BEST PRACTICE
EVIDENCE-BASED
GUIDELINE

# PREVENTION OF HIP FRACTURE AMONGST PEOPLE AGED 65 YEARS AND OVER

NEW ZEALAND GUIDELINES GROUP

JUNE 2003

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The Royal New Zealand College of General Practitioners

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Best Practice Evidence-based Guideline

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***STATEMENT OF INTENT***

Clinical guidelines are produced to help health professionals and consumers make decisions about health care in specific clinical circumstances. Research has shown that if properly developed, communicated and implemented, guidelines can improve care. The advice on the prevention of hip fracture amongst people aged 65 years and over given in this guideline is based on epidemiological and other research evidence, supplemented where necessary by the consensus opinion of the expert development team based on their own experience.

While the guidelines represent a statement of best practice based on the latest available evidence (at the time of publishing), they are not intended to replace the health professional's judgment in each individual case.



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# CONTENTS

# PURPOSE

The purpose of this guideline is to provide an evidence-based summary of the clinical aspects of hip fracture prevention, and advice that can effectively reduce the risks of hip fracture amongst people aged 65 years and over. By following the evidence-based recommendations in this guideline older people at high risk of hip fracture can adopt effective preventive strategies to help maintain an independent lifestyle.

The guideline draws on the best evidence available from New Zealand and international sources, and is designed to inform decisions made by policy makers, funders, clinicians and consumers. It should not be construed as including all appropriate methods of care, or excluding other acceptable treatments.

Decisions taken in the management of any individual in any relevant age group must be determined by the health care team and the person suffering hip fracture in the light of the clinical problem, and the diagnostic and management options available.

# ABOUT THE GUIDELINE



## FOREWORD

The New Zealand Guidelines Group Incorporated (NZGG) is a not-for-profit organisation established to promote effective health and disability services. Guidelines make a contribution to this aim by sharing the latest international studies and interpreting these in a practical way for adoption in the New Zealand setting.

Hip fractures occur most commonly in older people with weakened bones as a result of a fall. It may be possible to reduce the frequency of hip fracture by strategies that aim to preserve bone strength, reduce the frequency of falling, or protect bone on impact.

This guideline applies to prevention in the group at most risk – older people. It does not cover preventive measures which may be used in younger people to reduce the risk of osteoporosis, which are the subject of a separate guideline.

## GUIDELINE DEVELOPMENT PROCESS

In 2001 a multidisciplinary group of professionals and consumers was convened as the hip fracture guideline development team to develop two best practice evidence-based guidelines: one for the prevention of hip fracture amongst people aged 65 years and over; the other for the acute management and immediate rehabilitation after hip fracture amongst people aged 65 years and over. Both guidelines are available for download at www.nzgg.org.nz

Methods used by the group in preparing the guideline for the prevention of hip fracture amongst people aged 65 years and over are available on the New Zealand Guidelines Group website at www.nzgg.org.nz – click on 'Supporting Materials' for this guideline.

# THE GUIDELINE DEVELOPMENT TEAM

The hip fracture guideline development team was commissioned by the New Zealand Guidelines Group and funded by the Ministry of Health to develop an evidence-based guideline on the prevention of hip fracture amongst people aged 65 years and over. A multidisciplinary group was convened with members representing stakeholder professional groups and consumers. Contributors were:

## Research and writing group

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### *Raymond Jones*

Project Co-ordinator, Otago District Health Board; Post Graduate Diploma in Health Informatics, Registered Nurse (UK and NZ), English Nursing Board Post Graduate Certificate in Orthopaedic Nursing

## Consultation group

### *Marion Robinson (Dunedin)*

Personal experience of hip fracture

### *Heather Thomson (Opotiki)*

Māori, Consumer Advocate

### *Jim Reid (Dunedin)*

General medical practice

## Declaration of competing interests

John Campbell has received research funding from the Accident Compensation Corporation (ACC).

# CONSULTATION

A draft of the guideline was widely circulated to over 30 individuals/organisations for peer review. Comments were received from the following:

- ACC Injury Prevention Division
- Allan Panting, Nelson Hospital
- Bruce Twaddle, Orthopaedics Department, Auckland District Health Board
- David Rankin, General Manager, ACC Healthwise
- Gail Leach, Executive Director, NZ Society of Physiotherapists
- Jan Nicholson, Canterbury District Health Board
- Keith McKea, General Manager Injury Prevention, ACC
- Lyn Muller, Taranaki Health
- Mark Flowers, Chief Executive Officer, Hawke's Bay District Health Board
- Orthopaedic Ward, Nelson Hospital
- Osteoporosis New Zealand Inc
- Raewyn Osbaldiston, Department of Orthopaedic Surgery, Auckland Hospital
- Richard Webb, Chief Executive, Canterbury District Health Board
- Roger Harris, Department of Orthopaedic Surgery, Auckland Hospital
- Sandy Dawson, Ministry of Health.

# EVIDENCE AND RECOMMENDATION GRADING SYSTEM

The grading system is a two-tier system where the INDIVIDUAL STUDIES are each given a level of evidence from 1 to 4 (refer Appendix A for the details). Throughout the guideline, the level of evidence has been included alongside the references. This is formatted as reference[level of evidence].

The second step in grading is to consider the WHOLE BODY OF EVIDENCE ie, all the studies relevant to the issue, and decide on a recommendation and grade based on all of the individual studies.

| GRADES OF RECOMMENDATIONS | |
|---|---|
| At least one meta-analysis, systematic review, or RCT rated 1++, and directly applicable to the target population; or<br>A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results. | A |
| A body of evidence consisting principally of studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or<br>Extrapolated evidence from studies rated as 1++, or 1+. | B |
| A body of evidence consisting principally of studies rated as 2+, directly applicable to the target population, and demonstrating overall consistency of results; or<br>Extrapolated evidence from studies rated as 2++. | C |
| Evidence level 3 or 4; or<br>Extrapolated evidence from studies rated as 2+. | D |

The grades A to D are a measure of the strength of evidence underlying the recommendations and should not be construed as an indication of the relative importance of the recommendations.

# INTRODUCTION

The consequences of hip fractures in older people create a significant and increasing burden of illness in the community, and represent for many who suffer them 'a dramatic decline in physical function'.[1] Their anxiety is not without cause; 20% of older people who sustain a hip fracture die within a year. In New Zealand, the survivors, two years after the fracture, are more than four times more likely to have limited mobility than people of similar age without a fracture, and more than twice as likely to be functionally dependent.[1] In developed Western societies the lifetime risk of hip fracture is 17.5% in women and 6% in men.[2] Thus, strategies to prevent hip fractures, or more accurately, to reduce their frequency, would, if successful, reduce significant suffering.

In New Zealanders of European origin, surveyed in the Auckland region in 1994,[3] age-adjusted annual incidence rates were comparable with other societies. Ninety-seven per cent of hip fractures occurred in people identified as of European origin, compared with 0.9% for Māori and 0.6% for Pacific Peoples. The crude incidence rate for the population as a whole was 632.3 women per 100,000 and 239.9 per 100,000 in men. The chance of sustaining a hip fracture increases with age. Amongst women of European origin, age-specific rates ranged from 47.1 per 100,000 in under 65 year olds to 5384.6 in over 95 year olds. Sixty-seven per cent of the hip fractures were sustained by those aged 80 years or older. In Māori and Pacific Islands populations, the difference in rates between men and women were not apparent. Overall, crude rates in Māori were 151.6 per 100,000 for women, and 169.3 for men; in Pacific Peoples, the rates were 154.5 per 100,000 for women, and 168.7 for men. The size of the difference between Māori and non-Māori is notable since the rate of reporting a fall in the previous 12 months is very similar (26% and 25%).[4]

## DEFINITIONS

In **primary prevention**, general measures are undertaken for a whole population, or for predefined risk populations (eg, in this guideline, older people in residential care, who as a group are at high risk).

In the general population, primary prevention of fractures would concentrate on lifestyle issues, and on preventing osteoporosis from the time of the menopause; these aspects of prevention are not included in this guideline.

In **secondary prevention**, screening is conducted to identify those with a particularly high risk of fracture. For fracture prevention, this may be by identifying clinical risk factors, or by measuring bone density.

**Tertiary prevention** is directed at preventing further fractures in those who already have sustained a hip fracture. In the context of this guideline, we have made no practical distinction between this group and other high risk groups identified by screening.

**High risk of hip fracture** is defined in this guideline as an estimated one-year hip fracture risk of 1% or more.[5] This approximately corresponds to the risk for an average 80 year old woman.

## WHAT DO WE DO NOW?



At the time of writing we know of no implemented systematic fracture prevention programme in a New Zealand community. However, fall prevention programmes are being trialled in a number of communities, and individuals in many communities are offered preventive strategies following diagnosis of osteoporosis.

## OBJECTIVES

The objectives for developing this guideline were:

- to provide clinicians and people suffering hip fractures with decision-making tools for identifying older individuals with a high risk of hip fracture, and reducing that risk
- to provide evidence that supports clinical decision-making
- to provide a basis for local adaptation and implementation of a structured system of fall prevention and bone protection.

## TOPICS ADDRESSED BY THE GUIDELINE

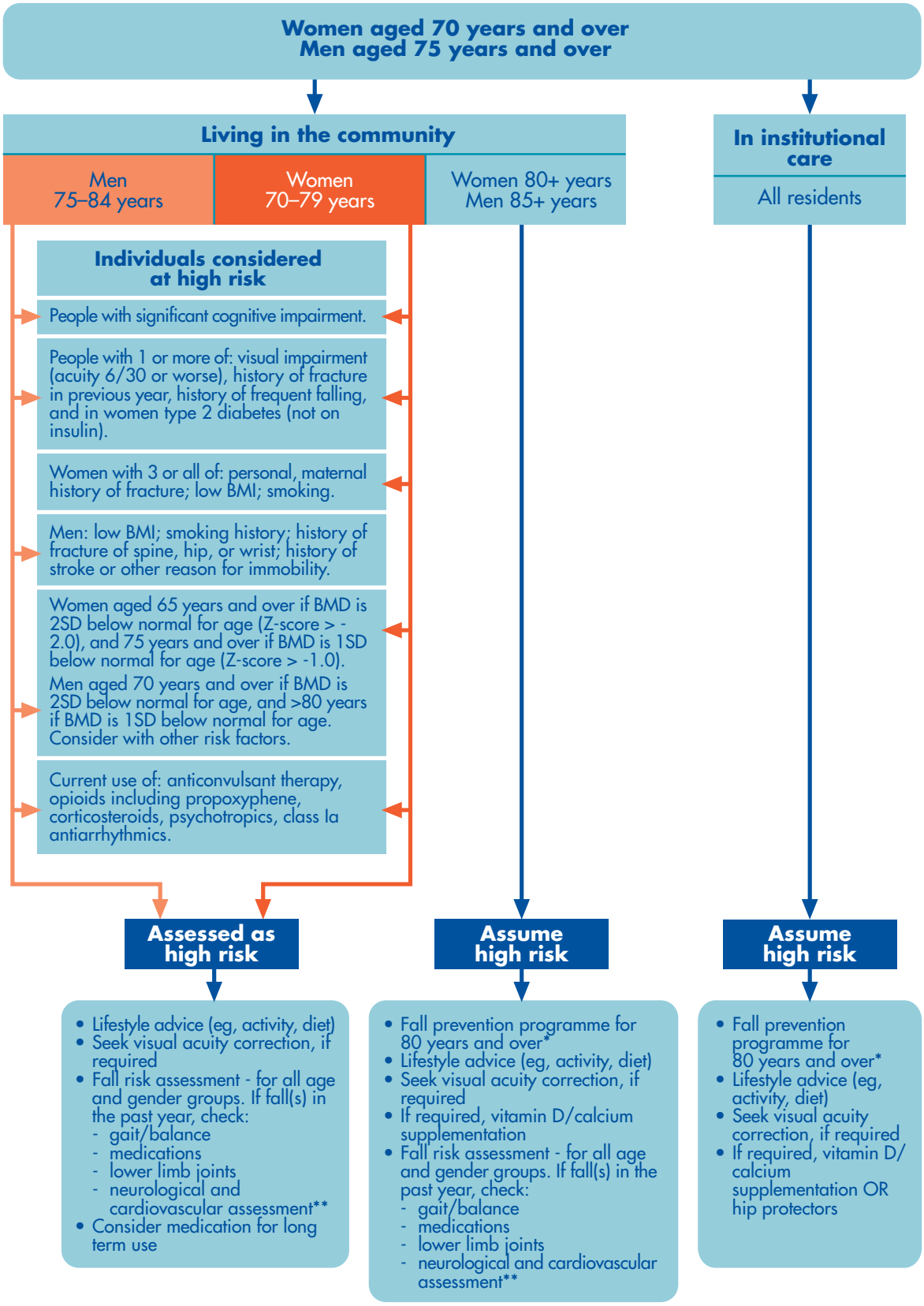
The guideline addresses the following aspects of hip fracture prevention in people aged 65 years and over:

- risk assessment
- fall prevention
- medication for bone protection
- hip protectors.

For each of the above, the aims are specified followed by a summary of the evidence. A summary algorithm is provided for risk assessment and a selection of preventive strategies.

# RISK ASSESSMENT & PREVENTIVE STRATEGIES FOR HIP FRACTURE IN OLDER PEOPLE

## SUMMARY ALGORITHM




Footnotes

* From Figure 1, p666: American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention. Guideline for the prevention of falls in older persons. Journal of the American Geriatrics Society 2001; 49: 664-672.

** Refer.[24]

# RISK ASSESSMENT FOR HIP FRACTURE IN OLDER PEOPLE



## AIM

To identify older people at high risk of sustaining a hip fracture.

## BACKGROUND

The risk of sustaining a fracture may be evaluated via an assessment of hip fracture risk factors, which may include a measurement of bone mineral density (BMD), usually with Dual-energy X-ray Absorptiometry (DEXA) scanning. Studies indicate that women are at greater risk of both osteoporosis and fracture than men, and this risk increases steadily and substantially with age.[3] In addition to gender, other factors that increase the risk of hip fracture are:

- living in institutional care[6,7,8]
- significant cognitive impairment[6,7,8]
- certain medications[7,8,9] (eg, anticonvulsants, corticosteroids)
- personal history and lifestyle factors[8,9,10]
- certain medical conditions[11,12] (eg, type 2 diabetes in women)
- low bone mineral density.[5]

Strategies for preventing osteoporosis over a lifetime differ from strategies for reducing the incidence of fall-associated fractures in older people. A cluster of several risk factors are consistently associated with low BMD. Specific instruments to assess the risk for low bone density have been developed overseas. The best validated tools include the Simple Calculated Osteoporosis Risk Estimation (SCORE)[13] and Osteoporosis Risk Assessment Instrument (ORAI).[14]

It is important to distinguish between BMD measurement as a tool for diagnosing and quantifying osteoporosis and its use as a tool for predicting fracture risk.[15] BMD measurement has important limitations as a tool for predicting fracture risk. While it has a high specificity, a sensitivity of 50% means that it does not discriminate well between people who get a fracture and those who do not.[16] It is also not widely accessible in New Zealand. Thus, there is wide consensus that BMD measurement should not be used for population screening, but it may have a role in selective testing of 'at risk' individuals. However, it should only be undertaken when the result will impact on decision making.[17]

In determining the future probability of hip fracture for an individual, an absolute risk approach should be taken. This may or may not include information obtained from a BMD measurement. When considering BMD measurement to facilitate an

informed choice, a person should be informed of the investigation's benefits and limitations, the cost, as well as the relative benefits and harms of the prevention options.

# EVIDENCE SUMMARY

In this section of the guideline, we provide information on fracture risk in older people. The approach is to provide information that will allow the identification of high risk individuals from amongst the community as a whole, from 15 years prior to the age at which, for an average New Zealander the fracture incidence per year is expected to exceed 1% (high risk).



## Epidemiology and risk factors for hip fracture

In New Zealand, the risk of sustaining a fracture in the following year exceeds 0.5% from the age of 75 years in women, and the age of 80 years in men; it exceeds 1% from the age of 80 years in women, and the age of 85 years in men.[3][2++] As a group, women aged 80 years and over, and men aged 85 years and over should be considered at high risk of hip fracture.

Living in institutional care is associated with a doubling of the risk of hip fracture in women and men compared with living in a private home, even after controlling for potential confounding factors.[6][2++] Women aged 70 years and over and men aged 75 years and over living in institutional care should be considered at high risk of hip fracture.

Significant cognitive impairment is associated with at least doubling of the risk of hip fracture in men and women.[6,7,8][2++] Applying these data to New Zealand, women aged 70 years and over and men aged 75 years and over, with significant cognitive impairment should be considered at high risk of hip fracture.

A number of fall-associated risk factors are associated with an estimate of a doubling of the risk of hip fracture or other serious injury.[11,12][2++] Applying these data to New Zealand, women aged 70 years and over and men aged 75 years and over, with visual acuity 0.2 (6/30, 20/100), history of a fall with fracture in the previous year, or a history of frequent falling, should be considered at high risk of hip fracture or other significant fall-related injury.

Women with type 2 diabetes who are not using insulin have an increased risk of hip fracture compared with non-diabetics.[18][2++] Applying these data to New Zealand, women aged 70 years and over, with type 2 diabetes who are not using insulin should be considered at high risk of hip fracture.[12]

Current usage of some medications is associated with an estimate of doubling of risk of hip fracture.[7,8,9][2++] Applying these data to New Zealand, women aged 70 years and over, and men aged 75 years and over currently using anticonvulsant therapy, opioids (including propoxyphene containing pain medication), or corticosteroids (doses greater than prednisone 5 mg per day or equivalent) should be considered at high risk of hip fracture. Current usage of other medications is associated with an estimate of a 50% increase in the risk of falling.[19,20][2++] Applying these data to New Zealand, women aged 70 years and over, and men aged 75 years and over currently using any psychotropic drug, or type Ia antiarrhythmics should be considered at high risk of hip fracture.

A cluster of four risk factors has been associated with hip fracture in women.[9,10][2++] In the New Zealand context this data suggests that women aged 70 years and over with three or all of the following four risk factors be considered at high risk:

- smoking history
- personal history of any previous fracture
- history of maternal hip fracture
- low body mass index

Likewise, in men significant personal history/lifestyle factors have been associated with hip fractures.[8][2+] In the New Zealand context this data suggests that men with any of the following be considered at high risk:

- aged 75 years and over with low body mass index
- smoking history
- history of fracture of spine, hip, or wrist; or history of stroke

## Evidence on the assessment of hip fracture risk



No controlled studies have examined the effect of risk assessment (screening) on fractures or fracture-related morbidity.[21][1++] Several risk factors including gender (women), increasing age (65 years and over), a low body mass index and not using oestrogen replacement have been consistently associated with low BMD.[21][1++] Specific instruments to assess risk for low bone density have been developed overseas. The best validated tools include the Simple Calculated Osteoporosis Risk Estimation (SCORE)[13] and Osteoporosis Risk Assessment Instrument (ORAI).[14] SCORE[13] uses the risk factors age, weight, ethnicity, oestrogen use, presence of rheumatoid arthritis, and history of fractures and has a sensitivity of 91% and specificity of 40%. For osteoporosis, ORAI has a sensitivity of 94% and specificity of 41% and uses age, weight and current use of hormone replacement therapy to identify women at risk for osteoporosis.

The available evidence does not support the use of BMD measurement for routine population screening of asymptomatic individuals.[22][1-] There is some support for the use of BMD measurement as part of an assessment of absolute risk in selected individuals. However, there is only limited evidence that this approach is effective in reducing the risk of future fractures.[23][1++] In a review of recommendations on screening for osteoporosis in patients identified as 'at risk' one of nine reports recommended against BMD, four made a conditionally positive recommendation for it's use and four made a clear positive statement.[23][1++] The eight reports in favour of selective screening proposed sets of clinical criteria that all differed in number and content.[23][1++]

As previously discussed, BMD measurement as a tool for predicting fracture risk has important limitations:

- it does not predict risk of future fracture very accurately e.g. more than half the women who eventually suffer fractures will be classified as 'normal' following a BMD scan[23,5][1++/2++]
- there are limitations in the analytical performance of measurement methods and the usefulness of results, creating substantial uncertainty in the correct classification of an individual as osteoporotic.[23][1++]
- it is not readily available in many parts of New Zealand.

A risk function of femoral neck BMD combined with age has been validated as predictive of hip fracture risk in women and men.[5][2++] In New Zealand this data indicates that women 65 years and over are at high risk if their BMD is 2SD below normal for age (Z-score > -2.0), and 75 years and over if BMD is 1SD below normal for age (Z-score > -1.0). Men are at high risk at 70 years of age and over if their BMD is 2SD below normal for age, and 80 years of age and over if BMD is 1SD below normal for age.

A study examining the predictive value of risk assessment tools to identify older New Zealanders at risk of fracture is required.

NB The evidence suggests that the pattern of risk factors is quite similar across developed communities. Therefore, in preparing these recommendations we have used local data where available, but have also extrapolated from other communities in Europe, Australia, and North America. In the New Zealand studies, the majority of people studied have been non-Māori, due to the relatively low incidence of hip fracture in Māori people.

| RECOMMENDATIONS | |
|---|---|
| Women aged 80 years and over and men aged 85 years and over are, as a group, at high risk of hip fracture. | B |
| Women aged 70 years and over and men aged 75 years and over are, as a group, at high risk of hip fracture:<br>• living in institutional care, OR<br>• with significant cognitive impairment | B |
| Women aged 70 years and over and men aged 75 years and over are at high risk of hip fracture:<br>• with one or more of the following conditions;<br>- visual acuity 0.2 (6/30)<br>- history of a fall with fracture in the previous year<br>- history of frequent falling<br>- type 2 diabetes (evidence available for women only)<br>• if currently using any of the following medications;<br>- anticonvulsant therapy<br>- opioids (including propoxyphene containing pain medication)<br>- corticosteroids (doses greater than prednisone 5mg per day or equivalent)<br>- any psychotropic drug<br>- type Ia antiarrhythmics. | C |
| Women aged 70 years and over with three or all of the following personal history/ lifestyle factors are at high risk of hip fracture:<br>• smoking history<br>• personal history of any previous fracture<br>• history of maternal hip fracture<br>• low body mass index. | C |
| Men aged 75 years and over with any of the following personal history/lifestyle factors are at high risk of hip fracture:<br>• low body mass index<br>• smoking history<br>• history of fracture of spine, hip or wrist<br>• history of stroke should be considered at high risk of hip fracture. | C |
| Women aged 65 years and over are at high risk if their bone mineral density (BMD) is 2SD below normal for age (Z-score > -2.0), and 75 years and over if BMD is 1SD below normal for age (Z- score > -1.0). The decision on prevention/treatment should take into account Z-score AND other risk factors.<br>Men aged 70 years and over are at high risk if their BMD is 2SD below normal for age, and 80 years and over if BMD is 1SD below normal for age. The decision on prevention/treatment should take into account Z-score AND other risk factors. | C |

**KEY** - *Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations - see page viii for details*

**A** Well designed meta-analysis (MA) or RCT, or a body of evidence which is consistently applicable
**B** Very well designed observational studies or extrapolated evidence from RCTs or MAs
**C** Lower quality observational studies or extrapolated evidence from B
**D** Non analytical studies or expert opinion

## RECOMMENDATIONS continued

| | |
|---|---|
| The available evidence does not support the use of BMD measurement for screening of asymptomatic individuals.<br>At present, there is only limited evidence that the use of BMD measurement in selected individuals is effective in reducing the risk of future fractures. | A |

# FALL PREVENTION



## AIM

To reduce the incidence of falls causing hip fracture or other injury in older people at high risk of hip fracture.

## BACKGROUND

Most hip fractures result from a fall from standing height or less. A substantial recent literature has examined the efficacy and effectiveness of fall prevention programmes in older people. The relevant clinical trials have been the subject of a Cochrane systematic review.[24] A number of community-based quasi-experimental observational studies have also evaluated the effectiveness of fall prevention strategies applied as a community intervention[25-28] (See Appendix B). Economic evaluations are available from one of these[28] and from three RCTs[29-31] (See Appendix B). The rate of falling increases with age in older New Zealanders, from 50 per 100 person years in those aged 70 – 74, to 120 per 100 person years in the 80 years and over age group.[32] It is estimated that 25 – 50% of falls in older people result in injury, 5 – 10% result in a fracture, and around 1% result in hip fracture.[33-37] Falls are a leading cause of accidental death in older New Zealanders.[38] Therefore, fall prevention has a broader aim than the prevention of hip fractures alone.

## EVIDENCE SUMMARY

A programme of muscle strengthening and balance training, individually prescribed by a trained health professional in a New Zealand primary health care setting, reduces the frequency of falls in high risk community-dwelling older people.[20] (1+)*

Multidisciplinary, multifactorial health/environmental screening/intervention programmes reduce the frequency of falls in high risk community-dwelling older people.[24] (1+)

Assessment, advice, and facilitation of home environment modification, when conducted in an experimental situation by a trained occupational therapist, reduces the frequency of falls in high risk community-dwelling older people.[24] (1+)

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* Detailed information about the programme can be obtained from this 'How to do it' article: Gardner MM, Buchner DM, Robertson MC, Campbell AJ. Practical implementation of an exercise-based falls prevention program. Age Ageing 2001; 30:77-83.

Each of these interventions has rather similar parameters of efficacy. On the basis of the RCT data, the likely number of people who must undergo a fall prevention programme to prevent one fall (NNT) is between 3 and 10. By extrapolation, NNT to prevent an injury fall is between 6 and 40, to prevent any fracture, between 30 and 100, and to prevent a hip fracture, between 300 and 1000. It is emphasised that efficacy of a complex intervention delivered by a fully trained professional in a research situation may not be reflected as effectiveness when an intervention is widely applied in the community. However, the results of the community interventions[25-28] in Table 1, Appendix B, are in broad agreement with those from randomised studies.

| RECOMMENDATIONS | |
|---|---|
| A programme of muscle strengthening and balance training, individually prescribed by a trained health professional in a New Zealand primary health care setting, reduces the frequency of falls in high risk community-dwelling older people. | **A** |
| Multidisciplinary, multifactorial health/environmental screening/intervention programmes reduce the frequency of falls in high risk community-dwelling older people. | **A** |
| Assessment, advice, and facilitation of home environment modification, when conducted in an experimental situation by a trained occupational therapist, reduces the frequency of falls in high risk community-dwelling older people. | **A** |

**KEY** - *Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations - see page viii for details*

**A** Well designed meta-analysis (MA) or RCT, or a body of evidence which is consistently applicable
**B** Very well designed observational studies or extrapolated evidence from RCTs or MAs
**C** Lower quality observational studies or extrapolated evidence from B
**D** Non analytical studies or expert opinion

# MEDICATION FOR BONE PROTECTION



## AIM

To prevent or reverse progressive bone loss in older people at high risk of hip fracture. Current candidate agents for preventive regimens are calcium plus vitamin D and bisphosponates.

## EVIDENCE SUMMARY

Many older people in New Zealand are vitamin D deficient.[39] There is insufficient evidence to confirm that vitamin D supplementation alone reduces the incidence of hip fracture, but vitamin D with calcium supplementation is effective.[40,41][1+] Daily supplementation with vitamin $D_3$ and calcium is effective in reducing hip fracture rates in high risk older people in institutional care. In this group, the estimated number of people who must receive vitamin $D_3$ and calcium supplementation to prevent one hip fracture (NNT) is 25.

Older people who have sustained a hip fracture have reduced levels of vitamin D compared with controls.[42] Daily supplementation with vitamin $D_3$ and calcium should be considered for older people who have sustained a hip fracture.[2++] NNT in this group is not known.

Daily supplementation with vitamin $D_3$ and calcium should be considered for older people who are on corticosteroid therapy.[43][1+] This evidence is extrapolated from the effect on Bone Mineral Density (BMD); there is insufficient direct evidence from clinical trials to confirm efficacy in preventing hip fractures. NNT in this group is not known.

Bisphosphonates (alendronate, risedronate) have been shown to be effective in reducing hip and other fracture rates in community-dwelling older women under 80 years of age.[44,45][1+] In women aged 80 years and over, effectiveness has not been confirmed.[45] For current prescribing availability in New Zealand, see the New Zealand Pharmaceutical Schedule at www.pharmac.govt.nz/pharm

HRT may be effective in reducing the risk of hip and other non-vertebral fractures in women aged 65 years and over, but the evidence is conflicting.[46,47][1+] A trade-off exists with the potential adverse effects of HRT. See latest recommendations for HRT use in Appendix C or NZGG's HRT Guideline Update at www.nzgg.org.nz

| RECOMMENDATIONS | |
|---|---|
| Daily supplementation with vitamin $D_3$ and calcium reduces the hip fracture rates amongst high-risk older people in institutional care, or who have already sustained a hip fracture. | A |
| Bisphosphonates (alendronate, risedronate) reduce hip and other fracture rates in community-dwelling older women under 80 years of age. | A |
| Evidence for the effectiveness of HRT in reducing hip fracture rates in women aged 65 years and over is conflicting. In view of more recent evidence on the risks of HRT, it is not recommended for first line prevention of hip fracture. Refer to Appendix C. | A |



**KEY** - *Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations - see page viii for details*

**A** Well designed meta-analysis (MA) or RCT, or a body of evidence which is consistently applicable
**B** Very well designed observational studies or extrapolated evidence from RCTs or MAs
**C** Lower quality observational studies or extrapolated evidence from B
**D** Non analytical studies or expert opinion

# HIP PROTECTORS



## AIM

To protect against hip fracture by wearing protective force-diverting or force-absorbing padding around the hip.

## EVIDENCE SUMMARY

Current evidence indicates that hip protectors reduce the incidence of hip fractures in older people in institutional care provided that compliance/adherence is achieved.[48][1+] Compliance with this intervention is limited; up to five protectors per resident may be necessary, deterioration of protectors may occur quite rapidly, and increased staff support for wearers is necessary.[49]

| RECOMMENDATION | |
|---|---|
| Hip protectors appear to reduce the incidence of hip fractures in older people in institutional care provided that compliance/ adherence is achieved. | A |

# COST-EFFECTIVENESS OF HIP FRACTURE PREVENTION STRATEGIES



The cost-effectiveness of hip fracture prevention is the subject of a recent systematic review,[50][1-] and of modelling;[51] this section of the guideline is based on its conclusions.

Considerable uncertainty exists around the cost-effectiveness of fracture prevention. Estimates are sensitive to individual's age at fracture, age at onset, duration, and other benefits of the prophylactic regimen, costs of adverse effects, and the costs of the intervention that vary considerably from country to country.

At present, the differences in cost of different hip fracture prevention strategies appear to be higher than the apparent differences in efficacy. Thus, cost-effectiveness ratios will be mainly influenced by the cost, rather than by the effectiveness.

## PRIMARY PREVENTION

Amongst frail older people in residential or nursing home care, economic modelling based on the results of RCTs indicates that the use of calcium and vitamin D supplementation appears more cost-effective than the use of hip pads.

For primary prevention using hormone replacement therapy (HRT), potential savings would only exceed costs if used in women aged 70 years and over (refer to Appendix C for caution on HRT use). It is therefore unlikely to be cost-effective in older women, since acceptance and continuing compliance, even when scanning has demonstrated low BMD, may be low.

## SECONDARY PREVENTION

Bisphosphonates used in secondary prevention appear to be less cost-effective than HRT. However, this conclusion is sensitive to compliance, and other possible positive and adverse effects of HRT (refer to Appendix C for current advice). Bisphosphonates may currently be a preferred option.

No studies appear to have measured or modelled the overall cost-effectiveness of fall-prevention programmes compared with other fracture prevention strategies.

In community-dwelling older women NNT to prevent one hip fracture is estimated at 90 for bisphosphonates,[45] compared with 300 to 1000 for fall prevention programmes. However, this is a crude comparison as the aim and impact of fall prevention programmes extend beyond hip fracture prevention.

# TERTIARY PREVENTION

In older people who have already sustained a hip-fracture, modelling suggests that potential savings from the use of either hip protectors or bisphosphonates would exceed costs over time, but savings would be less with bisphosphonates.

| RECOMMENDATIONS | |
|---|---|
| In frail older people in residential or nursing home care, calcium and vitamin D supplementation appears more cost-effective than the use of hip pads, although both approaches have similar efficacy. | B |
| The cost-effectiveness of bisphosphonates compared with HRT is sensitive to compliance and the incidence of adverse events, and is unclear (refer to Appendix C for current advice on HRT). | B |
| The overall cost-effectiveness of fall prevention programmes, compared with other strategies used for hip fracture prevention, is not known. | B |



**KEY** - *Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations - see page viii for details*

**A** Well designed meta-analysis (MA) or RCT, or a body of evidence which is consistently applicable
**B** Very well designed observational studies or extrapolated evidence from RCTs or MAs
**C** Lower quality observational studies or extrapolated evidence from B
**D** Non analytical studies or expert opinion

# IMPLEMENTATION



The recommendations of this guideline are intended to assist decision-making, and are based on current best evidence. The guideline is not intended to serve as, or be construed as, a standard of health care. Adoption and implementation of the recommendations will be a matter for Accident Compensation Corporation (ACC), District Health Boards (DHBs), Independent Practitioners' Associations (IPAs), Primary Healthcare Organisations (PHOs) and local provider units to consider. The guideline should provide a basis at local level for protocols, continuing health professional education, audit, and quality assurance activities. Suggestions for audit are described in Chapter 7.

## DISSEMINATION

The guideline will be sent to:

- ACC
- colleges and associations representing relevant health professional vocational groups
- members of IPAs
- PHOs
- chief executives and chief medical officers of DHBs
- tertiary education institutions offering health professional programmes
- providers of Aged Care services in the community
- selected others.

Summary guidelines will also be prepared. The guidelines and summaries will be posted on the NZGG website www.nzgg.org.nz and on the ACC website www.acc.govt.nz

# AUDIT AND PERFORMANCE INDICATORS



## QUALITY

People aged 65 years and over at risk for hip fracture, service providers and funders of services to people at risk of hip fracture all have an interest in the preventive strategies for people at high risk of hip fracture. This places a responsibility on service providers to collect information relevant to different perspectives. This chapter suggests:

- a minimum data set for collection relating to each individual at risk for hip fracture aged 65 years and over
- additional data for periodic audit (by an internal or external agency).

### *Suggested data for routine collection*

- Basic demographics of people at risk for hip fracture (age, gender, ethnicity, height, weight and body mass index (BMI))
- Current living status (own home – alone, residential, whānau/family support)
- Maternal history of hip fracture
- Smoker status. Number of attempts at quitting
- Diabetes diagnosed. Using insulin?
- Number of strokes
- Number of falls in the previous 12 months
- Previous fractures (hip, wrist, humerus, spine)
- Current medications and dose levels (anticonvulsants, bisposphonates, corticosteroids, opioids, HRT, psychotrophic drugs, and type Ia antiarrhythmic)
- Use of vitamin D supplements and calcium
- Side effects of medication.

## AUDIT

Audit is a systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which a service, such as a primary health care practice, is meeting best practice standards. In order to assess hip fracture prevention is being provided effectively, a register of individuals with risk factors for hip fracture may be established. In addition, the following performance indicators may be assessed.

## *Suggested performance indicators*

The proportion of people enrolled in the practice who are at high risk who have had:

- visual acuity check
- polypharmacy review
- vitamin D and calcium supplementation
- access to hip protectors
- specific anti-osteoporotic medication (prescribed or prescription offered), with details of the type of medication.



Proportion of community-dwelling people aged 80 years and over enrolled in the practice who have had:

- a formal hip fracture risk assessment including falls assessment.

# APPENDICES

# APPENDIX A

# EVIDENCE AND RECOMMENDATION GRADING SYSTEM USED FOR THIS GUIDELINE



The guideline development team ranked the evidence according to the revised system of the Scottish Intercollegiate Guidelines Network (SIGN).[52] The SIGN Grading System for Recommendations in Evidence-based Clinical Guidelines is a revised version of the system developed by the US Agency for Health Care Policy and Research (AHCPR).[53] Evidence statements relating to interventions have been assigned a grading according to the 'strength' of the supporting evidence where 1 is the best quality evidence and 4 is expert opinion.

Qualitative material was systematically appraised for quality, but was not ascribed a level of evidence.

| LEVELS OF EVIDENCE | |
|---|---|
| **1++** | High quality meta-analyses/systematic reviews of randomised controlled clinical trials (RCTs), or RCTs with a very low risk of bias |
| **1+** | Well-conducted meta-analyses/systematic reviews, or RCTs with a low risk of bias |
| **1-** | Meta-analyses/systematic reviews, or RCTs with a high risk of bias |
| **2++** | High quality systematic reviews of case-control or cohort studies<br>High quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal |
| **2+** | Well-conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal |
| **2-** | Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal |
| **3** | Non-analytic studies eg, case reports. Case series |
| **4** | Expert opinion<br>Qualitative material was systematically appraised for quality, but was not ascribed a level of evidence. |

# HIP FRACTURES EVIDENCE TABLES

*Table 1: Community fall/hip fracture prevention programmes*

| Study | Location/Population | Intervention | Results | Economic data |
|---|---|---|---|---|
| Ytterstadt 1996[25] | Harstad, Norway.<br>3-year baseline control; 4-year intervention. 22970 person years, aged >65 years.<br>Concurrent reference population in Trondheim, Norway (158911 person years). | Home visit by public health nurse. Promotion of environmental safety. Physical exercise sessions available. Correction of environmental hazards offered.<br>Acceptance rate of visit: 80%. | Non significant overall fall-fracture reduction rate of 9%.<br>ARR 3.4 per 1000 person years (0.034).<br>NNT >30. | None |
| Poulstrup 2000[26] | Vejle, Denmark.<br>5 intervention municipalities.<br>4 control municipalities.<br>12905 participants 65 years and over. | Information. Home visit with follow-up, health and medication assessment and targeted treatment. Graded process according to age.<br>Acceptance rate: No data. | Non significant overall fall-fracture reduction rate of 14% (95% CI –9 to 37). ARR and NNT not estimable from published data.<br>Non-significant reduction in hip fracture of 43%, (95% CI –2 to 88) ARR and NNT not estimable from published data. | None |
| Kempton 2000[27] | Northern Rivers Area, New South Wales, Australia.<br>1992 intervention and 1665 control group subjects >60 years. | 'Stay on your feet' 4-year programme for fall avoidance. Awareness raising, community education, policy development , home-hazard reduction, media campaigns, working with health professionals.<br>Acceptance rate: 82% intervention, 72% control. | Non significant 22% reduction in incidence of self-reported falls, and 20% lower fall-related hospitalisation rate.<br>ARR and NNT not estimable from published data. | Overall programme cost only. |

| Study | Location/Population | Intervention | Results | Economic data |
|---|---|---|---|---|
| Robertson 2001B[28] | Southern New Zealand.<br>450 women and men aged 79-94 years (120 controls in four centres, 330 intervention in 3 centres). | Home exercise programme supervised by physiotherapists and delivered by nurses who had received a training programme.<br>Acceptance rate 46%. | Significant reduction in number of injurious falls per 100 person years.<br>ARR 0.115 (95%CI 0.074 to 0.156). NNT=9 (95% CI 7 to 14). | Detailed economic evaluation.<br>Mean cost per injurious fall prevented NZ$3404; mean cost of intervention per fall prevented NZ$1519 (1998 prices). |

*Table 2: Fall prevention programmes. RCTs with economic evaluation*

| Study | Location/ Population | Intervention | Results | Economic data |
|---|---|---|---|---|
| Rizzo 1996[29] | USA. Health Maintenance Organisation.<br>288 people aged > 70 years with at least one targeted risk factor. | Home based targeted multifactorial programme. | Significant reduction in fall incidence. | Detailed economic evaluation.<br>Mean cost of intervention per fall prevented US$1772 (1993 prices). |
| Salkeld 2000[30] | Australia. 530 people aged >65 years discharged from hospital. | Home hazard reduction. | Significant reduction in fall incidence in those who had fallen in previous year. | Detailed economic evaluation.<br>Mean total health care cost per fall prevented AUS$3980 for those who fell in previous year (1997 prices). |
| Robertson 2001A[31] | New Zealand 240 community-dwelling people aged 79-95 years. | Home exercise programme supervised by physiotherapists and delivered by nurses who has received a training programme. Acceptance rate 41% . | Significant reduction in fall incidence. | Detailed economic evaluation.<br>Mean intervention cost per fall prevented NZ$1803 (1998 prices). |

# NZGG'S HORMONE REPLACEMENT THERAPY GUIDELINE UPDATE - SEPTEMBER 2002

These new key messages are based on recent research findings on the risks associated with the use of Combined Hormone Replacement Therapy and Estrogen Replacement Therapy. *They replace the advice published by the NZGG in May 2001.*



## REVISED KEY MESSAGES

### COMBINED HRT (estrogen with progestogen)

- Combined HRT is not recommended for long-term use except in limited circumstances because the risks of breast cancer, venous thromboembolism (VTE), stroke and coronary heart disease (CHD) outweigh the benefits of fracture reduction and reduced risk of colorectal cancer.
- Combined HRT should not be used for the prevention or treatment of coronary heart disease or stroke.
- For women at high risk of osteoporosis, combined HRT may be considered only where other treatment is not tolerated and the woman is at low cardio-vascular disease (CVD) risk and is fully informed of the risks of HRT.
- Combined HRT is effective for the control of troublesome menopausal symptoms of hot flushes and night sweats. However, even short-term use is associated with an increased risk of venous thromboembolism, stroke and coronary heart disease. HRT should only be used where menopausal symptoms are troublesome and women are fully informed of the risks.

### UNOPPOSED ESTROGEN THERAPY

- Unopposed estrogen replacement therapy should only be used by women who have had a hysterectomy.
- Unopposed estrogen replacement therapy is effective for the control of menopausal symptoms of hot flushes, night sweats and vaginal dryness.
- Use of unopposed estrogen replacement therapy is associated with an increased risk of venous thromboembolism.
- Use of unopposed estrogen therapy may be associated with an increased risk of ovarian cancer.
- Use of unopposed estrogen therapy (for more than 5 years) is associated with an increased risk of breast cancer.
- It is not clear whether unopposed estrogen therapy increases the risk of CHD and stroke. Further definitive information is expected by 2005. In the meantime, women should be informed of the lack of evidence for CHD and stroke benefit or harm.

### PREMATURE MENOPAUSE

- The new studies have not provided any data on the risk or benefits for women with premature or surgical menopause.

### TOPICAL ESTROGEN THERAPY

- Topical vaginal estrogen (cream or ring) is effective for the control of vaginal dryness and is safe to use long-term in doses that do not cause systemic absorption.

# GLOSSARY



**Absolute risk reduction (ARR):** The effect of a treatment can be expressed as the difference between relevant outcomes in the treatment and control groups by subtracting one rate (given by the proportion who experienced the event of interest) from the other. The reciprocal is the number needed to treat (NNT).

**Adverse event:** A non-beneficial outcome measured in a study of an intervention that may or may not have been caused by the intervention.

**Adverse reaction:** Any undesirable or unwanted consequence of a preventive, diagnostic or therapeutic procedure.

**Bias:** Bias is a systematic deviation of a measurement from the 'true' value leading to either an over- or underestimation of the treatment effect. Bias can originate from many different sources, such as allocation of participants, measurement, interpretation, publication and review of data.

**Case-control study:** Participants with a certain outcome or disease and an appropriate group of controls without the outcome or disease are selected (usually with careful consideration of appropriate choice of controls, matching, etc) and then information is obtained on whether the subjects have been exposed to the factor under investigation.

**Case series:** The intervention has been used in a series of patients (may or may not be consecutive series) and the results reported. There is no separate control group for comparison.

**Causality:** The relating of causes to the effects they produce. The Bradford-Hill criteria for causal association are: consistency, strength, specificity, dose-response relationship, temporal relationship (exposure always precedes the outcome – it is the only essential criterion), biological plausibility, coherence and experiment.

**Cochrane Collaboration:** The Cochrane Collaboration is an international network that aims to prepare, maintain and disseminate high-quality systematic reviews based on RCTs and when RCTs are not available, the best available evidence from other sources. It promotes the use of explicit methods to minimise bias, and rigorous peer review.

**Cohort study:** A study in which data are obtained from groups who have been exposed, or not exposed, to the new technology or factor of interest (eg, from databases). Careful consideration is usually given to participant selection, choice of outcomes, appropriate controls, matching, etc. However, data on outcomes may be limited.

**Confidence interval (CI):** An interval within which the population parameter (the 'true' value) is expected to lie with a given degree of certainty (eg, 95%).

**Confounding:** The measure of a treatment effect is distorted because of differences in variables between the treatment and control groups that are also related to the outcome. For example, if the treatment (or new intervention) is trialed in younger participants then it may appear to be more effective than the comparator, not because it is better, but because the younger participants had better outcomes.

**Effectiveness:** The extent to which an intervention produces favourable outcomes under usual or everyday conditions.

**Efficacy:** The extent to which an intervention produces favourable outcomes under ideally controlled conditions such as in a randomised controlled trial.

**Evidence:** Data about the efficacy or effectiveness of a treatment or intervention derived from studies comparing it with an appropriate alternative. Preferably the evidence is derived from a good quality randomised controlled trial, but it may not be.

**Extrapolation:** Refers to the application of results to a wider or different population and means to infer, predict, extend, or project the results beyond that which was recorded, observed, or experienced.

**Incidence:** The number of new events (new cases of a disease) in a defined population, within a specified period of time.

**Level of evidence:** A hierarchy of study evidence that indicates the degree to which bias has been eliminated in the study design.

**Meta-analysis:** Results from several studies, identified in a systematic review, are combined and summarised quantitatively.

**Number needed to harm (NNH)** (*see also* number needed to treat): When the treatment increases the risk of the outcome, then the inverse of the absolute risk increase is called the number needed to harm.

**Number needed to treat (NNT)** (*see also* number needed to harm): When the treatment reduces the risk of specified adverse outcomes of a condition, NNT is the number of participants with a particular condition who must receive a treatment for a prescribed period in order to prevent the occurrence of the adverse outcomes. This number is the inverse of the absolute risk reduction.

**Primary prevention:** A programme in which general measures are undertaken for a whole population, or for predefined risk populations (eg, in this guideline older people in residential care, who as a group are at high risk) to limit the incidence of disease or injury by controlling causes and risk factors.

**Randomised controlled trial (RCT):** An experimental comparison study in which participants are allocated to treatment/intervention or control/placebo groups using a random mechanism, such as coin toss, random number table, or computer-generated random numbers. Participants have an equal chance of being allocated to an intervention or control group and therefore allocation bias is eliminated.

**Relative risk or risk ratio (RR):** Ratio of the proportions in the treatment and control groups with the outcome. This expresses the risk of the outcome in the treatment group relative to that in the control group.

**Secondary prevention:** A programme in which screening is conducted to identify those with a particularly high risk of fracture. For fracture prevention, this may be by identifying clinical risk factors, or by measuring bone density.

**Systematic review:** The process of systematically locating, appraising and synthesising evidence from scientific studies in order to obtain a reliable overview.

**Tertiary prevention:** A programme directed at preventing further fractures in those who have already sustained a hip fracture.

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