or extrapolated recommendation from grade A evidence

\* Directly based on grade C evidence or extrapolated from grade A or B evidence

the community should not be established. (Grading for recommendations \*\*\*, see box.)

*Selected groups*—individually tailored exercise programmes administered by qualified professionals targeted at the over 80s should be established. (\*\*) Exercise programmes targeted at older people with mild deficits in strength, balance, lower extremity strength, and range of motion should be established. (\*)

T'ai chi classes with individual instruction should be offered to unselected older people living in the community. (\*\*)

**Multifaceted interventions**

Five trials tested multifaceted interventions. One trial combined exercise sessions, daily walks, a home assessment with safety improvements, and group teaching sessions on prevention of falls.<sup>18</sup> A decrease in falls occurred within the intervention group but there were no differences in the number of falls requiring medical care. Tinetti et al targeted high risk patients and combined an assessment by nurse practitioners and physiotherapists with interventions targeted at several risk factors.<sup>19</sup> The rate of falls was substantially reduced. Further analysis showed that interventions aimed at postural hypotension, gait, balance, transfers, and strength and range of motion of the lower extremities were most associated with a reduced incidence of falls.<sup>20</sup> Another trial tested an assessment visit by a

nurse, which aimed to increase physical and social activity.<sup>21</sup> A significant reduction in rate of falls one year after the visit was found.

The Cochrane systematic review reports on an unpublished trial of a review of drugs and assessment and advice about environmental hazards (S Carter, personal communication).<sup>4</sup> Pooling of these results with those of another trial with a similar intervention showed a significant reduction in the number of people who fell. Subsequent to the systematic review, a study reported on older people who presented at an accident and emergency department after a fall.<sup>22</sup> After discharge, the patients received a medical assessment at the local day hospital and an occupational therapy assessment at home, with advice and education and direct intervention when appropriate. Referrals to relevant healthcare professionals were made when necessary. A noticeable decrease in falls was found in the intervention group.

Successful intervention programmes included medical assessment and home safety assessment and advice, changes in prescribed drugs, environmental changes, tailored exercise, training in transfer skills and gait, and referral of clients to relevant healthcare professionals according to need. Although subgroup analysis can generate hypotheses about the relative effectiveness of components in a multifaceted intervention, there is insufficient evidence to generalise about individual components.<sup>20</sup>

When offering multiple interventions, there is a case for targeting patients at high absolute risk of falls. A multifaceted programme should consist of a core assessment and recommendations adapted to individual risk (for example, change of drugs and exercise training).

#### *Evidence statements*

Programmes that combine interventions (most studies include some form of exercise) reduce falls. (A, see box for evidence weighting.)

*Specific factors to target*—attention to postural hypotension, number of drugs, balance, transfers, and gait is particularly effective. (B)

#### *Recommendations*

Prioritise programmes for prevention of falls that include more than one intervention. (\*\*\*, see box for grading of recommendations.)

*Specific factors to target*—prioritise correction of postural hypotension, rationalisation of drugs where possible, and interventions to improve balance, transfers, and gait. (\*\*)

#### **Assessment in the community**

Six trials addressed the assessment by trained volunteers, health professionals, or researchers of older people who had fallen or those at risk in the community. In all but one of the studies, assessment at home was supplemented by advice and education. One study identified subjects in an accident and emergency setting.<sup>22</sup>

In one trial the intervention proved beneficial when people aged 75 years or over were assessed at home by trained lay volunteers.<sup>23</sup> Visits for assessment at intervals of three or six months for three years prompted referral to the patient's doctor in response to an increase in a disability score. Referrals were also made to non-medical services such as meals on wheels



BETTY PRESSANOS PICTURES

One type of active intervention for reducing falls

and home helps. This study had a low methodological quality score compared with others assessed for these guidelines, making it difficult to interpret and generalise the potential role of home visits with referral. Three other trials studied assessment at home by a health professional to identify medical problems and environmental hazards.<sup>24-26</sup> In another study, subjects received home safety assessment and education by a researcher.<sup>27</sup> None of the four trials included referrals or active intervention, and none detected a reduction in number of falls or, in Vetter et al's study, the incidence of fractures.<sup>25</sup>

Close et al's study implemented a medical assessment at the day hospital after discharge followed by an occupational therapy assessment at home, with direct intervention advice, education, and referral.<sup>22</sup> The study showed a reduction in the number of falls over one year.

#### *Evidence statements*

*Home assessment 1*—home assessment of disability and education in the risk areas and referral to the patient's doctor reduces falls. (C, see box for evidence weighting.)

*Home assessment 2*—home assessment of risk and education in these areas without further referral does not reduce falls. (A)

*Accident and emergency assessment*—identification of patients who attend accident and emergency departments after falls, with subsequent assessment of medical and occupational therapy and referral and follow up, reduces falls. (B)

#### *Recommendations*

*Home based interventions*—a programme of medical and environmental assessment, with client education about risks and with referrals to relevant healthcare professionals (for example, general practitioners, occupational therapists) should be established. (\*, see box for grading of recommendations.)

*Accident and emergency departments*—a programme of follow up for medical and occupational therapy for older people who have presented at accident and emergency departments after a fall should be established. A structured interdisciplinary approach to their management should be prioritised. (\*\*)

### Residential settings

Four trials were based in residential settings: three studied prevention of falls and one the prevention of fractures with hip protection. Because the evidence is from “nursing homes,” where residents have different levels of risk and fitness, it is probably applicable to a wide range of supervised residential settings in the United Kingdom.

Two studies concerned individual assessment of subjects at high risk followed by recommendations to their primary care physicians or nursing home staff, including changes to drugs and the environment.<sup>28 29</sup> One of the studies showed a reduction in admissions to hospital when ambulatory residents were assessed within seven days of a fall and a non-significant reduction in rate of falls.<sup>28</sup> The other study found a reduction in rates of falls after assessment and development of individual treatment plans along with education of staff caring for residents who had fallen in the past year and who had a deficit in one of four “safety domains.”<sup>29</sup> In another study, in which semi-independent residents of long stay nursing homes were given training in resistance, flexibility, balance, gait and transfers,<sup>8</sup> there was no reduction in the incidence of falls.

One study found the use of external hip protectors beneficial in the prevention of hip fractures in residents of nursing homes.<sup>30</sup> No fractures were sustained by residents wearing hip protectors when they fell, but compliance was a problem as it was in subsequent studies of hip protectors.<sup>31 32</sup>

### Evidence statements

*All residents*—non-selective exercise programmes for residents of nursing homes do not reduce falls. (B, see box for evidence weighting.)

*High risk residents*—assessment of residents after falls, with development of individual treatment plans and staff education, decreases falls. (B)

*Hip protectors*—neck of femur fractures are prevented by hip protectors being worn by residents of nursing homes. (B)

### Recommendations

*All residents*—non-selective exercise programmes for prevention of falls should not be implemented. (\*\*, see box for grading of recommendations.)

*High risk residents*—a programme of risk assessment for residents who have had at least one fall, with referral to their primary physician for specific preventive measures if necessary, should be established. (\*\*)

*Hip protectors*—all residents of nursing homes should be offered hip protectors. (\*\*)

### Conclusion

The recommendations in these guidelines are based on a rigorous development method with explicit links to evidence from trials. There are large gaps in this evidence (box). A key methodological problem is the uncertainty of the outcome measures used in most of the trials, as all methods of recording falls have weaknesses. None of the trials included an economic evaluation, although if reduction in falls also results in fewer injurious falls and fractures, then prevention of falls is likely to be cost effective because of the high costs of hospital care. The trial reports rarely have

### Areas where research is needed

Further trials of hip protectors in different care settings  
Validation of risk assessment as a guide to intervention  
Economic evaluations of intervention programmes for falls  
Evaluation of different components of multifaceted intervention programmes  
Trials of implementation of programmes for prevention of falls by several agencies

sufficient information about either the characteristics of the sample or the characteristics of the local population and service context in which they took place. It is not clear which components of the multifaceted interventions that were successful are essential, including exercise. Exercise is a non-specific term and can consist of several different elements, including strengthening of muscle and training of balance. A small number of trials showed a reduction in the rate of falls after exercise, but several others showed no significant effect. On the basis of the evidence, we recommend tailored exercise programmes to be targeted at high risk groups and administered by qualified professionals. A recent review identified insufficient duration, intensity, frequency, and specificity and the inclusion of people at low risk of falls as problems with the exercise regimens used in those trials that failed to show an effect.<sup>33</sup> This work also made recommendations regarding the most appropriate exercise programme for prevention of falls or fractures.

The guidelines rely on trials outside the United Kingdom. Furthermore, there are no pragmatic trials testing the implementation of a multifaceted programme for prevention of falls across the diverse agencies that need to be involved: primary and secondary health care as well as social and environmental health services. Nevertheless, there is a body of relatively consistent evidence from which it is possible to formulate general recommendations about worthwhile interventions at a local level to reduce the incidence of falls in older people. It is also possible to highlight interventions that are unlikely to be effective and should be avoided outside a research context.

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## Managed care of chronically ill older people: the US experience

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The continuing debate over changes in geriatric care in the United Kingdom could be informed by some difficult lessons learnt from recent developments in the United States.<sup>1</sup> Medicare, created by US law in 1965, is a low cost health insurance programme that is available to most Americans aged 65 or older and to some disabled younger people. Medicare is a traditional indemnity insurance plan that reimburses physicians, hospitals, and other professionals for providing Medicare beneficiaries with acute health-care services. The coverage does not include drugs or, with few exceptions, preventive or long term care services.

In the mid-1980s Medicare began looking to "managed care" to help control its runaway expenditure. Under managed Medicare, an insurance company known as a health maintenance organisation accepts from the Medicare programme a fixed capitation payment for each person it enrolls, and it agrees to provide that person with at least the standard package of Medicare benefits. The amount of the capitation payment is based on the person's age, sex, income, type of residence (nursing home or independent dwelling), and geographical location. The health maintenance organisation may, at its discretion, cover additional services and charge monthly premiums. Beneficiaries have the choice of remaining in the traditional fee for

### Summary points

The US Medicare health maintenance organisation industry has produced evidence on the cost effectiveness of new approaches to caring for elderly people

Some innovations change how and where health care is provided; others focus on educating patients and adapting their behaviour

Economic and organisational forces mean that most Medicare health maintenance organisations are reluctant to invest in new forms of care, even where programmes seem effective

Purchasers of health care for chronically ill older people should offer capitation payments that reflect each older person's probable need for health resources in the future

Purchasers should also facilitate the collection and public distribution of data about the quality and the outcomes of the care delivered by each provider

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