# Falls, Fragility & Fractures

## *National Service Framework for older people: The case for and strategies to implement a joint Health Improvement and Modernisation Plan for Falls and Osteoporosis*


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# Executive Summary

## Falls, Fragility & Fractures - the case for and strategies to implement a joint Health Improvement and Modernisation Plan for Falls & Osteoporosis

## Background

Accident prevention is one of the four priorities for the NHS as set out in the White Paper Saving Lives: Our Healthier Nation[1].

The recent National Service Framework for Older People[2] (NSF-OP) focuses on falls which result in serious injury in the population of older people. The NSF-OP highlights the link between falls and osteoporosis and sets minimum standards for healthcare.

This paper further highlights the link between falls and osteoporosis and the resulting injuries and deaths.
Falls and osteoporosis are common in older people. A fall in people with osteoporosis is likely to result in a worse outcome due to the increased risk of fracture. Falls and fractures are associated with high morbidity, mortality and substantial costs. [3 - 12]

# Integrated plans

Many Health Authorities and Primary Care Organisations (PCO's) have targeted either falls amongst older people or osteoporosis as a local priority, but rarely both. We recommend a joint approach as outlined below.

In this era of restricted Healthcare budgets it is important to maximise the benefit for any interventionist strategy and to target this to the highest risk sub-groups.

A particularly high-risk group is older people with a history of falling who also have osteoporosis. In excess of 95% of all hip fractures in older people occur as the result of a fall.[13-14] Over 90% of all hip fractures in the over 75's occur in people who have osteoporosis.[15]

This relationship is shown graphically in Figure S1.

In order to treat this sub-group, and avert fractures, measures will need to be taken to identify people both at risk of falling and at risk of osteoporosis.

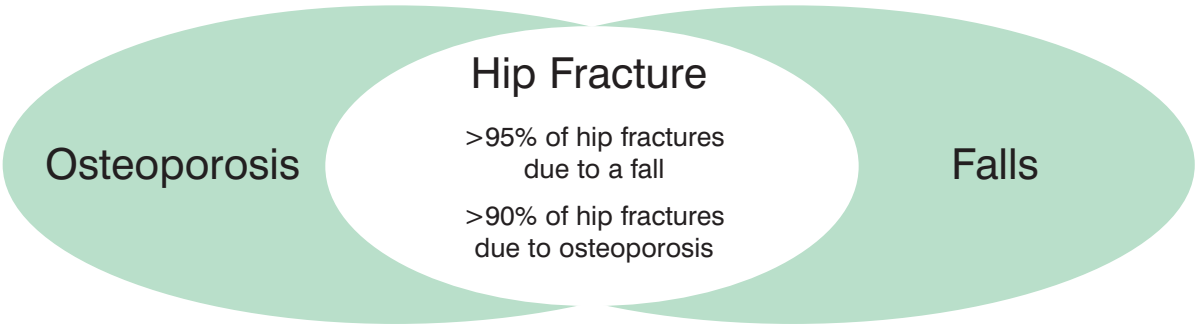



*Figure S1 - The relationship between Falls, Osteoporosis & Hip Fractures*

- Low trauma fractures, particularly hip fractures, are the major cause of accidental injury morbidity and mortality in older people.[3-12]
- Around 5% of falls result in fracture [16]
- In excess of 95% of hip fractures are fall related, spontaneous fractures being very rare.[13-14]
- Over 90% of hip fractures occur in older people with osteoporosis.[15]
- The risk of fracture is highest in those with osteoporosis who also have a high risk of falling.[17]
- Falling and osteoporosis are both highly prevalent in the same population - older people (and in particular, older women).

The nature of a fall determines the type of fracture, whilst bone density and factors that increase or attenuate the force of impact of a fall determine whether a fracture will occur as a result of the fall. These findings have important implications for prevention of fractures in older women.

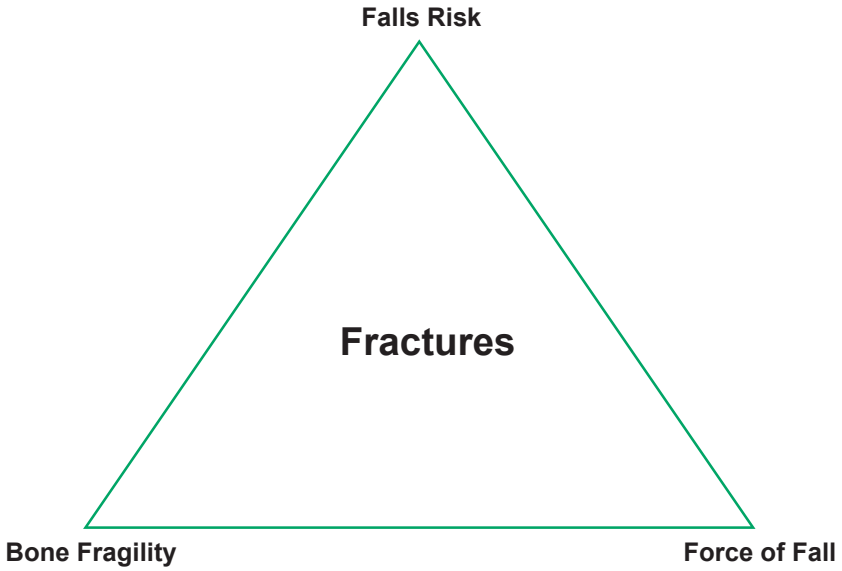



*Figure S2 - The Fracture Prevention Triangle* [18]

Figure S2 shows that approaches to fracture prevention must address both the force of a fall, the incidence of falling and bone fragility. In order to do this a multi -agency approach is essential.

## Strategy for the prevention of fractures

An optimum model for the reducing fractures involves:

I. Maximisation and maintenance of bone strength (prevention and treatment of osteoporosis)
II. Minimisation of trauma (prevention of falls/reduction of the force of impact as a result of falls)

It is recommended that healthcare providers include assessments for falls risk factors and treatment or referral to modify identified risk factors in the routine care of all older people; and particularly among those with osteoporosis. Likewise, in these same people, it is recommended that there be routine assessment of osteoporosis clinical risk factors, and where they exist that the person be referred for bone densitometry.

# Stages in Process

There are three stages in this integrated approach:

1. **Targeting** groups of older people at high risk of falling or fracture.
2. **Assessment** to identify whether remedial risk factors are present.
3. **Interventions** - facilitation of interventions to correct underlying risk factors.

## Targeting

We recommend an assessment for both osteoporosis and falls in people aged 70 years and over with any of the following criteria:

- recent injurious fall (which is an independent predictor of future falls)
- a history of multiple falls in the past year
- a fall in the past year with evidence of gait or balance problems
- recent low trauma fracture (which is an independent predictor of future fractures)
- evidence of osteoporosis/low bone density (which is a strong predictor of fracture).

## Assessment

Individuals that are identified for any of the above reasons should be assessed for both falls risks and for osteoporosis. The precise care pathway will vary according to how individuals are identified. These are shown in figures S3 & S4.

## Interventions

Interventions are recommended to ameliorate risk factors found at assessment. The specific interventions recommended are described in full within the main document. For osteoporosis/low bone density, we describe drug treatments in accordance with the Royal College of Physicians (RCP) Guidelines.[19, 20] For falls, the evidence for interventions to reduce falls is discussed and specific recommendations given for each fall related risk factor. Where possible the strength of evidence for each intervention is given.[4,43,44]

## Practical steps

Examples and tools for the implementation of this integrated Health Improvement and Modernisation Plan (HIMP) by a Primary Care Organisation (PCO) are included at the end of the document.

# Figure S3 & S4
## Care pathways for management of individuals presenting with a fall or an osteoporotic fracture

*Figure S3*
*Presentation with a fall/periodic case finding*

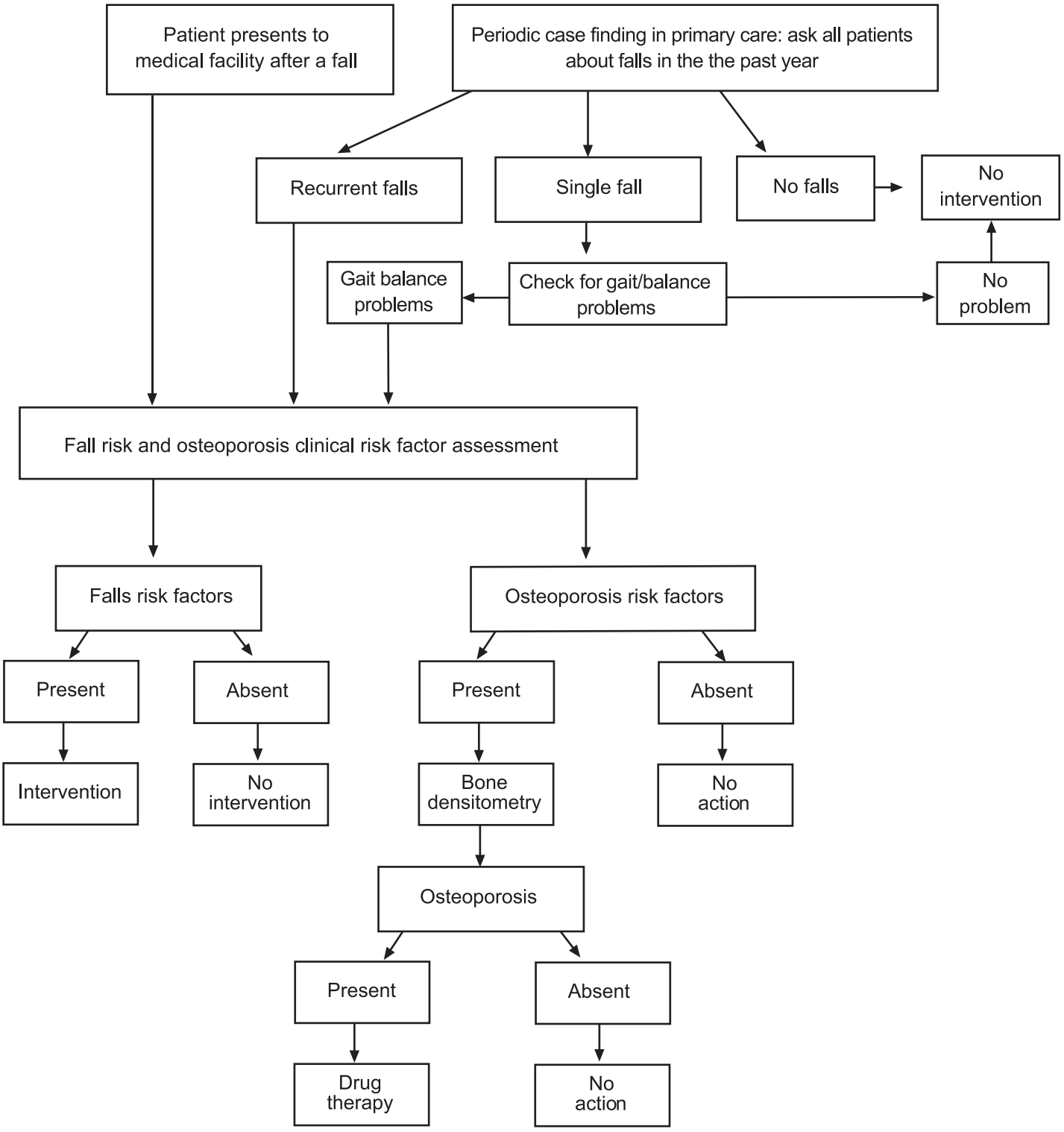
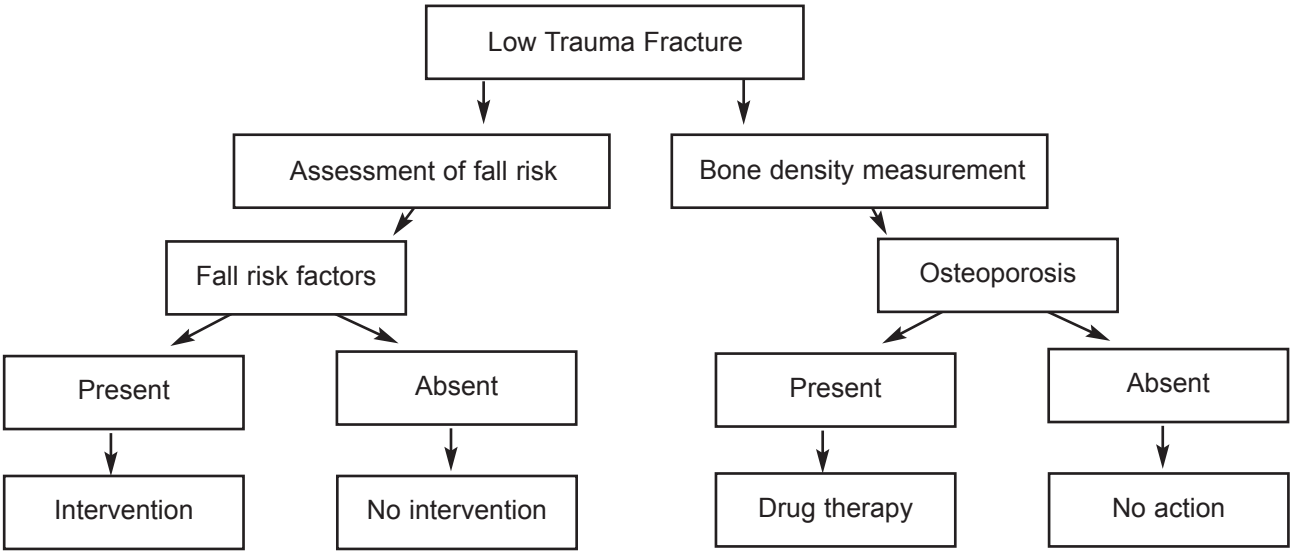


*Figure S4*
*Presentation with a low trauma fracture*



# Introduction

The White Paper Saving Lives: Our Healthier Nation sets out 4 priorities for the NHS.[1] One of these is accident prevention. The majority of accidental injuries resulting in death and hospitalisation for serious injury occur in older people, many of these accidental injuries are caused by falls, and the most common diagnosis amongst these accidental injuries is fracture. This White Paper has been re-enforced by the recent National Service Framework for Older People (NSF-OP) that sets out a service profile that interlinks falls and osteoporosis.[2] The Government have given a policy commitment to reduce the death rates from accidents by at least a fifth and the rate of serious injury from accidents by at least a tenth - saving 12,000 lives by 2010.[21] This paper highlights falls amongst older people as the most important cause of accidental injury amongst older people, due to their high mortality, morbidity and cost to the NHS. It is a combination of propensity to fall and osteoporosis that causes many of the serious injuries such as hip fractures amongst older people.

Many Health Authorities and Primary Care Organisations (PCOs) have targeted either falls amongst older people or osteoporosis as a local priority, but rarely both. This document seeks to bring together work on both falls and osteoporosis in a single Health Improvement and Modernisation Plan (HIMP). The principle behind this document is that it should give enough information on the available intervention options, without being too prescriptive. It will thereby allow the framework to be tailored to local needs, whilst effectively implementing the standards set out in the NSF-OP. We describe the context of osteoporosis and falls, the case for dealing with falls and fractures in a strategic way, and then provide practical tools for the implementation of this strategy

# 1.0 Falls

## 1.1 Epidemiology of Falls

Falls are the most important type of accident and many occur in and around the home [11-16]

- Around 30% of over 65's living in the community will fall per year.
- Over 60% of people in nursing homes fall each year.
- The rate of falls injury hospitalisation increases exponentially for over 65's with rates being higher in women than men.
- 75% of falls-related deaths occur in the home.

Applying the current epidemiological data to those aged 50 and over in a typical Primary Care Organisation (pop.100 000):

- 420 people are admitted to hospital due to a fall per year.
- 140 are admitted to hospital with a hip fracture per year.

The annual number with a hip fracture is predicted to rise to 400 by 2030.

## 1.2 Causes

Falls are the most important type of accident and many occur in and around the home [11-16] Table 1 illustrates the two different types of fall risk.

| Type | Factors | More important in |
|---|---|---|
| Extrinsic | Social or physical environmental factors | under 70's |
| Intrinstric | States or traits of an individual, (e.g. disease state) | over 70's |

*Table 1 - Type of falls risk*

### Extrinsic factors

Falls amongst older people most often occur whilst standing, or walking on one level. External factors reported to influence falling include:

- Hurrying.
- Collisions in the dark and failing to avoid temporary hazards.
- Frictional variations between shoe and floor.
- Excessive environmental demands as well as altered environmental conditions.

The evidence is unclear regarding the specific role the environment has in increasing the risk of falls. Some studies have identified many different external environment hazards, whereas others have not been able to demonstrate any association between hazards and falls rates. Specific environmental factors associated with increased falls (and/or 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 stair drops that are not easily distinguishable.

## Intrinsic risk factors

Detailed information on intrinsic risk factors is provided in Appendix 1.
Broad classes of risk factors include:

- Underlying conditions
- History of previous fall
- Physical functioning
- Foot problems and footwear
- Sensory declines
- Medical conditions
- Medicine use
- Psychological factors
- Mental health
- Cognitive declines
- Behavioural factors
- Strength, balance, gait, and physical performance

There is a complex causal net linking risk factors and falls occurrence.

The risk of falling increases with number of risk factors. For example, Tinetti and colleagues[16] in 1988 found that risk amongst community-dwelling people aged 75 years and older increased with the number of risk factors. (Figure 1)

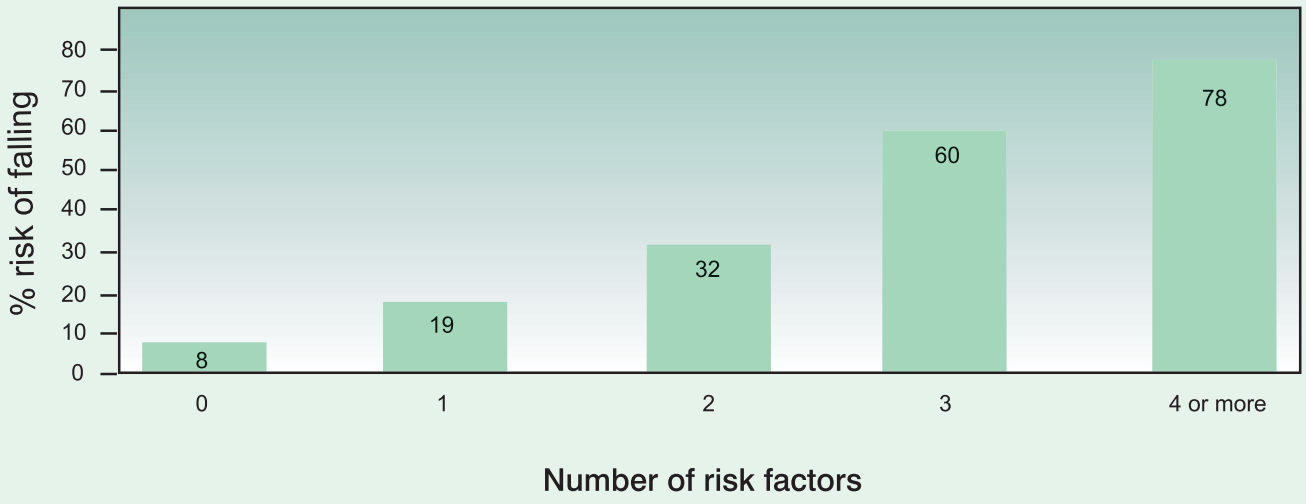



*Figure 1 - The relationship between risk of falling and number of risk factors*
*Adapted from Tinetti et al NEJM 1988;319:1701-7*

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

An important aspect of maintaining function and protecting against falls is physical activity. Only 1 in 6 women and 1 in 4 men of all ages 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). [23] 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. [23] When strength, muscle power, flexibility and co-ordination, and balance decline, the older person is less able to prevent a slip, trip or stumble becoming a fall. After a fall, many older people find getting off the floor impossible leading to a long lie. It is possible to reverse this functional decline relatively quickly. Regular and appropriate physical activity directly improves functional fitness and activities of daily living. [24] In people aged 75 and over, a 27% increase in muscle strength was achieved in 3 months. [25]

## 1.3 Human burden

Falls cause soft tissue injury and fractures which result in pain, disability, immobility and occasionally the need for surgery.

- One of the major consequences of falls in older people are osteoporotic hip fractures

A recent study examining the views of community dwelling older women on hip fracture that results in nursing home admission showed that they viewed this, in quality of life terms, as equivalent to death. Also hip fracture with maintenance of independence is still viewed by older people as resulting in substantial reductions in quality of life.[9]

- Falls can also result in a curtailment of activity, increased isolation and dependence

Falls result in curtailment of activity because of concern about further falls. They are associated with social isolation and lead to functional deterioration, which in turn leads to dependency and institutionalism. (Table 2.) [26,27]

| Type of fall | Increase in the likelihood of nursing home admission compared to non fallers |
|---|---|
| 1 non injurious fall | x 3 |
| 2 or more non injurious falls | x 5 |
| 1 fall causing serious injury | x 10 |
| % of admissions precipitated by fall | 40% |

*Table 2 - Loss of dependence in older people due to falls*

*(Source: Tinetti ME, Williams CS. Falls, injuries due to falls, and the risk of admission to nursing home. N Engl J Med 1997; 1279-84. Kellogg International Work Group on the Prevention of Falls by the Elderly. The prevention of falls in later life. Danish Medical Journal, Genrontology Special Supplement Series Number Four 1987; 34: 1-24.)*

## 1.4 Costs

The financial costs of falls are large because

- 1 in 5 fallers require medical attention.[28]
- 1 in 40 fallers are hospitalised.[28]
- 1 in 5 orthopedic beds is occupied by an older person with a broken hip. [19]

Estimates of the actual annual costs of falls in the UK have not been calculated. Figure 2, however, shows the annual increased health and care costs of fallers compared with non-fallers amongst ambulatory and cognitively sound older people aged 72 and over living in the USA. [29]

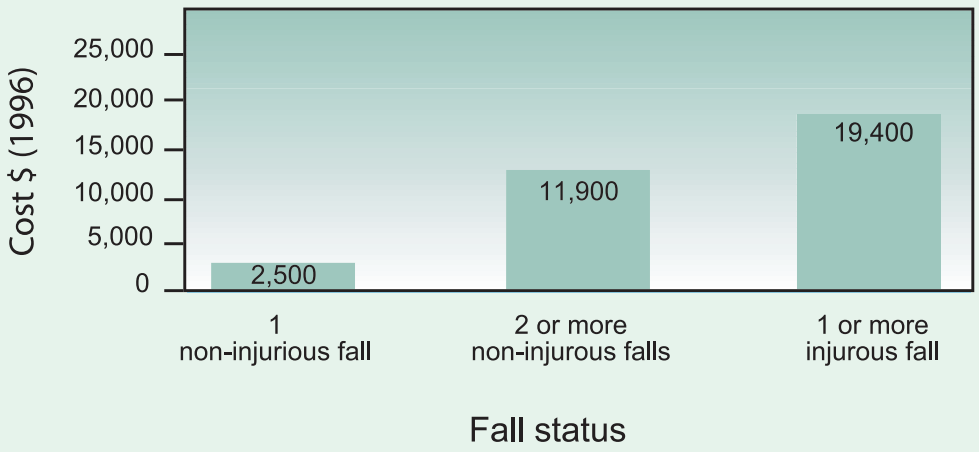



*Figure 2 - Cost of falls in USA*

*(Source: Rizzo JA, Friedkin R, Williams CS, et al. Health care utilization and costs in a medicare population by fall status. Medical Care 1998; 36: 1174-88.)*

It can be seen that the cost rises with the frequency of falling, and markedly when an injury is incurred. Indeed 5.3% of the total USA hospital charges in 1989 were attributable to the hospitalisation of older patients with fall-related trauma.

# 2.0 Osteoporosis

## 2.1 Definition

The current conceptual definition of osteoporosis is:

"A progressive systemic skeletal disease characterized by low bone mass and architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture" (WHO 1994)[12] Although this definition does not allow for patient identification it does convey the fact that the disease, if present, potentially affects most skeletal sites and that loss of bone mass and structure are important. It also implies that fracture risk is increased. This is important as fractures cause the clinical burden of the disease both to individuals and the health service.

In clinical practice osteoporosis is diagnosed from a variety of risk factors including:

- previous low trauma fracture
- low bone mass
- high dose steroids

In considering low bone mass, two arbitrary thresholds have been suggested by the WHO to define those at highest risk of fracture (osteoporosis) and a higher threshold, which defines a group of women who may need treatment to prevent bone loss at the menopause (low bone mass or osteopenia). "Osteoporosis" should be applied to those with bone density more than 2.5 standard deviations below the average for young normal sex matched individuals and "osteopenia" to those with bone density which is between 1 and 2.5 standard deviations below the average for young sex matched normal individuals.

## 2.2 Epidemiology of Osteoporosis

Osteoporosis is a common disease in the UK. It has been estimated that the disease affects 1 in 3 women over the age of 50 and 1 in 10 men.[30] The National Osteoporosis Society has estimated that there are 3 million osteoporotic patients in the UK.[31] Associated fractures occur after low energy impact or even spontaneously. (Table 3)

| Common Fracture site | No. of fractures / year | Burden to NHS | Mortality | Age group most effected | % men |
|---|---|---|---|---|---|
| Hip | 60,000 | 20% orthopaedic bed stays [19] | 15 -20 % at 1 year [33] | 70+ | 20% [35] |
| Spine | 40,000 (diagnosed) 120,000 (prevalent) | 14 extra visits to GP in the year after fracture [32] | 1.16 x higher mortality rate[34] | 60's | 15% [36] |
| Distal radius | 50,000 | 4 extra visits to GP in the year after fracture [32] | | 50's | |

*Table 3 - Impact of common fractures*

Other common fracture sites include the pelvis, proximal humerus, distal femur and ribs.

Evidence now shows that a fracture is an independent risk factor for a future fracture.

- Women with 1 pre-existing vertebral deformity have a 5 fold greater risk of further vertebral fracture. [36]
- This increased risk rises to 12.7 in women with the most severe vertebral deformities. [36]
- A recent study by Lindsay and colleagues showed that 20% of postmenopausal osteoporotic women suffered a further vertebral fracture within 1 year of a new vertebral fracture. [36]
- A study by Lauritzen and Lund showed that women with a pre-existing fracture had a 3.8 fold increased risk of hip fracture compared with the background female population. [38]
- This study also shows that the risk of subsequent hip fracture in patients with a previous vertebral or limb fracture is highest in the first year following the initial fracture. [38]

## 2.3 Causes

Osteoporosis is a multi factorial disorder with both genetic and environmental contributions. Genetic factors play an important role in the determination of peak bone density (that is the amount of bone accumulated during growth). In later life other factors, such as the menopause and exposure to toxins such as tobacco and alcohol as well as drugs such as steroids, also have an important role in causing osteoporosis. Additionally, considerable epidemiological evidence exists for the protective effect of exercise on the skeleton.

## 2.4 Human burden

### Hip fracture

Hip fractures invariably require hospitalisation and operative intervention. Studies of functional status after a hip fracture indicate that many previously independent older people have difficulty with basic activities of daily living and often need residential or nursing home support [39] A number of studies show that mortality is as high as 20% in the first year following a hip fracture, and higher in older men.[33,39] Up to 50% of people will not be able to walk unaided after a hip fracture.

### Distal radial fractures

This type of fracture is usually treated as an outpatient. The majority will regain good function. A minority suffer a reduction in function. Pain and stiffness can persist for 6 to 12 months afterwards.

### Vertebral fractures

The study of vertebral fractures is complicated by the fact that up to two thirds of these fractures may be asymptomatic. [34] Symptomatic fractures cause pain, which is often severe, and may result in hospitalisation. The presence of a vertebral fracture in older women has been shown to be associated with increased risks of mortality and hospitalisation, which cannot be fully explained by the presence of co-morbidities. [34]

Multiple vertebral fractures often result in kyphosis, which can lead to shortness of breath and abdominal bloating. Vertebral fracture is a strong predictor of future fractures, with a vertebral fracture increasing the risk of subsequent hip fracture nearly 4 fold. [38]

## 2.5 Costs

The health care and social care costs of fractures occurring in men and women over the age of 50 years has been estimated to be £1.8 billion/annum.[40] Whilst, hip fractures are responsible for the majority of these costs, vertebral fractures pose a significant burden on primary care. (Table 4)

| | **Impact on NHS** |
|---|---|
| Hip Fracture [32,35,40,41] | 60,000 per annum<br>First Year cost £13000<br>Second Year cost £7000<br>20% of orthopedic bed stays<br>800,000 bed days a year (England only ) |
| Vertebral Fracture [32,35] | 120,000 vertebral fractures per annum of which 40,000 are clinical fractures 14 additional GP visits in patients with clinical vertebral fracture in the year after fracture compared to the year before fracture. |
| Wrist Fracture [35] | 50,000 per annum |
| Total Costs [40] | 1.8 billion per year |

*Table 4 - Cost and Impact of fracture*

# 3.0 A joint Falls and Osteoporosis HIMP

## 3.1 The argument for a joint programme

Any HIMP that covers the areas of falls and osteoporosis could potentially involve large numbers of clients, and hence have a large impact on the healthcare budget. In this era of restricted healthcare budgets it is important to maximise the benefit for any interventionist strategy by targeting this to the highest risk sub-groups.

A particularly high-risk group is older people and who have a history of falling who also have osteoporosis. In excess of 95% of all hip fractures in older people occur as the result of a fall. [13,14] Data also suggests that over 90% of all hip fractures in the over 75's occur in people that have osteoporosis. [15] This can be seen graphically in Figure 2.

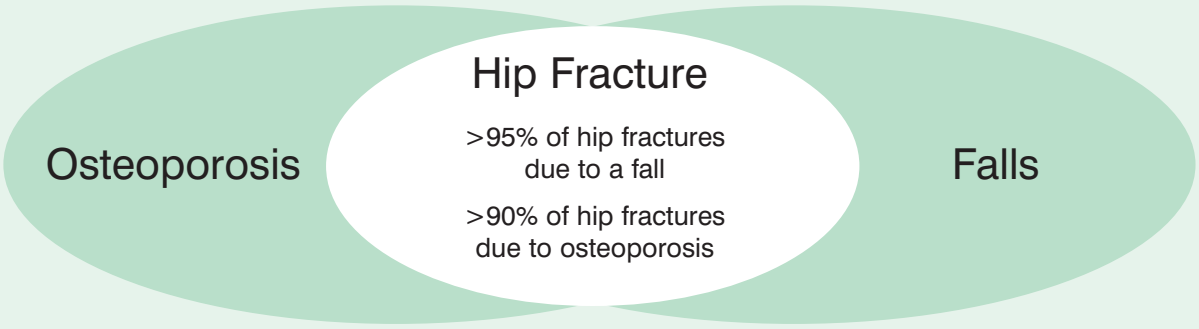



*Figure 2 - The relationship between Falls, Osteoporosis & Hip Fractures*

Around 5% of falls in older people result in a fracture, with 1% resulting in a hip fracture [16] In excess of 95% of hip fractures are fall related, spontaneous fractures being very rare [13,14]. Furthermore, in the over 75's, 90% of these fractures are related to osteoporosis.[15] One of the highest risk sub -group is those individuals who have both osteoporosis and a high risk of falling.

In order to treat this sub-group, and avert fractures, measures will need to be taken to identify people both at risk of falling and at risk of osteoporosis.

- Low trauma fractures, particularly hip fractures, are the major cause of accidental injury morbidity and mortality in older people [3-12]
- Around 5% of falls result in fracture [16]
- In excess of 95% of hip fractures are fall related, spontaneous fractures being very rare [13,14].
- Over 90% of hip fractures occur in older people with osteoporosis.[15]
- The risk of fracture is highest in those with osteoporosis who also have a high risk of falling [17].
- Falling and osteoporosis are both highly prevalent in the same population - older people (and in particular, older women).

The nature of a fall determines the type of fracture, whilst bone density and factors that increase or attenuate the force of impact of a fall, determine whether a fracture will occur following a fall. These findings have important implications for prevention of fractures in older women.

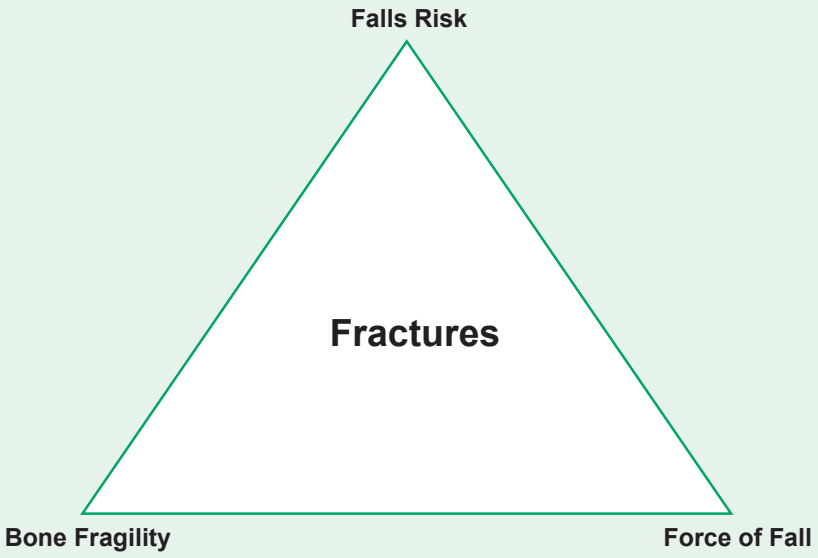



*Figure 3 - The Fracture Prevention Triangle* [18]

Figure 3 shows that approaches to falls prevention must address both the force of a fall, the incidence of falling and bone fragility.

In order to do this a multi-agency approach is essential, to address a range of preventive issues from the installation of grab bars in bathrooms, balance and gait problems, dizziness and osteoporosis.

## Strategy for prevention of fractures

An optimum model for reducing fractures involves:

I. Maximisation and maintenance of bone strength (prevention and treatment of osteoporosis )

II. Minimisation of trauma (prevention of falls/reduction of the force of impact as a result of falls)

It is recommended that healthcare providers include assessments for falls risk factors and treatment or referral to modify identified risk factors in the routine care of all older people; and particularly among those with osteoporosis. Likewise, in these same people, it is recommended that there be routine assessment of osteoporosis clinical risk factors, and where they exist that the person be referred for bone densitometry.

## Strategic Approach

- the prevention of falls amongst older people.
- the prevention and treatment of osteoporosis.
- the use of hip protectors and other strategies that reduce the transfer of kinetic energy to the skeleton.

## Stages in Process

There are three stages to this integrated approach:

1. Targeting groups of older people at high risk of falling or fracture.
2. Assessment to identify whether remedial risk factors are present.
3. Intervention - facilitation of interventions to correct underlying risk factors.

The next part of the document discusses these stages in more detail.

# 4.0 Targeting of high risk sub-groups

## 4.1 Population-wide approach

The National Screening Committee (NSC) in its latest review of osteoporosis stated, "There does not appear to be a simple reliable test for osteoporosis that would meet all the criteria for a screening program." Bearing that in mind, "The NSC decided that no population-wide screening programme could be justified at present but the various markers of bone health should be regularly reviewed as the numbers of potentially osteoporotic individuals increase." [42]

There is no evidence that a population-wide screening programme for falls risk would satisfy validity guidelines for screening. The number of individuals involved in such a programme would be large and this approach is unlikely to be economically viable. Nevertheless, recent guidelines recommend periodical asking older people, under the care of a health professional, about falls in the past year to identify a high risk group of older people for targeting [43.]

## 4.2 Selective identification of those at risk

In the absence of evidence to promote a population based screening approach, a strategy which will target groups of individuals who are at high risk of falls and osteoporotic fracture seems more suitable. A number of criteria could be used but the following are likely to be effective in identifying the highest risk group:

- Recent injurious fall (which is an independent predictor of future falls)
- A history of multiple falls in the past year
- A fall in the past year, with evidence of gait or balance problems
- Recent low trauma fracture (which is an independent predictor of future fractures and diagnosis of osteoporosis)
- Diagnosis of osteoporosis/low bone density (which is a strong predictor of future fractures)

The above criteria for the identification of at-risk individuals are very clear.

A recent fall and/or osteoporotic fracture is identifiable by staff in healthcare and non-healthcare settings, and should stimulate referral to the assessment and intervention programme.

They also have the advantage that a recent fall or fracture as well as the results of bone densitometry may increase patient awareness and willingness to participate in an assessment and intervention programme.

The majority of the evidence for falls prevention applies to the over 70's. The incidence and risk of both falling and osteoporosis increase with age. We recommend that strategies be implemented for this age group. This does not mean that younger individuals should not be assessed and treated. In the case of younger individuals they should treated as per the standards set down by such bodies as the Royal College of Physicians. [19,20]

# 5.0 Detailed assessment

The following is applicable to individuals aged 70 or over

## 5.1 Falls assessment

It is recommended that all patients over the age of 70 who have an injurious fall, multiple falls in the past year, or have a fall that resulted from balance or gait problems, have a recent low trauma fracture, or have a diagnosis of low bone density, should receive a fall risk assessment. The recommended assessment is currently that published in the Department of Health sponsored guidelines for the prevention of falls in older people, although this is being further developed and an updated tool will be published as soon as possible. [4,44]

The assessment tool has been derived from sound randomised controlled trials that have shown a reduction in the rate 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 risk factors addressed by the assessment include the following:

- History of falling
- Number of medications
- Balance
- Postural hypotension
- Vision
- Walking/gait
- Transfers: toilet, bath, shower, bed
- Use of central nervous system suppressants

The recently published American and British Geriatric Society guidelines propose that similar risk factors be addressed as well as lower limb joint, neurological and cardiovascular disorders [43.]

If a patient has any of these risk factors, the appropriate management strategy should be implemented, either by the assessor, if qualified, or by referral to the appropriate professional. Direct evidence of the effectiveness of falls prevention intervention 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 (in the USA) who have recently fallen

The method of measurement of each of these risk factors is given in the detail of the falls risk assessment tool (see section 8).

## 5.2 Osteoporosis assessment

Before initiating treatment for osteoporosis, assessment is recommended. In general practice this can be broken down into three basic areas: previous fracture, steroid use and bone densitometry.

### Previous fracture

The Royal College of Physicians - osteoporosis clinical guidelines for prevention and treatment (2000) state that "A previous fragility fracture is a strong independent risk factor for further fracture and may be regarded as an indication for treatment without the need for BMD measurement when the clinical history is unequivocal" [20]
Where there is limited access to bone densitometry, this seems a reasonable strategy particularly for vertebral fractures. The situation for peripheral fractures such as Colle's fractures is less clear as falls play an important role and fractures may occur despite normal bone density.

### 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. [12,45] 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 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 guidelines 1999).[19] It is beyond the scope of this document to detail the various means of BMD measurement but they are summarised in Appendix 2. Local availability is likely to determine the technique used although it is recognised that Dual – energy X ray Absorptiometry (DXA) is the preferred choice. Where this is not available alternative technologies such as peripheral scanning may be useful. However the exact role of these technologies remains to be defined.

Measurement of bone mineral density (BMD) should be performed if an individual has:

- a recent fall
- fulfils other criteria for bone densitometry listed below (Adapted from Royal College of Physicians Osteoporosis Guidelines 1999) [19]:
- Glucocorticosteroid therapy. Cumulative prednisolone dosage 7.5mg per day for 6 months or more
- Previous fragility fracture, particularly of the spine, hip and wrist
- Radiographic evidence of osteopenia and/or underlying vertebral deformity
- Loss of height, thoracic kyphosis (after radiographic confirmation of vertebral deformities)
- Maternal family history of hip fracture
- Low body mass index (< 19 kg/m$^2$)
- Other disorders associated with osteoporosis

Malabsorption syndromes
Primary hyperparathyrodism
Hyperthyroidism
Premature menopause (age < 45 years)
Previous prolonged secondary amenorrhoea ( > 1 year)
Prolonged immobilization
Post-organ transplantation
Cushing's syndrome
Chronic renal failure

In order to carry out a practical programme of osteoporotic diagnosis it may be necessary to carry out a targeted programme of identification utilizing audit protocols, questionnaires, and/or peripheral bone densitometry.

## Interpretation of BMD

BMD thresholds for intervention vary with the methods used to assess it. Thresholds are discussed with reference to the interventions recommended by the Royal College of Physicians.[19,20] It is recommended that the physician look not only at the BMD measurement but also at other risk factors the patient may have.

## Corticosteroid Use

The Department of Health in its publication: Primary Care Guidelines for Osteoporosis state that treatment should be considered if a patient is on 7.5mg daily of corticosteroids for three months or more.[46]

## Exclusion of other diseases

It is important to exclude secondary causes of osteoporosis (e.g. alcohol abuse, malabsorption, hyperparathyrodism and hyperthyroidism), as well as diseases which may mimic osteoporosis (such as malignancy and osteomalacia).

# 6.0 Intervention

Following identification of high-risk individuals, intervention has to occur to reduce both falls risk and treat osteoporosis so as to reduce falls and fractures.

## 6.1 Modification of falls-related risk factors

Until recently the evidence base to show that intervention was able to reduce falls was limited. Information is accumulating and is summarised in Appendix 4. The most important conclusion from this evidence is that multiple risk factor assessment and intervention are recommended in older people to reduce falls. There is limited evidence to show that these interventions result in reductions in severe injury or fracture.

### Falls prevention guidelines

Following full assessment of falls risks, as referred to above, a multi-agency approach is needed to ensure appropriate interventions and referrals. The recommended interventions are based on the research evidence contained within the randomised controlled trials that were reviewed. Evidence-based statements and recommendations based on these can be found in Appendix 4. In addition, those individuals with complex problems and who have multiple risk factors for falls could be referred to a geriatrician for assessment and management.

A care pathway is outlined in the Sample Tools (Section 8), as well as intervention guidelines for modifying falls risk. These intervention guidelines are being further developed in line with the updated assessment tool and will be published shortly.

A number of risk factors identified using the falls risk assessment tool can be modified using exercise interventions. No national guidelines have been produced which give detailed advice on exercise for falls prevention for use with older people, although Skelton and Dinan have produced a framework for falls and falls injury prevention based on the research evidence [47] The background to this is shown in Appendix 3. A training course for professionals working in the field of falls and fracture prevention has been developed by these authors in collaboration with others, funded by the Department of Health, and is now available.

The modification of a number of these risk factors involves referral to a physiotherapist or occupational therapist. Guidelines for the collaborative, rehabilitative management of older people who have fallen have been produced that are specifically aimed at occupational therapists and physiotherapists who receive referrals of older people who have recently fallen. An outline of these guidelines are shown in Appendix 5.

## 6.2 Treatment of osteoporosis

The goal for any treatment of osteoporosis must be to reduce fractures in the most cost-effective manner with the fewest side effects. Before initiating treatment it is necessary to exclude secondary causes of osteoporosis.

The Royal College of Physicians guidelines state that interventions should be focused towards the treatment of high risk individuals, with therapies available that can reduce the risk of fracture in 1 year, rather than longer term preventative strategies. [20]

Treatments should be individualised for each patient and take into account local treatment guidelines if they exist. A template guideline for primary care organisations to modify is included in the Sample Tools section. Reference should also be made to the recent publication from the Royal College of Physicians 2000 "Osteoporosis clinical guidelines for prevention and treatment." Update on pharmacological interventions and an algorithm for management " and the relevant publications from the United Kingdom Drug Information Pharmacists Group and MeReC.

Table 5 summarises the anti-fracture efficacy of drug interventions in the treatment of postmenopausal osteoporotic women (Adapted from the RCP Osteoporosis Guidelines 2000) [20]

| Therapy | Spine | Non-vertebral | Hip |
|---|---|---|---|
| Alendronate | A | A | A |
| Calcitonin | A | B | B |
| Calcitriol | A | A | Not demonstrated |
| Calcium | A | B | B |
| Calcium (+ vitamin D ) | Not demonstrated | A | A |
| Etidronate (cyclical) | A | B | B |
| HRT | A | A | B |
| Raloxifene | A | Not demonstrated | Not demonstrated |
| Risedronate | A | A | A |
| Tibolone | Not demonstrated | Not demonstrated | Not demonstrated |
| Vitamin D | Not demonstrated | B | B |

*Table 5 - Review of Evidence for therapies in the treatment of osteoprosis* [20]

Grading of evidence base

**Grade A** randomised controlled trial or meta-analysis of randomised controlled trials 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, e.g. comparative studies, correlation studies, case control studies

**Grade C** from expert committee reports / opinions and / or clinical experience of authorities

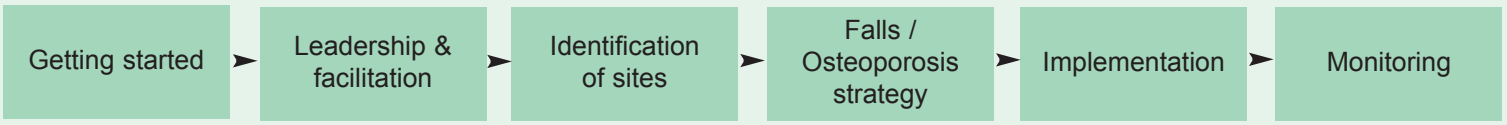
It is important to also consider the cost effectiveness of the intervention used and the safety profile of the intervention. Further guidance on the cost effectiveness of treatments is available from the National Osteoporosis Society [48]

## 6.3 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 bone using external body shielding. Hip protectors are specially designed clothing (one design is similar to bicycle shorts) worn external to undergarments, which divert/absorb the force of an impact on the hip. A number of studies have shown that hip protectors are effective in reducing the incidence of fractures. [49, 50, 51] The initial trials were carried out in nursing homes, although one study involving community-dwelling older people has been published and other community-based studies are ongoing. The major disadvantages of hip protectors are that they only work whilst they are worn. They can be uncomfortable. Significantly reduced compliance limits their potential efficacy. [50] However, they could be useful in motivated individuals who are fully able to appreciate their risk of fracture and are willing to comply.

Data from studies examining compliance in high-risk community dwelling individuals and those who have had a first hip fracture are awaited.

# 7.0 Practical steps to make it happen




## 7.1 Getting started

All relevant health and care professionals need to be engaged with the HIMP, as well as older people themselves, to ensure successful implementation of a preventive programme based around multi-agency, multidisciplinary risk factor assessment and intervention. This would involve discussion with each of the relevant groups and professionals in turn, but would be enhanced by multi-agency meetings / working groups. Part of the agenda for a working group would be the development of a local strategy for falls and osteoporotic fracture prevention based around this document, and the included Sample Tools.

## 7.2 Leadership & Facilitation

It is recommended that the process of working towards a joint HIMP and implementation of the NSF-OP be led by an individual with good contacts across primary and secondary care and who is in a position to influence the commissioning and funding bodies.

It is also recommended that a professional facilitator take the implementation of the intervention forward. People with relevant professional backgrounds for the facilitating role include nurses, GPs, occupational therapists, physiotherapists, and health promotion specialists. It is recommended that this individual would have close contacts with the PCO Board and be supported by them.

The facilitator's role would be to engage all professionals involved in assessment, referral and management of identified problems, and get agreement regarding roles, referral triggers, who is eligible to refer, which patients should be referred to each professional involved in patient management, etc.

## 7.3 Sites within a PCO area where identification of high risk individuals may occur

Individuals at high risk of future falls and osteoporotic fracture may be identified by a large number of health care workers and in a variety of environments. The following examples are not meant to be exhaustive

| Setting | Examples |
|---|---|
| A&E | Fall resulting in soft tissue injuries or fracture e.g. Colle's fractures |
| Residential / Nursing homes | Fall or fracture |
| Orthopedic units | Following discharge with a hip fracture |
| Geriatric and medical wards | Following discharge with pubic ramus fracture or soft tissue injury<br>Low bone density detected following DXA scan (according to usual guidelines) |
| GP surgeries and the Primary Care Team | Giving a history of a recent fall |
| Outpatient clinics | History of falls<br>Low bone density detected following DXA scan (according to usual guidelines) |
| Osteoporosis unit | Low bone density detected following DXA scan (according to usual guidelines) |
| Community pharmacy | Medication reviews of over 75s leading to identification of patients on long term cortico-steroids and those on therapies that increase the risk of falling |

*Table 7 - Identification of high risk individuals*

## 7.4 Falls & Osteoporosis strategy

In all settings, it is recommended that a referral network be agreed with all relevant professionals to manage older people assessed and found to be at risk of falls or osteoporotic fracture. A series of examples of implementation tools are shown or referred to at the end of the document. It is envisaged that these will be built upon in the forthcoming months.

It is recommended that:

- the design and implementation of assessment and referral forms/letters be facilitated;
- the existing assessment, referral and treatment/rehabilitation service provision for older people in the locality, that could impact on falls and osteoporotic fracture prevention, be identified and mapped.
- referral networks build on current relationships between health and social care agencies and negotiated with local groups
- the facilitator/leader identify barriers to referral and suggest strategies to address them

| Setting | Professionals | Role in joint group | Implementation tools |
|---|---|---|---|
| **Secondary Care** | A&E<br>Care of Elderly<br>Rheumatology | Identification of at-risk pts. due to falls/ fractures | DH falls guidelines |
| | | Referral guidelines<br>Identification of service needs<br>Treatment/diagnostic protocols | RCP guidelines |
| | Ward Pharmacists | Identification of at-risk pts. | RCP Guidelines<br>Medication review |
| **Primary Care** | PCO Clinical Governance | Establishment of best practice. | RCP guidelines<br>DH falls guidelines<br>AGS/BGS falls guidelines |
| | Falls/osteoporosis lead<br>PCO Rx lead<br>Community nurses<br>HIMP managers | Implementation of best practice | Clinical Governance programme |
| | Community Pharmacists | Treatment protocols<br>Identification of pts.<br>Implementation/links with local HIMP | RCP & PCR guidelines<br>Peripheral scanning protocols<br>Audit protocols |
| **Social Services** | Older People Service managers | Identification of high risk patients | Risk factor questionnaire assessment |
| | Older people care managers<br>Nursing home managers | Identification of pts.<br>Reduction in Falls risk<br>Establishment of referral protocols | DH falls guideline<br>AGS/BGS falls guidelines |

*Table 7 - Involvement of professionals in differing situation*

### Automatic reminders to those carrying out assessments

In some settings (e.g. primary care, hospital clinics and wards), input of key information onto IT systems (examples given in section 5.1 & 5.2) could be made to trigger prompts for a screening assessment for increased risk of falls and osteoporosis. This would improve the assessment rates of those most at risk.

### Enhancement of the falls prevention service in secondary care

It may be necessary to facilitate the development of a falls clinic, or to instigate an enhancement of geriatric services, to manage the increased number of referrals that may occur as a result of the increased assessments. This will obviously require a commitment from the hospital trust to support this initiative.

## 7.5 Monitoring and Evaluation

### Primary endpoints

In line with the NSF-OP the primary endpoints of any joint osteoporosis and falls HIMP will be the eventual reduction of fractures, other injuries and the other consequences of falls. These however are long-term measures and PCOs may wish to find proxies for this. Examples are given below:

- Change in clinical practice as measured by data from baseline audits of clinical practice and successive audits
- Number of patients identified with osteoporosis
- Number of patients identified with falls risks
- Number of fallers identified

### Data sets

There are a number of indicators that can be used to monitor change from before to after the implementation of the HIMP. These include indicators relevant to the process of implementation, to the impact, and to changes in outcomes that result from implementation. It is likely that localities will choose only a small number of indicators to evaluate the effect of their HIMP. The choice and relevance of the indicators will depend on local circumstances and availability of data.

Examples of indicators given in Appendix 6 have been guided by consideration of the approach taken by the NHS Executive when developing the NHS Performance Assessment Framework (PAF).

The PAF encourages action and monitoring in 6 areas:

1. Health improvement.
2. Fair access to health services.
3. Effective delivery of appropriate healthcare.
4. Efficiency.
5. Patient/carer experience.
6. Health outcomes of NHS care.

# 8.0 Examples of implementation tools

## Details of provided tools

In the following pages some examples of implementation tools are given. It is envisaged that in the forthcoming months these will be added to and elaborated on. We have also included references for further resources.

## Example implementation tools

8.1 Assessment of predisposition for falling in older patients

8.2 Template Guideline for the Medical Management of Men & Women over 45 years of age who have or are at risk of Osteoporosis

8.3 Template guideline for management of osteoporosis

8.4 Integrated care pathways for falls and osteoporosis

8.5 Intervention table for modifying risk of falling

## References for further information

Royal College of Physicians – Updated guidelines on osteoporosis
www.rcplondon.ac.uk/pubs/wp_osteo_update.htm

National Osteoporosis Society – www.nos.org.uk

Guidelines for prevention of falls – see reference 44 and 43

# 8.1 Assessment of predisposition for falling in older patients

## - from the Department of Health sponsored guidelines for the prevention of falls in older people[4]

### (For targeting interventions and identification of referral pathways)

Multi professional assessment tool for use by social workers, the primary health care team and A & E staff.

This assessment tool has been derived from sound RCTs that have shown a reduction in the risk of falling or falls injury. This tool has not been validated formally. No single validated tool exists to identify all the risk factors addressed in these trials.

Notes for users:

1. Complete assessment tool below.
2. Where a positive response is indicated please see 'Intervention table for modifying falls risk' (later this section) for interventions and for the identification of referral pathways.
3. Users can undertake appropriate interventions at the time of assessment.

5.4. Consider which referral would be most appropriate given the patient's needs and local resources.

| | YES | NO |
|---|---|---|
| 1. History of falling<br>*has history of one or more falls in past year* | ☐ | ☐ |
| 2. Number of medications<br>*takes >4 medications per day* | ☐ | ☐ |
| 3. Central nervous system suppressants<br>*use of 1 or more for more than two weeks* | ☐ | ☐ |
| 4. Alcohol intake<br>*> 1unit alcohol per day* | ☐ | ☐ |
| 5. Postural hypotension<br>** 20mmHg drop between lying and standing BP or symptomatic i.e. dizziness on standing/sitting up* | ☐ | ☐ |
| 6. Vision<br>*test difficulty in reading newspaper/book, cannot recognise an object across the room, recently started wearing bifocals* | ☐ | ☐ |
| 7. Hearing<br>*has difficulty in hearing conversational speech* | ☐ | ☐ |
| 8. Walking/Gait<br>*is unsteady on feet, shuffles or takes uneven steps / is housebound* | ☐ | ☐ |
| 9. Transfers<br>*lack of control when moving between surfaces* | ☐ | ☐ |
| 10. Balance<br>*needs to hold onto furniture, requires cane or walker* | ☐ | ☐ |
| 11. Environmental hazards<br>*untidy, slip/trip hazards* | ☐ | ☐ |

# 8.2 Template Guideline for the Medical Management of Men & Women over 45 years of age who have or are at risk of Osteoporosis

This template contains 2 pages;
a) provides a clinical management pathway for men and women over the age of 45 who have or are at risk of osteoporosis
b) provides a template for Options for Prevention and Treatment of Osteoporosis (which will need to be localised by the PCO)

**Major risk factors**

(other than previous fragility fracture) include the following:

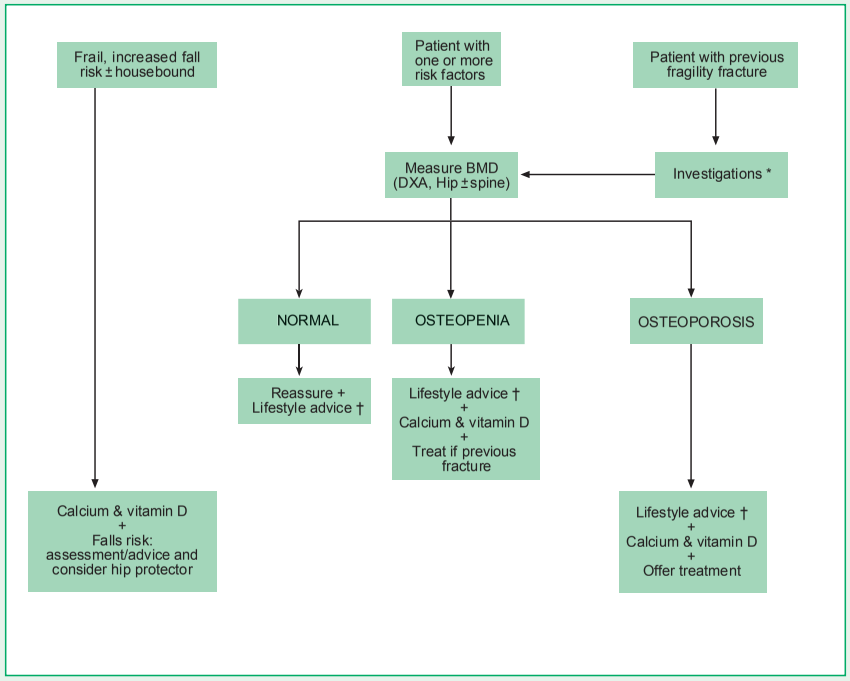
- Untreated hypogonadism (premature menopause, 2° amenorrhoea, 1° hypogonadism in women, 1° or 2° hypogonadism in men).
- Glucocorticoids (oral) (7.5 mg per day prednisolone for 6 months or more)
- Disease associated with increased prevalence of osteoporosis (eg. GI disease, chronic liver disease, hyperparathyroidism, hyperthyroidism)
- Radiological osteopenia

*Other risk factors in national and international guidelines include:*

- Family history (especially maternal hip fracture)
- Lower body weight
- Cigarette smoking
- Height loss
- Low bone mass as assessed by other techniques

**BMD Measurements**

- DXA not necessary in women willing to take HRT or in frail/elderly patients, unless there are exceptional risk factors.
- In patients with baseline BMD, repeat measurement every 1-3 years




*Adapted from the Royal College of Physicians & Bone and Tooth Society of Great Britain guidelines, July 2000*

For men aged less than 65 years, specialist referral should be considered

BMD: Bone mineral density

DXA: Dual energy x-ray absorptiometry

**Previous fragility fracture**

Defined as a fracture from standing height or less and includes prevalent vertebral deformity. A previous fragility fracture is a strong independent risk for further fracture and may be regarded as an indication for treatment without the need for BMD measurement when the clinical history is unequivocal.

**† Lifestyle advice**

- Adequate nutrition especially with calcium & vitamin D
- Regular weight bearing exercise
- Avoidance of tobacco use & alcohol abuse

*** Investigations**

- FBC, ESR
- Bone & liver function tests (Ca, P, alk phos, albumin, AST, GGT)
- Serum creatinine
- Serum TSH

**And if indicated:-**

- Lateral thoracic & lumbar spine x-rays
- Serum paraproteins & urine Bence Jones protein
- Isotope bone scan
- Serum FSH if hormonal status unclear (women)
- Serum testosterone, LH & SHBG (men)

Options for Prevention and treatment of Osteoporosis:

**HORMONE REPLACEMENT THERAPY**
Licensed for:
Dose:
Comments:
Cost:

**RALOXIFENE**
Licensed for:
Dose:
Comments:
Cost:

**BISPHOSPHONATES**

Risedronate
Licensed for:
Dose:
Comments:
Cost:

Cyclic Etidronate
Licensed for:
Dose:
Comments:
Cost:

Alendronate
Licensed for:
Dose:
Comments:
Cost:

**CALCIUM & VITAMIN D**

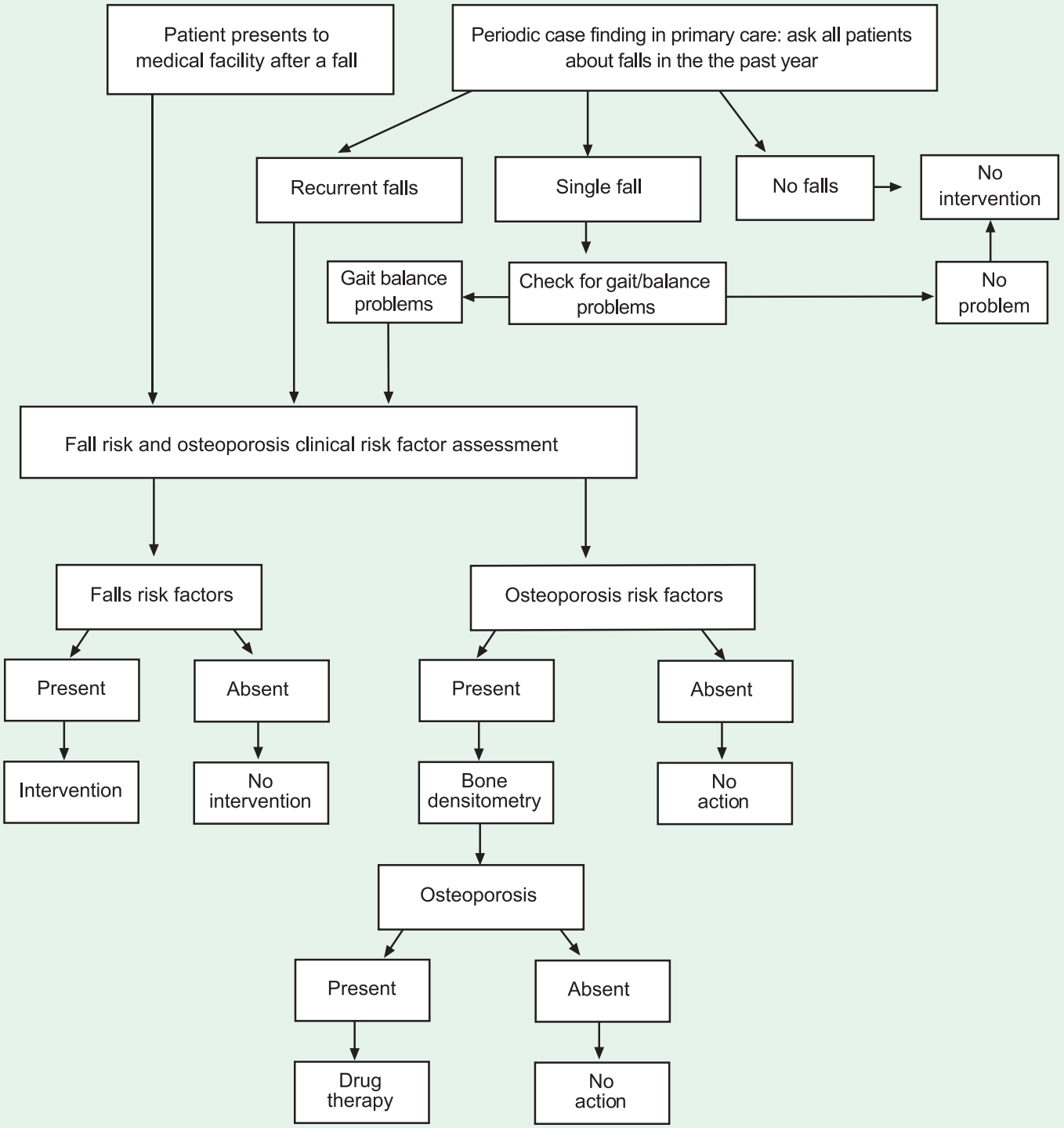
Licensed for:
Dose:
Comments:
Cost:

**CALCITONIN**
Licensed for:
Dose:
Comments:
Cost:

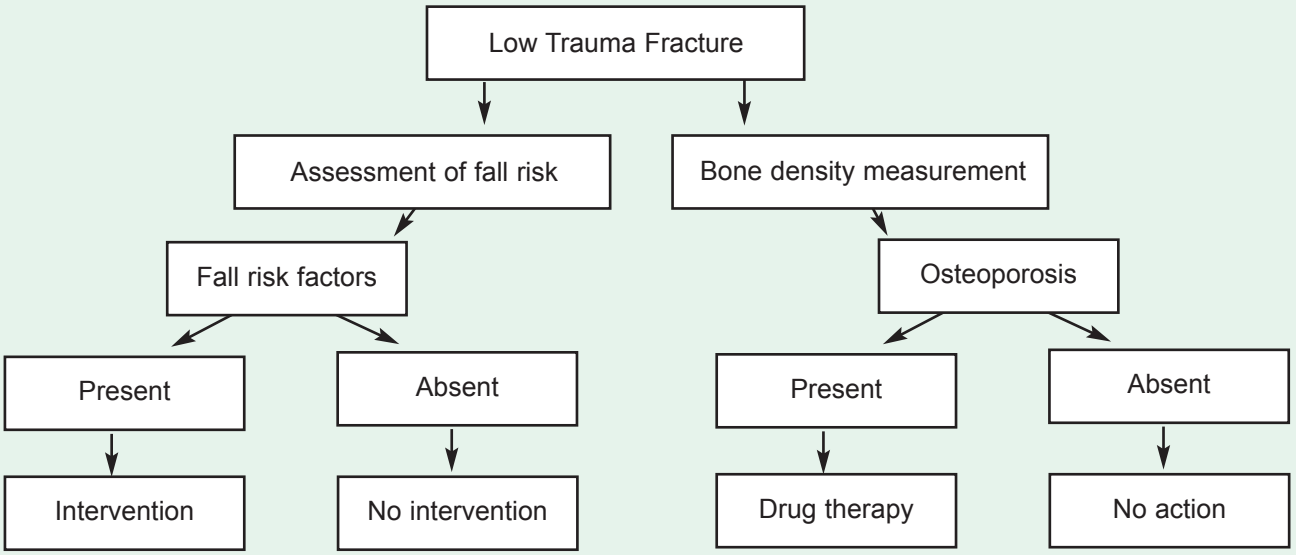
Comments: Insert local therapy recommendation

# 8.3 Care pathways for management of individuals presenting with a fall or an osteoporotic fracture

## 1) Presentation with a fall, or falls history identified through period case finding



## 2) Presentation with a low trauma fracture



# 8.4 Intervention Table for Modifying Falls Risks
## - from the Department of Health sponsored guidelines for the prevention of falls in older people[4]

| RISK FACTOR | INTERVENTION | | REFERRAL OPTIONS |
|---|---|---|---|
| | ASSESSOR | OTHER | |
| History of Falling | Review incident(s), listening for how to prevent falls | Discuss fear of falling and realistic preventive measures | Physiotherapist<br>OT |
| Number of medications | Ask about symptoms of dizziness | Review medications | GP |
| Central Nervous System Suppressants | Identify type of medication being prescribed<br>i.e. hypnotic,antidepressants, sleeping pills, antipsychotics | Review medication<br>Teach regarding changes in sleep patterns normal with aging<br>Encourage discontinuing of new sleep medications as soon as possible. Teach sleep promoting behavioural techniques | GP |
| Alcohol Intake | Teach regarding immediate and long-term fall risk due to dulling of neurological capacity from alcohol | | Practice Nurse<br>District Nurse<br>GP |
| Postural Hypotension | Consider raising head of bed if severe | Review medications<br>Teach to stabilise self after changing position and before walking | Practice Nurse<br>District Nurse<br>GP |
| Vision | Raise awareness regarding risks due to blurring and difficulty in judging distance. Advise disuse of bifocals or care when first wearing them. Advise to concentrate on walking and be deliberate/cautious, especially in new situations and on uneven surfaces | Test vision/eyes | Optician |
| Hearing | | Remove cerumen/wax<br>Check if hearing tested and corrected to extent possible<br>Teach patient and family about using visual cueing, lowering voice and speaking in best ear to maximise hearing<br>Earphones and amplifiers may be of use | Audiologist<br>Practice Nurse<br>GP (for referral ENT department) |
| Walking/Gait | Teach about risk | Physiotherapy evaluation for ROM, strength, balance and/or gait exercises<br>Appropriate selection and use of assistive devices | Physiotherapist<br>OT |
| Transfers | | Physiotherapy evaluation for ROM, strength, balance, gait<br>Transfer exercises and manoeuvres<br>Consider environmental modifications to compensate for disability and to maximise safety | Physiotherapist<br>OT |
| Balance | | Physiotherapy evaluation for ROM, strength, balance and gait<br>Transfer exercises Evaluate for assistive device<br>Teach about the risk and how to manoeuvre safely, effectively and efficiently<br>Consider environmental modifications so that daily activities do not require stooping or reaching overhead | Physiotherapist<br>OT |
| Environmental Hazards | Teach about the need for environmental modifications<br>Remove rugs or at least get rubber skid guards.<br>Remove obstacles | Teach about the need for environmental modifications<br>Note the potential of stubbing toe on irregular floor heights - correct if possible.<br>Explain characteristics that make furniture unsafe and suggest alternatives. Teach about identified hazards, not only to the resident, but as risks to visitors. Suggest low-cost alternatives.<br>Make sure pull cords haven't deteriorated and are within reach from the floor. If possible, activate Personal Emergency Response Systems (PERS) so patient knows what to expect. | Mobile repairs<br>OT |

IF CLIENT HAS MULTIPLE RISK FACTOR WHICH MAY BENEFIT FROM A GLOBAL MULTIDISCIPLINARY ASSESSMENT, REFERRALS SHOULD BE MADE TO THE DAY HOSPITAL NOT TO SEPARATE AGENCIES

# Appendices

1. Intrinsic risk factors for falls
2. Methods for BMD measurement
3. Framework for falls and falls injury prevention through exercise
4. Evidence for the prevention of falls in older people
5. Guidelines for physiotherapists and occupational therapists
6. Indicators to assess the HIMP

# Appendix 1

## Intrinsic risk factors for falls

Accident prevention is one of the four priorities for the NHS as set out in the white paper Saving Lives: Our Healthier Nation[1].

The recent National Service Framework for Older People[2] (NSF-OP) focuses on falls which result in serious injury in the population of older people. The NSF-OP highlights the link between falls and osteoporosis and sets minimum standards for healthcare.

| Classes of risk factor | Examples |
|---|---|
| Underlying conditions | Lower extremity disability; arthritis (particularly of the lower limb); postural hypotension. |
| Strength, balance, gait, and physical performance | Difficulties with chair stand; ankle and grip strength; increased body sway; dizziness; use of walking aids; lack of gait symmetry and step continuity; two leg support during gait; transfer problems (on/off toilet, into/out of the bath or shower). |
| Physical functioning* | Difficulties with activities of daily living; impaired mobility; frequency goes outside; difficulty walking 400m; urinary urgency; poor night time sleep; 'stops walking when talking'. |
| Foot problems and footwear | Include calluses, hallux vagus and lesser digital deformity; footwear problems include use of thick soft materials at the midsole. |
| Sensory declines | Vision problems; reduced touch sensation; peripheral neuropathy. |
| Medical conditions | Acute illness; circulatory disease; stroke history. |
| Medicine use** | Psychotropic medicines*** (antidepressants, benzodiazepines); polypharmacy – 4 or more prescription medicines. |
| Psychological factors | Fear of falling. |
| Mental health | Poor mental state. |
| Cognitive declines | Cognitive impairment; Alzheimer's disease. |
| Behavioural factors | Diet and malnutrition. |
| History of previous fall | Fall in the last year; 3 or more falls in the last year; previous fall with injury. |

* Physical functioning itself is influenced by: cognitive impairment, depression, disease, low levels of physical activity, poor perceived health status, and vision impairment.

** Medicines have also been classified as extrinsic factors.

*** Psychotropic medicines are inappropriately prescribed in many instances.

# Appendix 2

# Methods for BMD measurement

| Technique | Skeletal sites | Approximate cost of machine (excludes running costs and running costs) | Advantages | Disadvantages |
|---|---|---|---|---|
| DXA | Lumbar spine<br>Hip, Wrist | £ 50,000 | Important sites<br>Best relationship to fracture | Hospital based<br>Spine effected by OA<br>Expensive |
| SXA | Forearm<br>Heel | £15,000 | Portable<br>Community based | Not spine or hip |
| US | Heel<br>Finger | £15,000 | Portable<br>primary care<br>No radiation | Limited to elderly women<br>Not for monitoring |
| QCT | Spine | * | Not affected by OA<br>Volumetric data | Hospital based<br>Limited fracture data |

DXA Dual energy X-ray absorptiometry
SXA Single energy X-ray absorptiometry
US Ultrasound
QCT Quantitative computerised tomography

** Cost difficult to estimate as CT scanners are usually used for imaging*

# Appendix 3 (refers to section 6.1)

## Framework for falls and falls injury prevention through exercise

A number of the risk factors identified using the falls risk assessment tool can be modified using exercise interventions. Exercise results in a number of favourable responses, and contributes to healthy ageing. However, to be successful at falls and falls injury prevention it must be specific for purpose. Its effect differs according to the type of exercise, the exercise programme and the target group of adults.[52] Age is no barrier in response to endurance and strength training.

Exercise may not necessarily be effective in modifying falls risk. A number of trials have been ineffective in preventing falls in older people for one or more of the following reasons:

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

Specificity for task is important.

No national guidelines have been produced which give detailed advice on exercise for falls prevention for use with older people, although recently Skelton and Dinan (1999) have reviewed the literature and have gone some way to address this and produced a framework for falls and falls injury prevention.[47] Department of Health funded the development of a training programme for professionals working in the field of falls and fracture prevention to teach practicalities of the delivery of relevant programmes for fall prevention to older people who have various levels of health and frailty. This programme can be accessed through
Leicester College.

# Appendix 4

## Evidence for the prevention of falls in older people

### (a) The Department of Health sponsored guidelines[4,44]

| Statement | Falls fracture reduction | Strength of evidence |
|---|---|---|
| Most exercise programmes without other interventions in unselected community-living older people | Do not reduce falls | 1 |
| Individually tailored exercise programmes administered by qualified professionals in a selected community-living high risk group | Reduce falls | 2 |
| Exercise programmes in a selected community living group with mild deficits in strength and balance | Reduce falls | 3 |
| Exercise classes, where the exercise is based on Tai Chi forms, with individual tuition with older people | Reduce falls | 2 |
| Programmes based on multiple risk factor assessment and tailored intervention (most of which include some form of exercise) | Reduce falls | 1 |
| Attention to postural hypotension, number of medications, balance, transfers and gait is | Reduce falls | 2 |
| Home assessment of function, with education in risk areas, and referral to the patient's GP | Reduces falls | 3 |
| Home assessment of risk with education in the areas identified but without direct intervention or further referral | Does not reduce falls | 1 |
| Identification of patients who attend A&E because they have fallen with subsequent medical and OT assessment, with referral and follow-up | Reduces falls | 2 |
| Non-selective exercise programmes for nursing home residents | Do not reduce falls | 2 |
| Assessment of residents after falling with recommendations for specific preventive measures | Reduce falls | 1 |
| Hip protectors in nursing home residents | Prevent hip fractures | 2 |

*Evidence grading:*

*1 – Consistent findings in multiple randomised controlled trials (RCTs) or meta-analysis*

*2 – Single RCT or weak inconsistent findings in multiple RCTs*

*3 – Limited scientific evidence, cohort studies, flawed RCTs, panel consensus.*

## (b) Falls prevention recommendations (From the American and British Geriatric Societies guidelines on falls prevention)[43]

1) All older persons who are under the care of a health professional (or their caregiver) should be asked at least once a year about falls.

2) All older persons who report a single fall should be observed as they stand up from a chair without using their arms, walk several paces, and return (ie. the "Get Up and Go Test"). Those demonstrating no difficulty or unsteadiness need no further assessment.

3) Persons who have difficulty or demonstrate unsteadiness performing this test require further assessment.

4) Older persons who present for medical attention because of a fall, report recurrent falls in the past year, or demonstrate abnormalities of gait and/or balance should have a fall evaluation performed. This evaluation should be performed by a clinician with the appropriate skills and experience, which may necessitate referral to a specialist.

5) A fall evaluation is defined as an assessment that includes the following: history of fall circumstances, medications, acute or chronic medical problems, and mobility levels; an examination of vision, gait and balance, and lower extremity joint function; an examination of basic neurological function, including mental status, muscle strength, lower extremity peripheral nerves, proprioception, reflexes, tests of corticol, extrapyramidal, and cerebullar function; assessment of basic cardiovascular status including heart and rhythm, postural pulse and blood pressure and, if appropriate, heart rate and blood pressure responses to carotid sinus stimulation.

6) Among community-dwelling older persons (ie. those living in their own homes), multifactorial interventions should include: gait training and advice on appropriate use of assistive devices (B); review and modification of medication (B); exercise programs with balance training as one of the components (B); treatment of postural hypotension (B); modification of environmental hazards (C); and treatment of cardiovascular disorders, including cardiac arrhythmias (D).

7) In long-term care and assisted living settings, multifactorial interventions should include: staff education programs(B); gait training and advice on the appropriate use of assistive devices (B); and review and modification of medications, especially psychotropic medications (B).

8) The evidence is insufficient to make recommendations for or against multifactorial interventions in acute hospital settings.

9) Although exercise has many proven benefits, the optimal type, duration and intensity of exercise for falls prevention remains unclear (B).

10) Older people who have recurrent falls should be offered long-term exercise and balance training (B).

11) Tai Chi C'uan is a promising type of balance exercise, although it requires further evaluation before it can be recommended as the preferred balance training (C )

12) When older patients at increased risk of falls are discharged from hospital, a facilitated environmental home assessment should be considered (B).

13) Patients who have fallen should have their medication reviewed and altered or stopped as appropriate in light of their risk of future falls. Particular attention to medication reduction should be given to older persons taking four or more medications and to those taking psychotropic medications (C ).

14) Studies of multifactorial interventions that have included assistive devices (including bed alarms, canes, walkers/Zimmer frames, and hip protectors) have demonstrated benefit. However, there is no direct evidence that the use of assistive devices alone will prevent falls. Therefore, while assistive devices may be effective elements of a multifactorial intervention program, their isolated use without attention to other risk factors cannot be recommended (C ).

15) Although studies of multifactorial interventions that have included behavioural and educational programs have demonstrated benefit, when used as an isolated intervention, health or behavioural education does not reduce falls and should not be done in isolation (B).

Strength of recommendations:

A: Directly based on Class I evidence

B: Directly based on Class II evidence or extrapolated recommendation from Class I evidence.

C: Directly based on Class III evidence or extrapolated recommendation from Class I or II evidence.

D: Directly based on Class IV evidence or extrapolated recommendation from Class I, II or III evidence.

Categories of evidence

Class I: Evidence from at least one randomized controlled trial or a meta-analysis of randomized controlled trials.

Class II: Evidence from at least one controlled study without randomization or evidence from at least one other type of quasi-experimental study.

Class III: Evidence from nonexperimental studies, such as comparative studies, correlation studies, and case-control studies.

Class IV: Evidence from expert committee reports or opinions and/or clinical experience of respected authorities.

# (1) Appendix 5 (refers to section 6.1)

## Guidelines for physiotherapists and occupational therapists

Guidelines for the collaborative, rehabilitative management of older people who have fallen have been produced. These guidelines , prepared by Janet Simpson, Division of Geriatric Medicine, St George's Hospital Medical School, in consultation with AGILE (Chartered Physiotherapists working with older people), and the Association of Chartered Physiotherapists in the Community (ACPC), complement the falls prevention guidelines. They are specifically aimed at occupational therapists and physiotherapists who receive referrals of older people who have recently fallen.

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 on the basis of the assessment, interventions are agreed with the older person, and these 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.

See:

Simpson JM. Guidelines for the collaborative, rehabilitative management of older people who have fallen. Version 10.b. Division of Geriatric Medicine, St George's Hospital Medical School. October 1996.

Simpson JM, Marsh N, Harrington R. Guidelines for managing falls among elderly people. Br J Occupational Therapy 1998; 61: 165-8.

# Appendix 6

# Indicators to assess the HIMP

In the list below, the initials contained in a '[ ]' after a proposed indicator, shows the national indicator on which the proposed local indicator is based. The key to the initials used is included at the end of the section. Shown in '{}' are the sources of data from which the indicator can be constructed. Again, the key to the initials used is shown at the end of the section. In what follows, 'older people' refers to people aged 70 and over.

## Health Improvement

- Age-sex-standardised mortality rate due to falls amongst older people. [CCHI]{D,P}
- Age-sex-standardised mortality rate due to fracture of the proximal femur (FPF). [CCHI]{D,P}
- Age-sex-standardised hospitalised incidence rate of FPF. [HOI]{PAS,P}
- Age-sex-standardised rate of falls-related admission to hospital amongst older people [OHN-TS]{PAS,P}
- Age-sex-standardised rate of admission to hospital for falls-related serious* injury amongst older people [OHN]{PAS,P}
- Change in the age-sex-adjusted percentage of older people experiencing 1 or more falls, recalled over the previous 12 months, amongst those who receive a screening assessment {LS–BA}
- Hospitalised incidence of a second (contralateral) fracture of the proximal femur. [HOI]{PAS,P}

## Effective delivery of appropriate healthcare

- Whether training of relevant professionals on the assessment and modification of falls and osteoporosis risk factors is (a) up and running, (b) ongoing. {TC}
- Percentage of older people screened for their falls and osteoporosis risk amongst those who fall and attend A&E**{RAD,A&E}
- Percentage of older people who attend hospital with a fracture who are screened for falls risk and for osteoporosis {RAD,R}
- Percentage of older people who have their medicines reviewed each time a new medicine is prescribed by their GP{GP}

## Fair access to health services

- Percentage of older people who take up their offer of referral following their screening assessment {RAD, LS
- Percentage of older people who had a routine eye check in the last 12 months {HA-OB}
- Age-sex-standardised referral rates for bone densitometry {OS ,P}

## Patient / carer experience

- Incidence of pressure sores during inpatient stay within a provider unit population admitted for care of fractures. [HOI]{WAP, PAS}
- Percentage of older people who are prescribed four or more medicines {GP}
- Percentage of older people prescribed antidepressants, sleeping pills or sedatives [HLPI]{GP}

## Health outcomes of NHS care

- Rate of discharge to their normal place of residence within 28 days of admission with a fractured femur. [HLPI]{PAS}
- Age-standardised rates of death in hospital within 30 days of admissions with hip fracture. [CCHI]{PAS}
- Summary of a measure of a return to pre-fracture level of mobility, within a provider unit population of older people who have undergone treatment for fractures. [HOI]{LS,PAS}
- Summary of measure of post-operative pain within a provider unit population of older people who have undergone surgical treatment for fractures. [HOI]{LS,PAS}
- Summary of a measure of a return to pre-fracture level of social integration, within a provider unit population of older people who have undergone inpatient treatment for fracture. [HOI]{LS,PAS}

## Indicator set:

[CCHI] = Compendium of Clinical and Health Indicators

[HLPI] = High Level Performance Indicators

[HOI] = Health Outcome Indicators

[OHN] = Saving Lives: Our Healthier Nation

[OHN-TS] = Saving Lives: Our Healthier Nation – Technical Supplement

* Serious injury could be defined in a number of ways including: (I) injury that results in 4 or more days stay in hospital; (II) fracture of the proximal femur; (III) serious long bone fracture.

** Dependent on the existence of A&E administration systems for which the number of fallers amongst older people can be accurately ascertained.

## Data sources:

{A&E} – Routinely collected A&E data

{D – ONS} mortality data

{GP} - Routine GP information systems

{HA-OB} – Health Authority (optician benefits) database.

{LS} - Local survey

{LS-BA} - Local survey of older people at the time of the screening assessment, and 12 months later.

{OP} – Routinely collected outpatient data

{P – ONS} mid-year population estimates

{PAS} – Routinely collected hospital inpatient data.

{R} – Radiology data systems.

{RAD} – Analysis of routine assessment documentation

{TC} – Subjective assessment by the training co-ordinator.

# Glossary

| Abbreviation | Definition |
|---|---|
| HIMP | Health Improvement and Modernisation Plan |
| LHG | Local Health Group |
| NSF-OP | National Service Framework for Older People |
| PAF | Performance Assessment Framework |
| PCO | Primary Care Organisation |
| PCR | Primary Care Rheumatology Society |
| RCP | Royal College Physicians |
| GP | General Practitioner |
| OT | Occupational Therapist |
| ROM | Range of movement |

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