

# GUIDANCE ON THE PREVENTION AND TREATMENT OF OSTEOPOROSIS

**March 2001**

*Based on the Royal College of Physicians' documents –  
"OSTEOPOROSIS – clinical guidelines for prevention and treatment"  
(1999), Update (2000), the Department of Health's Quick Reference  
Primary Care Guide on the Prevention and Treatment of Osteoporosis  
(1998) and the National Osteoporosis Society documents.*



CREST established a working group with the remit:

*“In the light of recommendations contained in the Royal College of Physicians guidelines on osteoporosis:*

*to develop local guidelines on the prevention and treatment of osteoporosis, taking account of the implications for the health service in Northern Ireland.”*

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**This document and audit forms are available on the CREST website: [www.n-i.nhs.uk/crest](http://www.n-i.nhs.uk/crest)**

**Further copies of this booklet and charts are available from the CREST Secretariat, Room 517,  
Dundonald House, Upper Newtownards Road, BELFAST, BT4 3SF (Tel: 028 9052 4391)**

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## **BACKGROUND TO THE GUIDANCE**

In March 1999, the Royal College of Physicians of London issued guidelines for the prevention and treatment of osteoporosis. The scope of the guidelines is to review the assessment and diagnosis of osteoporosis, the therapeutic agents available and the manner in which these can be used to develop management strategies for both the prevention and the treatment of osteoporosis, with the aim of reducing fracture rates.

Levels of evidence are defined as follows:

- Ia from meta-analysis of randomised controlled trials (RCTs)
- Ib from at least one RCT
- IIa from at least one well designed controlled study without randomisation
- IIb from at least one other type of well designed quasi-experimental study
- III from well designed non-experimental descriptive studies, eg comparative studies, correlation studies, case-control studies
- IV from expert committee reports or opinions and/or clinical experience of authorities
- V from meta-analysis of observational studies

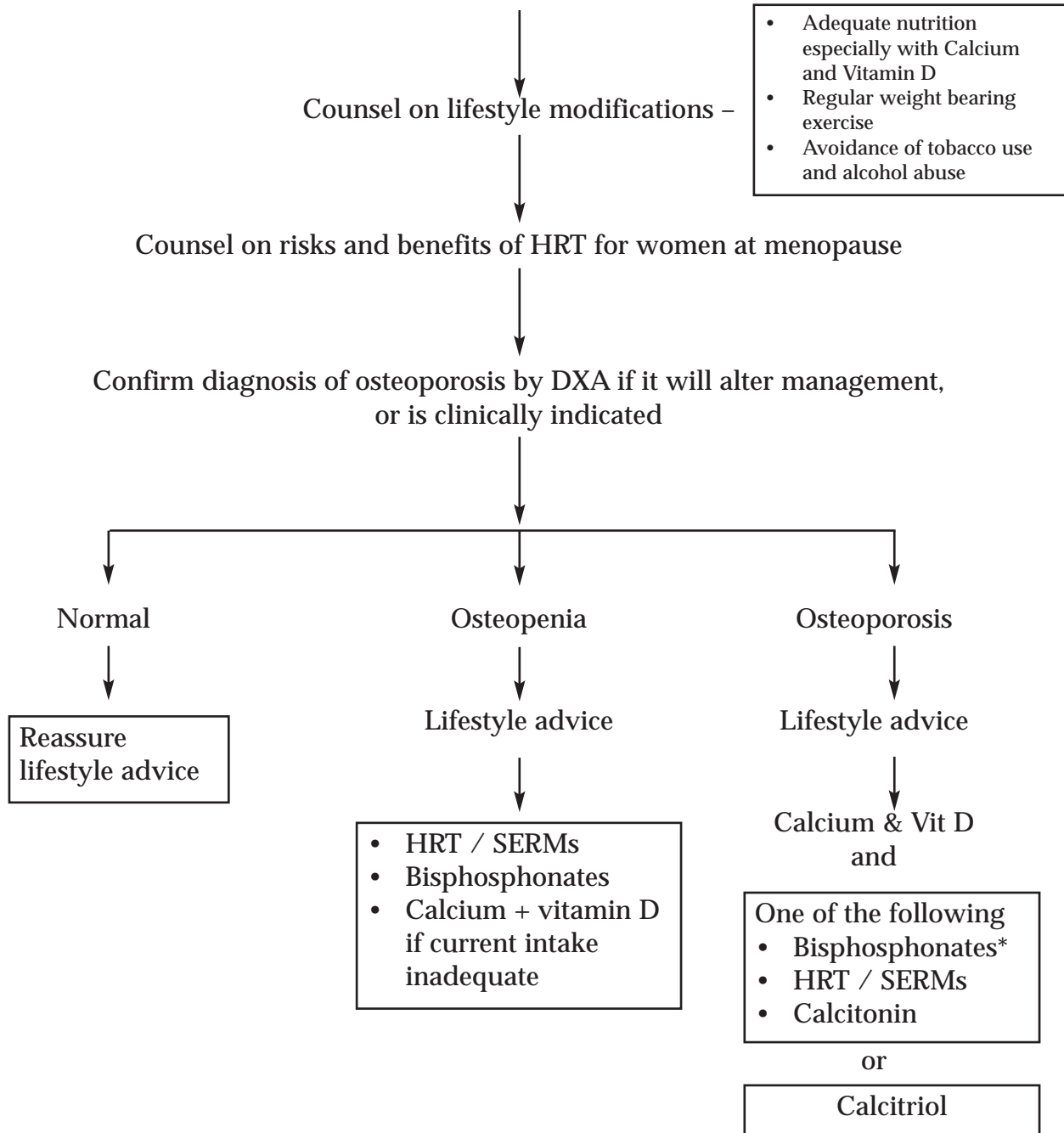
The guideline recommendations are similarly graded to indicate the levels of evidence on which they are based:

- grade A** evidence levels Ia and Ib
- grade B** evidence levels IIa, IIb and III
- grade C** evidence level IV

An update on pharmacological interventions and an algorithm for management was produced in July 2000 by the Royal College of Physicians and the Bone and Tooth Society of Great Britain.

## SUMMARY OF THE PREVENTION AND TREATMENT OF OSTEOPOROSIS

Identify those at possible increased risk from history/physical examination



- Adequate nutrition especially with Calcium and Vitamin D
- Regular weight bearing exercise
- Avoidance of tobacco use and alcohol abuse

Counsel on lifestyle modifications –

Counsel on risks and benefits of HRT for women at menopause

Confirm diagnosis of osteoporosis by DXA if it will alter management, or is clinically indicated

Normal

Reassure lifestyle advice

Osteopenia

Lifestyle advice

- HRT / SERMs
- Bisphosphonates
- Calcium + vitamin D if current intake inadequate

Osteoporosis

Lifestyle advice

Calcium & Vit D and

- One of the following
- Bisphosphonates\*
  - HRT / SERMs
  - Calcitonin

or

Calcitriol

**\*Note:** Cyclical Etidronate contains calcium carbonate



**Indications for the diagnostic use of bone densitometry**

<b>TARGET GROUP</b>	<b>REASON FOR REFERRAL</b>
1. Presence of strong risk factors (a) Oestrogen deficiency: – Premature menopause (age < 45 years) – Prolonged secondary amenorrhoea (> 1year) – Primary hypogonadism in women (b) Primary or secondary hypogonadism in men (c) Corticosteroid therapy: – Prednisolone > 7.5mg/day for 6/12 or more (d) Maternal family history of hip fracture (e) Low body mass index (< 19 kg/m <sup>2</sup> ) (f) Other disorders associated with osteoporosis: Anorexia nervosa Malabsorption syndromes Primary hyperparathyroidism Post-transplantation Chronic renal failure Chronic liver disease Hyperthyroidism Prolonged immobilisation Cushing’s syndrome	HRT contraindicated and in those who are uncertain about or do not wish to take HRT  Assess bone density to decide need for treatment  “ “ “
2. Radiographic evidence of osteopenia and/or vertebral deformity	“
3. Previous fragility fracture, particularly of the hip, spine or wrist*	“
4. Loss of height, thoracic kyphosis (after radiographic confirmation of vertebral deformities)	“

**NOTE**

1. There is no scientific evidence to support mass screening, of asymptomatic individuals including menopausal females.
2. Scan only if result will influence management.  
 \*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.
3. To monitor treatment – consider scan at 2 yearly intervals.
4. Patients with renal failure and those in whom steroid therapy is being prescribed should be considered for an early scan.

# OSTEOPOROSIS AND PHYSIOTHERAPY

## General Aims

To Improve Muscle Strength  
 To Improve Patient Posture  
 To Improve Patient Well-Being and Confidence  
 To Improve Patient Knowledge of Osteoporosis

<p><b>GROUP 1</b>  <b>Those at Risk</b>  <b>Aims</b>                  General Aims as Listed                  Also to Increase/Maintain Bone Mass</p>			<p><b>GROUP 2</b>  <b>Osteoporotic Patients who have not Sustained A Fracture</b>  <b>Aims</b>                  General Aims as Listed                  Also to Prevent Fractures                  To Maintain Bone Strength                  To Reduce Falls</p>		<p><b>GROUP 3</b>  <b>Those With Severe Osteoporotic Changes</b>  <b>Aims</b>                  General Aims as Listed                  Also to Prevent Further Fractures                  To Reduce Risk of Falls                  To Improve Balance                  To Reduce/Control Pain</p>	
EXERCISE MANAGEMENT			EXERCISE MANAGEMENT		EXERCISE MANAGEMENT	
<p><b>ACTIVITY</b>                  Jogging                  Skipping                  Stairs                  Cycling                  Brisk Walking                  Step Aerobics</p>	<p><b>EFFECTS ON BMD</b>                  Potential to Improve BMD                  Potential to Improve BMD                    No Effect on BMD                  No Effect on BMD</p>	<p><b>GENERAL EFFECTS</b>                  Good Functional Activity                  Good Aerobic Activity                  Good Functional Activity                  Best to Recommend                  To Over 50's</p>	<p><b>ACTIVITY</b>                  Brisk Walking                  Stair Climbing                  Strength Training                  Aerobic Activity                  Balance Training                  Postural Correction</p>	<p><b>GENERAL EFFECTS</b>                  Good Functional Activity                  Good Functional Activity                  Progressive but Low Ratio                  Low Impact Only                  Falls Prevention                  Trunk Extension Exercise</p>	<p><b>ACTIVITY</b>                  Walking                  Strength Training                  Swimming/                  Hydrotherapy                  Balance Activities                  Pain Management</p>	<p><b>GENERAL EFFECTS</b>                  As Pain Allows                  Progressive                  Psychological                  Well Being                  Falls Prevention                  Interferential/Tens/Heat</p>
PRECAUTIONS			PRECAUTIONS		PRECAUTIONS	
<p>Those with Joint Conditions                  Those With Pelvic Floor Problems                  Those who Cannot Perform the Activity Correctly</p>			<p>No High Impact Exercise                  Reduce Trunk Flexion                  Reduce Trunk Rotation                  especially with loading                  Avoid Lifting</p>		<p>No High Intensity Exercise                  Reduce Trunk Flexion                  Reduce Trunk Rotation                  especially with loading                  Avoid Lifting</p>	

## SUMMARY OF DIETARY ADVICE FOR PREVENTION OF OSTEOPOROSIS

A healthy diet at all stages of life is essential for prevention of osteoporosis. Calcium and vitamin D are two nutrients of particular importance for healthy bones.

<p style="text-align: center;"><b>CALCIUM</b></p> <ul style="list-style-type: none"> <li>• Adult requirement 700 mg/day</li> <li>• Requirement is increased in adolescence and during lactation</li> <li>• Aim for 1 pint milk or equivalent daily</li> <li>• 1/3 pint milk = 1 pot yoghurt = 1 oz cheese</li> <li>• Low fat dairy products suitable from age 5+ but skimmed milk <b>not</b> suitable for under 5s</li> <li>• Calcium also found in:           <ul style="list-style-type: none"> <li>⇒ fish with bones</li> <li>⇒ wheaten, soda and white bread and flour</li> <li>⇒ nuts, dried fruit and pulses</li> <li>⇒ green leafy vegetables</li> <li>⇒ fortified soya milk</li> </ul> </li> </ul> <p>Calcium from diary products is easier to absorb</p>	<p style="text-align: center;"><b>CALCIUM CONTENT OF SOME FOODS</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="text-align: right; width: 20%;">Calcium (mg)</th> </tr> </thead> <tbody> <tr><td>Milk (whole) 1/3 pint (200ml)</td><td style="text-align: right;">230</td></tr> <tr><td>Milk (semi-skimmed) 1/3 pint (200ml)</td><td style="text-align: right;">240</td></tr> <tr><td>Milk (skimmed) 1/3 pint (200ml)</td><td style="text-align: right;">240</td></tr> <tr><td>Fruit yoghurt 1 pot (125g)</td><td style="text-align: right;">200</td></tr> <tr><td>Cheddar cheese 1oz (28g)</td><td style="text-align: right;">224</td></tr> <tr><td>Cheese – 1 slice</td><td style="text-align: right;">119</td></tr> <tr><td>Cheese spread – 1 triangle</td><td style="text-align: right;">71</td></tr> </tbody> </table> <hr/> <p style="text-align: center;"><b>OTHER SOURCES</b></p> <table style="width: 100%; border-collapse: collapse;"> <tbody> <tr><td>Cabbage (cooked) 4oz (112g)</td><td style="text-align: right;">59</td></tr> <tr><td>Spring greens (cooked) 4oz (112g)</td><td style="text-align: right;">34</td></tr> <tr><td>Broccoli – 3 1/2oz (100g)</td><td style="text-align: right;">76</td></tr> <tr><td>Baked Beans – small tin</td><td style="text-align: right;">95</td></tr> <tr><td>White bread – 1 round</td><td style="text-align: right;">30</td></tr> <tr><td>Soda bread – 1 slice</td><td style="text-align: right;">84</td></tr> <tr><td>Wheaten bread – 1 slice</td><td style="text-align: right;">70</td></tr> <tr><td>Muesli – 2 oz (56g)</td><td style="text-align: right;">112</td></tr> <tr><td>Porridge (made with milk) – 1 bowl</td><td style="text-align: right;">216</td></tr> <tr><td>Salmon (tinned) – 2oz (56g)</td><td style="text-align: right;">52</td></tr> <tr><td>Sardines (tinned) – 2oz (56g)</td><td style="text-align: right;">258</td></tr> <tr><td>Almonds – 2oz (56g)</td><td style="text-align: right;">140</td></tr> <tr><td>Dairy ice-cream – 1 scoop</td><td style="text-align: right;">78</td></tr> <tr><td>Milk chocolate – 1 small bar</td><td style="text-align: right;">108</td></tr> <tr><td>Soya milk (fortified) – 1/3 pint (200ml)</td><td style="text-align: right;">230</td></tr> </tbody> </table>		Calcium (mg)	Milk (whole) 1/3 pint (200ml)	230	Milk (semi-skimmed) 1/3 pint (200ml)	240	Milk (skimmed) 1/3 pint (200ml)	240	Fruit yoghurt 1 pot (125g)	200	Cheddar cheese 1oz (28g)	224	Cheese – 1 slice	119	Cheese spread – 1 triangle	71	Cabbage (cooked) 4oz (112g)	59	Spring greens (cooked) 4oz (112g)	34	Broccoli – 3 1/2oz (100g)	76	Baked Beans – small tin	95	White bread – 1 round	30	Soda bread – 1 slice	84	Wheaten bread – 1 slice	70	Muesli – 2 oz (56g)	112	Porridge (made with milk) – 1 bowl	216	Salmon (tinned) – 2oz (56g)	52	Sardines (tinned) – 2oz (56g)	258	Almonds – 2oz (56g)	140	Dairy ice-cream – 1 scoop	78	Milk chocolate – 1 small bar	108	Soya milk (fortified) – 1/3 pint (200ml)	230	<p style="text-align: center;"><b>VITAMIN D</b></p> <ul style="list-style-type: none"> <li>• Sunlight is most important source</li> <li>• Ageing reduces absorption of sunlight</li> <li>• Food source of vitamin D include:           <ul style="list-style-type: none"> <li>⇒ Margarine and spreads</li> <li>⇒ Fish oils and oily fish</li> <li>⇒ Egg yolks</li> <li>⇒ Fortified foods</li> </ul> </li> </ul> <hr/> <p style="text-align: center;"><b>INTAKE MAY BE LOW IN:</b></p> <ul style="list-style-type: none"> <li>• Infants – supplement breastfed infants with vitamin D from 6 months</li> <li>• Pre-school 1-5 years</li> <li>• Ethnic groups</li> <li>• Residents of Mental Health Institutions</li> <li>• Pureed diets</li> <li>• Older people</li> </ul> <hr/> <p style="text-align: center;"><b>OTHER DIETARY INFLUENCES:</b></p> <ul style="list-style-type: none"> <li>• Protein – supplement malnourished elderly with hip fracture</li> <li>• Trace elements – may be low in malabsorption</li> <li>• Alcohol – follow guidelines – men 3-4 units/day, women 2-3 units/day</li> <li>• Caffeine – may interfere with bone regeneration</li> <li>• Phylates and osylates – excess may reduce calcium absorption</li> </ul>
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<p style="text-align: center;"><b>CALCIUM INTAKE MAY BE LOW IN:</b></p> <ul style="list-style-type: none"> <li>⇒ adolescents</li> <li>⇒ sports people</li> <li>⇒ vegan diets</li> <li>⇒ malabsorption</li> <li>⇒ supplementation may be necessary in eg coeliac disease, lactose intolerance</li> </ul>																																																

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## 1.0 INTRODUCTION

### 1.1 Definition

The internationally agreed definition of osteoporosis is:

*A progressive systemic skeletal disease characterised by low bone mass and micro-architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture. (World Health Organisation 1994).* Osteoporosis is a significant cause of morbidity and disability and can result in patients experiencing vertebral deformity, limitation of height and limitations in daily activities.

### 1.2 Size of the Problem

In many Western countries the remaining lifetime risk of a hip fracture in white women at the age of the menopause is approximately 14%. The current cost of hip fractures in Northern Ireland for the 1623 fractures in 1997 was £19.5 million, an estimated cost of £12,000 per fracture.

Total numbers of hip fractures in Northern Ireland in the following years were:

YEAR	NO. OF FRACTURES
1985	1100
1991	1294
1994	1475
1997	1623

Source: Beringer et al (personal communication)

It is estimated that 90% of these fractures are osteoporosis related.

The risk for other common types of osteoporotic fracture is nearly as high, so the combined risk is 30-40%. ***Thus, more than one third of adult women will sustain one or more osteoporotic fractures in their lifetime.***

The remaining lifetime risk of symptomatic fracture for a fifty-year-old white man in the UK has been estimated to be 2% for the forearm, 2% for the vertebrae and 3% for the femoral neck. Currently about 15% of symptomatic vertebral fractures and 20% of hip fractures occur in men and cause significant morbidity and excess mortality. ***Thus, more than 1 in 12 adult men will sustain an osteoporotic fracture in their lifetime***

## **2.0 TARGETING PREVENTION OF OSTEOPOROSIS**

Strategies for the prevention or treatment of osteoporosis include:

- population- based strategies; and
- those targeted to individuals at high risk ('high-risk strategy').

### **2.1 Population wide approach**

Approaches to decreasing fracture risk for the population include the following modifications of lifestyle:

Ensuring an adequate diet including calcium and Vitamin D;  
Increasing the level of physical activity undertaken at all ages, especially weight bearing exercise;  
Reducing the prevalence of smoking; and  
Ensuring alcohol intake is within national agreed limits.

These risk factors are associated with osteoporosis and are important causes of morbidity and mortality in general, but there is little evidence (positive or negative) about the effect on fracture risk of interventions aimed at changing these behaviours.

**The importance of early prevention commencing in childhood by means of adequate diet and regular exercise is emphasised.**

### **2.2 Selective case finding**

In addition to promoting lifestyle changes, an approach to finding and treating those who are already at risk from osteoporosis and those already with the disorder (with or without a fragility fracture) should be identified, ie a 'high risk strategy'.

At present there is no universally accepted policy for screening to identify patients with osteoporosis. With the recognition that factors in addition to BMD can be measured, it is possible that screening strategies might be developed in the future. In their absence, a case-finding strategy is recommended (grade C )

where patients are identified because of the presence of a fragility fracture or by the presence of strong risk factors. The use of risk factors that add information on fracture risk independently of BMD improves the predictive value of the assessment.

### **2.3 Who is at risk?**

Referral for assessment of BMD may be considered where assessment would influence management. Case finding may occur in both primary and secondary care. The following table (Table 1) presents those at increased risk of osteoporosis and therefore of fracture.

**Table 1**

**Indications for the diagnostic use of bone densitometry**

<b>TARGET GROUP</b>	<b>REASON FOR REFERRAL</b>
1. Presence of strong risk factors (a) Oestrogen deficiency: – Premature menopause (age < 45 years) – Prolonged secondary amenorrhoea (> 1year) – Primary hypogonadism in women (b) Primary or secondary hypogonadism in men (c) Corticosteroid therapy: – Prednisolone > 7.5mg/day for 6/12 or more (d) Maternal family history of hip fracture (e) Low body mass index (< 19 kg/m <sup>2</sup> ) (f) Other disorders associated with osteoporosis: Anorexia nervosa Malabsorption syndromes Primary hyperparathyroidism Post-transplantation Chronic renal failure Chronic liver disease Hyperthyroidism Prolonged immobilisation Cushing’s syndrome	HRT contraindicated and in those who are uncertain about or do not wish to take HRT  Assess bone density to decide need for treatment  “ “ “
2. Radiographic evidence of osteopenia and/or vertebral deformity	“
3. Previous fragility fracture, particularly of the hip, spine or wrist*	“
4. Loss of height, thoracic kyphosis (after radiographic confirmation of vertebral deformities)	“

**NOTE**

1. There is no scientific evidence to support mass screening, of asymptomatic individuals including menopausal females.
2. Scan only if result will influence management.  
 \*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.
3. To monitor treatment – consider scan at 2 yearly intervals.
4. Patients with renal failure and those in whom steroid therapy is being prescribed should be considered for an early scan.



## **2.4 Bone Mineral Density Measurements (DXA Scan)**

Dual energy Xray absorptiometry (DXA) uses x-rays to measure BMD (bone mineral density) at the forearm, hip, and spine. BMD has high specificity but low sensitivity. This means that a negative test (the absence of osteoporosis) indicates a very low risk of future fracture.

The risk of fracture increases more than 2.5 times for each standard deviation decrease in hip BMD. Lumbar spine measurements may be falsely high if the patient has spinal osteophytes, crush fractures, scoliosis, sclerotic processes or aortic calcification. This is, however, the preferred site for monitoring treatment.

## **2.5 Interpreting DXA results**

DXA scans are reported as T scores (comparison with young adult mean) and Z scores (comparison with reference values of the same age). The T score relates to the absolute fracture risk, whereas the Z score relates to the relative risk for their age. In patients over the age of 70, Z score should be used in preference to T score. The table (Table 2) below shows a simple classification of DXA results and guidance for management.

A full clinical appraisal is important if the results of DXA scan are to be interpreted (this is of particular importance in Corticosteroid Induced Osteoporosis (CIO)).

**Table 2**

**Classification of DXA Scan Results and Guidance for Management**

<b>T-score</b>	<b>Fracture risk</b>	<b>Action</b>
Normal T > - 1.0	Low	Lifestyle advice
Low bone mass (osteopenia) T - 1.0 to - 2.5	Above average	Lifestyle advice. HRT therapy (especially women 50-60 years). SERMs/bisphosphonates Calcium and Vitamin D supplementation, if current intake inadequate.
Osteoporosis T < - 2.5	High	Lifestyle advice. Treat :- HRT/bisphosphonates/ SERMs/calcitonin and calcium and vitamin supplementation or Calcitriol
Established Osteoporosis T < - 2.5 and one or more fractures	Very high	Lifestyle advice. Pain control. Exclude secondary causes. Treat :- HRT/bisphosphonates/ SERMS/calcitonin and Calcium and Vitamin D supplementation or Calcitriol. Consider referral.

## **2.6 Quantitative Ultrasound (QUS)**

QUS uses ultrasound not ionising radiation and measurement is usually at the heel. It is relatively inexpensive and portable and has been shown in prospective studies to be a fairly good predictor of future fracture risk and should be used in conjunction with other risk factors. It does not diagnose osteoporosis nor can it be used to monitor therapy. The T-scores used to diagnose osteoporosis by DXA are not applicable to QUS. Those with a low QUS measurement should either be referred for DXA measurement or be advised of preventative therapy if other risk factors are present.

There is presently concern about increasing use of QUS measurements in low risk groups for profit, without adequate training or quality control.

## **2.7 Pharmacological and Non Pharmacological Interventions in Prevention of Osteoporosis**

Although the precise role of lifestyle factors in the prevention of osteoporosis is conjectural, all patients should be advised to modify lifestyle:

Ensure diet has adequate calcium and vitamin D. Requirements may be raised in some individuals e.g. frail elderly and some ethnic groups;

Regular weight bearing exercise;

Stop smoking; and

Avoid excessive alcohol consumption.

***See Appendix 1 for calcium intake figures.***

Recommendations concerning interventions for the prevention of osteoporosis, and the grade of these recommendations are summarised in the following table, which is based on a systematic literature review.

**Table 3**

**Interventions for prevention of osteoporosis**

<b>Intervention</b>	<b>Increases BMD</b>	<b>Vertebral Fracture Decreased</b>	<b>Hip Fracture Decreased</b>
Exercise	A	B	B
Pharmacological Calcium (+/-Vitamin D)	A	B	B
Dietary Calcium	B	B	B
Smoking cessation	B	B	B
Reduced alcohol consumption	C	C	B
Oestrogen	A	B	B
Tibolone	A	B	B
Raloxifene	A	A	-
Etidronate	A	-	-
Alendronate/Risedronate	A	-	-

**2.7.1 Hormone Replacement Therapy(HRT)**

HRT is the preferred treatment for the management of menopausal symptoms (grade A). Where indicated, it is considered first line intervention for the prevention of osteoporosis. HRT with or without opposed oestrogen prevents bone loss in women in osteoporosis (level 1b) and decreases the risk of fragility fractures (level 1b). There is uncertainty about how to optimise the balance of risk and benefit with HRT at any age, but current opinion suggests that giving HRT for periods of up to 10 years would yield significant benefit with minimal risk. Longer durations of HRT use should further increase benefit but may increase risk. It is recommended (grade C) that the risks and benefits of HRT be explained to women at the time of the menopause or later, so that an informed decision can be made concerning its use.

*For further information on risks and benefits of HRT see Appendix 3 of RCP Guidelines. [www.rcplondon.ac.uk/files/osteosummary.pdf](http://www.rcplondon.ac.uk/files/osteosummary.pdf).*

### **2.7.2 *Selective Estrogen Receptor Modulators (SERMS)***

Raloxifene has been introduced for the prevention of vertebral fractures in postmenopausal women at increased risk of osteoporosis. Both raloxifene and tamoxifen exert some oestrogenic activity on bone. Their effects on bone mineral density appear to be less complete than those of oestrogen (level 1b). Raloxifene decreases vertebral fracture risk (level 1b) and is indicated for the prevention of low trauma fractures. There is no data on extra vertebral fractures.

▼ See advice of BNF on new drugs.

### **2.7.3 *Tibolone, Bisphosphonates and Calcitonins***

These are recommended (Grade A) as alternative interventions for the prevention of osteoporosis.

## **3.0 THE TREATMENT OF OSTEOPOROSIS**

Both the prevention and treatment of osteoporosis require a coordinated approach across the primary, community and secondary sectors of health and social services. This next section focuses on the investigation of those suspected of osteoporosis and the management of established osteoporosis, both pharmacological and non pharmacological interventions.

### **3.1 Investigation of suspected osteoporosis**

The following are the general principles for the investigation of men and women with suspected osteoporosis:-

- 3.1.1 Assess general health and lifestyle factors.
- 3.1.2 Check HRT status of perimenopausal women.
- 3.1.3 Seek specialist advice for suspected secondary cause of bone loss or osteoporosis in men.
- 3.1.4 Consider Bone Mineral Density Measurement in selected patients.

## **Common diagnostic procedures used in the investigation of osteoporosis**

History and physical examination.

Blood cell count, erythrocyte sedimentation rate, serum calcium, albumin, phosphate, serum creatinine, serum TSH, alkaline phosphatase and liver transaminases.

Radiograph of lumbar and/or thoracic spinal column, if clinically indicated.

Bone mass measurement (dual- or single-energy absorptiometry), if results would change management.

These investigations may be used:

- To establish the diagnosis of osteoporosis (e.g. DXA).
- To establish the cause.
- To establish differential diagnosis (eg serum calcium and alkaline phosphatase for osteomalacia).

### **3.2 Principles of treatment of osteoporosis**

Offer advice to all on modification of lifestyle (see 2.1);

Address risk factors for falls, eg vision, walking difficulties, medication and environmental risks;

Appropriate management of low impact (fragility) fracture;

Specific pharmacological interventions (see below);

Seek specialist advice for men and for those with severe disease.

#### **3.2.1 *Pharmacological interventions in the treatment of osteoporosis***

Treatment of osteoporosis is possible by the use of agents that decrease turnover and/or increase bone mass. Lack of comparative

data makes it impossible to recommend specific treatments based on a hierarchy of evidence or clinical effectiveness.

Table 4 contains the recommendations concerning treatment of osteoporosis, and the grade of these recommendations is shown in the following table.

**Table 4**

<b>Recommendations for the treatment of osteoporosis</b>			
<b>Intervention</b>	<b>Bone Mineral Density increased</b>	<b>Vertebral fracture decreased</b>	<b>Hip fracture decreased</b>
Calcium(+ Vit D)	A	A	B
Oestrogen	A	A	B
Alendronate	A	A	A
Etidronate	A	A	B
Risedronate	A	A	A
Raloxifene	A	A	B
Calcitonin	A	A	B
Calcitriol	A	A#	C

The basis for these recommendations are contained in the RCP report at [www.rcplondon.ac.uk/files/osteosummary.pdf](http://www.rcplondon.ac.uk/files/osteosummary.pdf).

*# Inconsistent data*

With the exception of calcium, which has weaker activity than other treatment modalities, there are insufficient studies to evaluate comparative efficacy. The following paragraphs represent a summary of the evidence of each pharmacological intervention.

**Calcium and Vitamin D**

Calcium supplements of one gram or more daily decreases bone loss in women with osteoporosis (level Ia). The effects are less complete than those of HRT (level Ib) or other more specific bone protection agents. Pharmacological amounts of calcium decrease the risk of vertebral fracture (level Ib), but the effects on hip fracture are less certain (Level II).

Parenteral vitamin D (Vitamin D2 or D3) with or without supplements of calcium salts, decreases the risk of hip and other fractures in the institutionalised frail elderly (level Ib). Beneficial effects in the general community have not been demonstrated. The use of vitamin D with calcium in elderly osteoporotic women saves great resources and it is recommended that these individuals be offered such treatment (grade A).

Care should be taken to avoid over supplementation if the individual is already taking over the counter preparations e.g. cod liver oil.

### **Hormone replacement therapy**

The following is the evidence for hormone replacement therapy with or without progestogen:-

- It prevents bone loss in women with osteoporosis (level Ib).
- A single RCT has demonstrated a decrease in vertebral fracture frequency (level Ib).
- Many observational studies indicate a potential effect of HRT on hip and distal forearm fractures (level III).
- The effects of HRT on bone mass are dose dependent (level Ib).

### **Bisphosphonates (Etidronate, Alendronate and Risedronate)**

Bisphosphonates are poorly absorbed and need to be taken in the fasting state. These products can cause gastro intestinal upset. For further information see Summary of Product Characteristics. Three bisphosphonates are now licensed for use in both postmenopausal and glucocorticoid-induced osteoporosis, namely cyclic etidronate, alendronate and risedronate. Etidronate is given cyclically and intermittently with calcium, and alendronate and risedronate are given as a single daily dose without calcium included in the formulation. Alternatively, alendronate can now be prescribed as a 70mg weekly dose instead of 10mg daily for the treatment of post-menopausal osteoporosis. The optimal duration of bisphosphonate therapy has not been established.



## **SERMS – Raloxifene**

Raloxifene reduces the incidence of vertebral but not hip or other fractures. Overall bone mineral density increases by a mean of 2% but the response is variable with one third showing a decrease.

## **Calcitonin**

Currently only parenteral calcitonin is licensed for use in postmenopausal osteoporosis, in the form of calcitonin. The recommended dose is 100 IU daily and co-administration of calcium and vitamin D is recommended in daily doses of 600 mg and 400 IU respectively.

## **Calcitriol and Alfacalcidol (active vitamin D metabolites)**

These have been shown to decrease loss of bone in women with osteoporosis (level Ib). Some, but not all, studies have shown a decrease in vertebral fracture frequency (level Ib).

No protective effect has been shown for hip fracture.

### **3.2.2 *Non pharmacological interventions***

#### **Physical exercise**

Exercise regimens can be very helpful in the management of established osteoporosis. Exercise, carefully structured according to the disability of the patient, can improve well being, muscle strength and postural stability and may decrease the risk of fractures (level IIa)

See Appendix 2 for further advice on exercise.

#### **Preventing falls**

With the exception of vertebral fractures, the vast majority of fragility fractures occur after falls. Fracture prevention is feasible by treating the causes of falls or by reducing the impact of the falls. The efficiency of these approaches in a community setting is uncertain and is recommended as an important subject for further research. Hip fracture may be decreased in the elderly residents of nursing homes by the use of hip protectors.

For further advice on exercise and the prevention of falls see Appendix 2.

### **Vision**

Have regular eye tests, check that spectacles are of the correct prescription and are worn correctly.

## **3.3 Treatment of osteoporosis in men**

Treatments have been poorly evaluated in men with osteoporosis, though there is no evidence that skeletal metabolism differs fundamentally from that of women. It is recommended (grade C) that men be treated with the same range of therapeutic interventions as women.

Secondary causes of osteoporosis are commonly found amongst men, so this population requires thorough investigation (grade C).

In view of the current lack of an established treatment for osteoporosis in men, consideration should be given to referring men with osteoporosis to specialist centres, for assessment and monitoring of any empirical treatment. This is particularly appropriate in younger men or those with severe disease (grade C).

Intermittent cyclical etidronate may be useful in men with osteoporosis and vertebral fractures (grade B), whilst alendronate and risedronate may be beneficial when bone density is reduced at other sites (grade C).

Although the study results are conflicting, calcium and vitamin D supplementation may be useful, particularly in older men with osteoporosis (grade C).

In old or frail men with osteoporosis, consideration should be given to measures to decrease the risk of falling and reduce the impact of such falls (grade C).

## **4.0 TREATMENT OF FRACTURES**

### **4.1 Hip fractures**

Hip fracture patients should be operated on if possible within 24 hours, if the patient's medical condition permits, in a dedicated orthopaedic operating theatre. They should be closely supervised by an experienced anaesthetist (grade B). Prophylaxis against infection and deep vein thrombosis should be used routinely (grade B).

Collaboration between geriatricians and orthopaedic surgeons, and between the medical and non-medical disciplines concerned, should be encouraged wherever possible (grade B).

#### **4.2 Other fractures**

Surgeons, A&E staff and general practitioners should note the relevance of osteoporosis as an underlying condition, and, where appropriate, institute treatment.

### **5.0 RECOMMENDATIONS FOR HEALTH BOARDS AND OTHER COMMISSIONERS OF HEALTH CARE**

We recommend that Boards and Commissioners should recognise that osteoporosis is a significant public health issue, and ensure that it is dealt with explicitly in their local strategies for health improvement.

#### **5.1 Prevention of osteoporosis**

Boards should take account of the recommendations contained in regional strategies such as the Physical Activity Strategy, Regional Nutritional Strategy and the Smoking and Alcohol Strategies as these are relevant to osteoporosis prevention. They should ensure that the local strategies for health improvement address approaches to reducing the prevalence of avoidable risk factors for osteoporosis. In so doing the roles of both the HPSS and other agencies should be made explicit.

They should ensure that accurate up-to-date information about the effects of HRT is widely available to postmenopausal women and their professional advisers so that each woman may make an informed decision about the use of HRT.

They should put arrangements in place so that those at high risk of osteoporosis have the opportunity to receive appropriate investigation, management and advice about diet, physical activity and smoking.

#### **5.2 Diagnosis, investigation and treatment**

To facilitate implementation and monitoring of osteoporosis guidelines, Boards should ensure that these guidelines are included in the service agreements with Trusts.



Once CREST guidelines have been agreed, they should be widely disseminated and the necessary service changes should be made to allow the guidelines to be implemented. Implementation of the CREST guidelines should be evaluated.

These CREST guidelines should provide a suitable tool for carrying out local audit. Audit guidelines are presented as a separate publication.

**Table 6**

## Hormone Replacement Therapy

Type	Brand	Estrogen	Progestogen	Formulation	Bleed	Licensed Indication		Cost/28 days Oct 2000
						Prop	TX	
<i>Sequential Combined Therapy</i>	Elleste Duet	2mg	N 1mg	Tabs	M	Y		3.24
	Cyclo-progynova	2mg	L/nor 0.25mg/0.5mg	Tabs	M	Y	Y	3.34
	Nuvelle	2mg	L 75mcg	Tabs	M	Y	Y	4.59
	Trisequens	2/2/1mg	N 1mg	Tabs	M	Y		4.80
	Trisequens Forte	4/4/1mg	N 1mg	Tabs	M	Y		4.80
	Prempak-C	Conj. O 0.625, 1.25mg	N 150mcg	Tabs	M	Y		4.91
	Femoston 2/10	2mg	D 10mg	Tabs	M	Y		4.99
	Femoston 2/20	2mg	D 20mg	Tabs	M	Y		7.48
	Premique Cycle	Conj. O 0.625mg	M 10mg	Tabs	M	Y		7.54
	Tridestra	2mg	M 20mg	Tabs	Q	Y		7.66
	Evorel-Pak	50mcg	N 1mg	Patch & tab	M	Y	Y	8.45
	Femapak	80mcg	D	Patch & tab	M	Y	Y	8.45
	Estrapak	50mcg	N 1mg	Patch & tab	M	Y		9.48
	Evorel Sequi	50mcg	N 170mcg	Patch	M	Y	Y	11.00
Estracombi	50mcg	N 0.25mg	Patch	M	Y		11.14	
<i>Continuous Combined Therapy</i>	Elleste Duet Conti	2mg	N 1mg	Tabs	X	Y		5.99
	Nuvelle Continuous	2mg	N 1mg	Tabs	X	Y	Y	6.01
	Femoston Conti	1mg	D 5mg	Tabs	X	Y		7.54
	Premique	Conj. O 0.625mg	M 5mg	Tabs	X	Y		7.54
	Climesse	2mg	N 0.7mg	Tabs	X	Y		7.90
	Kliofem	2mg	N 1mg	Tabs	X	Y		8.65
	Kliovance	1mg	N 0.5mg	Tabs	X	Y		8.65
	Evorel Conti	50mcg	N 170mcg	Patch	X	Y	Y	12.90
<i>Gonadomimetic</i>	Livial		Tibolone 2.5mg	Tabs	X	Y		13.05
<i>Unopposed Oestrogen</i>	Elleste Solo	2mg		Tabs		Y		1.78
	Hormonin	O*		Tabs		Y		2.20
	Progynova	2mg		Tabs		Y		2.34
	Zumenon	2mg		Tabs		Y		2.55
	Premarin	Conj. O 0.625mg		Tabs		Y		2.70
		Conj. O 1.25mg						3.66
		Conj. O 2.5mg						3.90
	Harmogen	Oestrone 0.93mg		Tabs		Y		3.00
	Femseven	50mcg		Patch		Y		5.20
		75mcg						6.05
		100 mcg						6.30
	Estraderm MX	50 mcg		Patch		Y		5.22
		75 mcg						6.08
		100 mcg						6.31
	Elleste Solo MX	80mcg		Patch		Y		5.99
	Fematrix	80mcg		Patch		Y		6.00
	Estraderm TTS	50mcg		Patch		Y		6.23
		100mcg						7.52
	Menorest	50mcg		Tabs		Y		6.44
		75mcg						7.50
Evorel	50 mcg		Patch		Y		6.48	
	75 mcg						6.87	
	100 mcg						7.13	
Oestrogel	1.5mg		Gel		Y		7.95	

Conj O = conjugated Oestrogens  
 O\* = Oestriol/oestradiol/oestrone  
 All other oestrogen products =  
 Oestradiol

N = norethisterone  
 L = levonorgestrol  
 D = dydrogesterone  
 M = medroxyprogesterone  
 N = norgestrol

Y = yes

M = monthly bleed  
 X = no bleeding  
 Q = quarterly  
 TX = treatment  
 Prop = prophylaxis

**Table 7**

**Calcium**

**Calcium supplements**

Licensed Indication: Adjunct in Osteoporosis

Drug Name	Formulation	Daily dose	Calcium Salt	Ca <sup>2+</sup> equivalent	Vit D	Cost/ 28 days
Adcal D3	chewable tab	1 BD	Ca Carbonate	1200mg	800iu	4.20
Cacit D3	sachet	1-2 daily	Ca Carbonate	500-1000mg	440-880iu	3.65-7.30
Cacit	effervescent tabs	1-3 daily	Ca Carbonate	500-1500mg		4.02-12.03
Calceos	chewable tab	1 BD	Ca Carbonate	500-1000mg	800iu	7.46
Calcichew	chewable tab	2-3 daily	Ca Carbonate	1000-1500mg		5.50-8.25
Calcichew Forte	chewable tab	1-1.5 daily	Ca Carbonate	1000-1500mg		6.14-9.21
Calcichew D3	chewable tab	2 daily	Ca Carbonate	1000mg	400iu	8.41
Calcichew D3 Forte	chewable tab	2 daily	Ca Carbonate	1000mg	800iu	5.32
Calcidrink	sachet	1 daily	Ca Carbonate	1000mg		7.91
Calcium-Sandoz	syrup	55-75ml daily	Ca glubionate/ lactobionate	5940-8100mg		17.86-24.36
Ossopan 800	tabs	4-8 daily	Calcium/ phosphorus suppl.	712-1424mg		21.59-43.19
Ossopan 800	sachet	1-2 daily	Calcium/ phosphorus suppl.	712-1424mg		17.23-34.46
Ostram	sachet	1 daily	Calcium phosphate	1200mg		5.55
Sandocal 400	effervescent tabs	3-5 daily	Ca lactate gluconate/ carbonate	1200-2000mg		6.04-10.06
Sandocal 1000	effervescent tabs	1-2 daily	Ca lactate gluconate/ carbonate	1000-2000mg		6.03-12.06

**Table 8**

<b>Bisphosphonates</b>				
Drug	Brand Name	Licensed Indications	Dose	Cost/28 days
Etidronate	Didronel PMO*	Treatment of osteoporosis	400mg daily 14/7 + Cacit 1 daily 76/7	12.51
		Prevention of post-menopausal osteoporosis	as above	12.51
		Treatment & prevention of corticosteroid induced osteoporosis	as above	12.51
Risedronate	Actonel	Treatment and prevention of post-menopausal osteoporosis	5mg daily	21.83
		Maintenance or increase in bone mass in post menopausal women	5mg daily	21.83
Alendronate	Fosamax	Prevention of post-menopausal osteoporosis	5mg daily	25.69
		Treatment of post-menopausal osteoporosis	10mg daily	25.69
		Treatment & prevention of glucocorticoid induced osteoporosis ~ Postmenopausal women not on HRT ~ all others	10mg daily 5mg daily	25.69 25.69
Alendronate	Fosamax once weekly 70mg	Treatment of osteoporosis in post-menopausal women	70mg weekly	Licensed in December 2000

**Table 9**

<b>SERMS</b>				
<b>Selective Oestrogen Receptor Modulator</b>				
Drug	Brand Name	Licensed Indications	Dose	Cost/28 days
Raloxifene	Evista	Treatment and prevention of post menopausal osteoporosis	60mg daily	19.76

**Table 10**

<b>Calcitonin</b>				
Drug	Brand Name	Licensed Indications	Dose	Additional Supplements
Salcatonin	Calsynar	Post menopausal osteoporosis	100 units daily IM or SC £221.70 cost for 28 days	Patients should receive 600mg elemental Ca and 400 units vit D daily

## REFERENCES

### NATIONAL DOCUMENTS ACCESSED

OSTEOPOROSIS -- Royal College of Physicians Clinical guidelines for prevention and treatment ISBN 1 86016 079 4 and update July 2000.

Advisory Group on Osteoporosis (1994). Report to DoH London (ed. Barlow DH )

Effective Health Care Bulletin Vol 2 No 4 - Preventing falls and subsequent injury in older people.

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National Osteoporosis Society Guidelines,

Accidents, falls, fractures and osteoporosis, January 2000

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The Balance of Good Health (1994), HEA

Dietary Reference Values for Energy and Nutrients for the United Kingdom: Report 41, (1991) Committee on Medical Aspects of Food Policy

Nutrition and Bone Health with particular reference to calcium and vitamin D: Report 49, (1998) Committee on Medical Aspects of Food Policy.

### OTHER DOCUMENTS ACCESSED

- Guidelines for the prevention, investigation and treatment of osteoporosis – Southern Health and Social Services Board (unpublished)
- Ettinger B, Black DM, Mitlak BH, Knickerbocker RK, et al Reduction in vertebral fracture risk in postmenopausal women with osteoporosis treated with raloxifene: results from a 3-year randomised clinical trial. *JAMA* 1999 VOL 282; 637-645
- Kreiger et al – development and validation of the osteoporosis risk assessment instrument to facilitate selection of women for bone densitometry. *Canadian Medical Association*. 2000; 162: 1289





Information on osteoporosis, for patients and professionals, is available by contacting:

National Osteoporosis Society  
PO Box 10  
Radstock  
BATH  
BA3 3YB

Tel: 01761 471771

Fax: 01761 471104

Website: [www.nos.org.uk](http://www.nos.org.uk)

Email Address: [info@nos.org.uk](mailto:info@nos.org.uk)

Patient & Professional Helpline: 01761 472721

## Appendix 1

### ADVICE ON DIET AND EXERCISE

#### THE ROLE OF DIET IN PREVENTION OF OSTEOPOROSIS

A healthy diet is essential for the formation and maintenance of the bones. The principles of a healthy diet<sup>1</sup> are summarised below:

Lean meat, fish, chicken, eggs, pulses etc: Moderate amounts – choose lower fat versions  
 Fruit and vegetables: at least 5 portions daily

Starchy foods: bread, potatoes, pasta, rice, cereals etc: at least one portion at each meal  
 Milk and dairy products: 1 pint milk or the equivalent daily

1/3 pint milk = 1 pot yoghurt = 1 oz cheese

Fatty and sugary foods: eat these sparingly

#### Calcium

An adequate intake of calcium is essential throughout life and especially during childhood and adolescence as this is the time when bone is most actively formed.

#### UK Dietary Reference Values for calcium (mg/d (mmol/d))

	0-12 months	1-3 years	4-6 years	7-10 years	11-18 yrs M/F	19+ years	Lactation
RNI*	525 (13.1)	350 (8.8)	450 (11.3)	550 (13.8)	1000/800 (25.0/20.0)	700 (17.5)	+550 (+14.3)

SOURCE: Dietary Reference Values for Food Energy and Nutrients for the United Kingdom: Report 41, (1991) Committee on Medical Aspects of Food Policy

\* RNI: Reference Nutrient Intake

Recommendations for daily calcium intake made by the National Osteoporosis Society are higher than those made by COMA who did not consider that there was sufficient evidence to justify increasing the RNI.

One pint of milk or its equivalent (see above) provides approximately 700 mg calcium. Low fat milk and dairy products such as skimmed and semi-skimmed milk, reduced fat cheeses and low fat yoghurts are suitable sources of calcium for children over 5 and most adults. **Skimmed milk is not suitable for children under 5.**

Other sources of calcium include:

- Fish with soft bones eg tinned salmon, sardines, pilchards etc
- Wheaten and soda breads, white flour, bread and scones.
- Nuts and dried fruit
- Pulses – peas, beans and lentils
- Green leafy vegetables eg spring greens, spinach, broccoli, watercress
- soya milk fortified with calcium

Calcium is less well absorbed from these sources than from milk.

**TABLE OF CALCIUM SOURCES**

<u>CALCIUM CONTENT OF SOME FOODS</u>	
	CALCIUM (mg)
Milk (whole) 1/3 pint (200 ml)	230
Milk (semi-skimmed) 1/3 pint (200 ml)	240
Milk (skimmed) 1/3 pint (200 ml)	240
Fruit yoghurt 1 pot (125 g)	200
Cheddar cheese 1 oz (28 g)	224
Cheese – 1 slice	119
Cheese spread – 1 triangle	71
<u>OTHER SOURCES</u>	
Cabbage (cooked) 4oz (112 g)	59
Spring greens (cooked) 4oz (112 g)	34
Broccoli - 3 1/2 oz (100 g)	76
Baked beans – small tin	95
White bread – 1 round	30
Soda bread – 1 slice	84
Wheaten bread – 1 slice	70
Muesli – 2 oz (56 g)	112
Porridge (made with milk) – 1 bowl	216
Salmon (tinned) – 2 oz (56 g)	52
Sardines (tinned) – 2 oz (56 g)	258
Almonds – 2 oz (56 g)	140
Dairy ice-cream – 1 scoop	78
Milk chocolate – 1 small bar	108
Soya milk (fortified) – 1/3 pint (200 ml)	230

## Groups where calcium intake may be low

**Adolescents:** Skeletal length and density changes considerably during adolescence. However dieting is common at this age, especially among teenage girls, who may avoid milk and dairy products because they are perceived as ‘fattening’.

**Sports people:** Low calcium intakes are well documented especially among women athletes and in sports where weight is important eg jockeys, rowers, boxers, ballet dancers, gymnasts etc. Advice from an Accredited Sports Dietitian is recommended for these individuals.

**People following a vegan diet:** Soya milk, which has been fortified with calcium and B12, makes a suitable alternative to cows milk.

**Patients with malabsorption.** There may be a reduction in both nutrient intake and calcium absorption. The National Osteoporosis Society and The Coeliac Society recommend higher calcium intakes for people with coeliac disease<sup>2</sup>. This may require supplementation. Supplementation may also be advisable in lactose intolerance unless sufficient calcium from non-dairy sources eg fortified soya milk, is consumed.

## Vitamin D

An adequate intake of vitamin D is essential for the prevention of rickets and osteomalacia.

### UK Dietary Reference Values for Vitamin D (g/d)

	0-3 months	7-12 months	1-3 years	4-50 years	50+ years	Pregnancy	Lactation 0-4 month	Lactation 4+ months
RNI*	8.5	7	7	0*	10*	10	10	10

SOURCE: Dietary Reference Values for Food Energy and Nutrients for the United Kingdom: Report 41, (1991) Committee on Medical Aspects of Food Policy

\* Certain at-risk individuals or groups may require vitamin D supplementation

\*\* For the population aged 65 or more only

Sunlight is the most important source of vitamin D. In Britain, sunlight is most effective between approximately the beginning of April and mid October<sup>3</sup>. Care should be taken to guard against excessive exposure to sunlight.

**Foods rich in vitamin D include:**

- Margarine and spreads - these are fortified with vitamins A and D
- Fish oils and oily fish eg salmon, trout, sardines, mackerel, tuna, pilchards etc.
- Egg yolks
- Fortified foods such as dried skimmed milk.

**Groups where supplementation of vitamin D intake should be considered:**

- Infants - from 6 months of age (only if being breast fed, as proprietary infant formulae are already fortified).
- Toddlers and pre school children - age 1-5 years.
- Ethnic groups - where traditional practices such as the wearing of clothing which conceals the body and spending little time out of doors are maintained.
- Individuals who live in mental health institutions - exposure to sunlight may be reduced and dietary intakes inadequate.
- Those on pureed diets
- Older people. Ageing reduces the permeability of the skin to sunlight increasing the reliance on foods as a source of vitamin D. Supplements are particularly recommended for older people if ill, housebound or resident in a Nursing or Residential Home. **WARNING:** Many older people take fish oil supplements, which are rich sources of vitamin D. Care should be taken to avoid overdose.

**Other dietary influences on bone health:**

**Protein** - Undernourished elderly patients with hip fracture have an improved clinical outcome if given protein rich nutritional supplements.

**Trace elements** - Absorption of magnesium, phosphate and other components of bone may be reduced in patients with long-term malabsorption or on very restrictive diets.

**Alcohol** - Excessive alcohol intake impairs bone regeneration. The recommended limits should not be exceeded:

MEN: 3 – 4 units per day  
WOMEN: 2 – 3 units per day

**Caffeine** - Excessive amounts of caffeine may interfere with bone regeneration. Over consumption of strong coffee and soft drinks containing caffeine should be discouraged.

**Phytates and oxalates** - Phytates (found in raw, unprocessed bran and cereals) and oxalates (found in rhubarb and spinach) may reduce calcium absorption if eaten in excess. Addition of raw or unprocessed bran to the diet is no longer recommended for the prevention or cure of constipation.

## **References**

- <sup>1</sup> The Balance of Good Health, (1994), Health Education Authority
- <sup>2</sup> Osteoporosis in people with coeliac disease: recommendations. (January 2000), The National Osteoporosis Society, The Coeliac Society
- <sup>3</sup> Nutrition and Bone Health with particular reference to calcium and vitamin D: Report 49, (1998) Committee on Medical Aspects of Food Policy.

## **Appendix 2**

### **PHYSIOTHERAPY AND OSTEOPOROSIS**

The natural stimulus for bone to maintain its functional strength is the loading which results from gravitational forces and the tensions exerted by muscular activity. Exercise therefore has a role in reducing the long-term risk of developing an osteoporotic fracture. There is good evidence that site specific loading of bone through suitable physical activity produces changes in bone mass and density.

Exercise therapy also has an important role in the frail/elderly group with severe bone changes. Here the aim is to prevent further fractures by improving muscle strength, exercise tolerance, balance and therefore reducing the risk of falling. Different Physiotherapy Management is recommended for the three distinct target groups who are at different stages of the disease including those concerned with reducing the risk of developing the disease. Accurate assessment of all the aspects of impairment disability and handicap is essential. This should include an assessment of spinal mobility, strength, aerobic capacity, balance, functional assessment and paid levels.

#### **GROUP 1**

##### **Osteopenia and those concerned with reducing the risk**

High impact exercise that is skipping and jogging has the greatest potential to improve BMD in the pre-menopausal group. Strength training is useful if it is of high enough intensity as it will improve muscle strength and improve BMD. High impact exercise is suitable for those who regularly exercise, a lower impact programme of exercise for those used to regular exercise. All programmes should start at low level and be comfortable for the patients. To be effective all exercise programmes need to be progressive in terms of impact and intensity as strength levels improve.

#### **GROUP 2**

##### **Those people who have been diagnosed with osteoporosis but not yet sustained any fractures.**

In this group both with loading and strengthening activities this needs to be site specific. A high load and low repetition regime is used. Exercise in this group should be used in combination with both adequate calcium intake and preventative therapy if indicated. All exercise should start at any easy level and be progressive in terms of intensity and impact.

Precautions within this group should include to avoid:-

High impact exercise, Trunk flexion, and Trunk rotation with any loading.

### **GROUP 3**

#### **With severe osteoporotic changes**

The aim of exercise in this group is to minimise the risk of falling and therefore reduce the risk of fracture as opposed to affecting bone density. Strength training is suggested using short levers or body resistance. All exercise programmes should be progressive in terms of intensity and impact, low impact programme using gravity and body resistance exercises are generally recommended. Hydrotherapy can be of great value, there is no evidence to suggest its effect on BMD but it can effect muscle strength, aerobic capacity and pain levels. Exercise has the potential to improve dynamic stability and therefore be a role in falls prevention, this activity needs to be weight bearing. It is important to consider the frequency intensity and duration of exercise in order to maximise the positive effects on bone health. Studies have shown that weight bearing exercise with progressive increases in intensity need to be continued for nine months in order to achieve positive effect on bone density, applying the general principles of starting at easy level and progressing. The most recent approach would be more frequent bouts of moderate intensity, five by thirty minutes per week as a general guideline.

#### **THE POTENTIAL RISKS OF EXERCISE**

1. Ensure correct diagnosis as to category within osteoporosis grouping is made.
2. Fracture is the main risk within all groups
3. Ensure individuals specific exercise programme respects individual exercise tolerance levels and is progressive.
4. In osteoporotic and severe osteoporotic groups no high impact exercise should be undertaken and avoid rotational and flexion movements of the spine.

#### **PATIENT EDUCATION**

Patients must understand the implications and risks associated with osteoporosis. Lifestyle advice is important with respect to lifting and handling, diet, posture and safe exercise (there is a balance between activity and rest which must be recognised) and so individual goal setting is dependent on the severity of their condition.



## **HEALTH PROMOTION**

Physiotherapists have a professional responsibility to promote exercise strategies for bone health in all age groups. Promotion of the benefits of exercise would encourage young people to raise their physical activity levels and therefore achieve a high peak bone mass. They also aim to highlight the importance of prevention and reducing of the risks within all age groups.

## **EXAMPLES OF OPPORTUNITIES FOR SELECTIVE CASE-FINDING**

Patients at risk of osteoporosis may present in both primary and secondary care, hence the need for a collaborative approach to identify opportunities for selective case-finding and to agree subsequent management of patients. Table 5 provides some examples of opportunities for identifying some patients at high risk of osteoporosis. Audit, involving a trawl of computer records to identify relevant patients, offers a more systematic approach.

**Table 5**

**Examples of Opportunities for Selective Case-Finding**

HIGH RISK GROUP	SETTING	ACTION
Patients with history of minimal trauma fracture	Hospital Fracture Clinic: Advise fracture patients of possible osteoporosis risk and inform primary care team of need for follow-up	Warn of possible osteoporosis risk
	Encourage patient to visit GP for follow-up	Offer general lifestyle advice and NOS details
	Offer advice to patient during rehabilitation after hip fracture	Consider referral for diagnostic confirmation and/or treatment
Patients on oral corticosteroids	On initiation of corticosteroid treatment	Warn of possible osteoporosis risk
	In asthma and rheumatology clinic	Review dose of steroid
	On prescription review for patients already prescribed steroids	Offer general lifestyle advice and NOS details  Refer for densitometry and treat according to NOS Corticosteroid Guidelines
Early menopause	At follow-up after hysterectomy	Warn of possible osteoporosis risk
	Review records of women excluded from cervical smear target lists or those recorded as having a hysterectomy to confirm advice offered	Offer general lifestyle advice and NOS details  Strongly advise prescription of HRT unless contraindicated
		Refer for densitometry if it will change clinical management

## SUMMARY OF THE PREVENTION AND TREATMENT OF OSTEOPOROSIS

Identify those at possible increased risk from history/physical examination

↓

**Counsel on lifestyle modifications –**

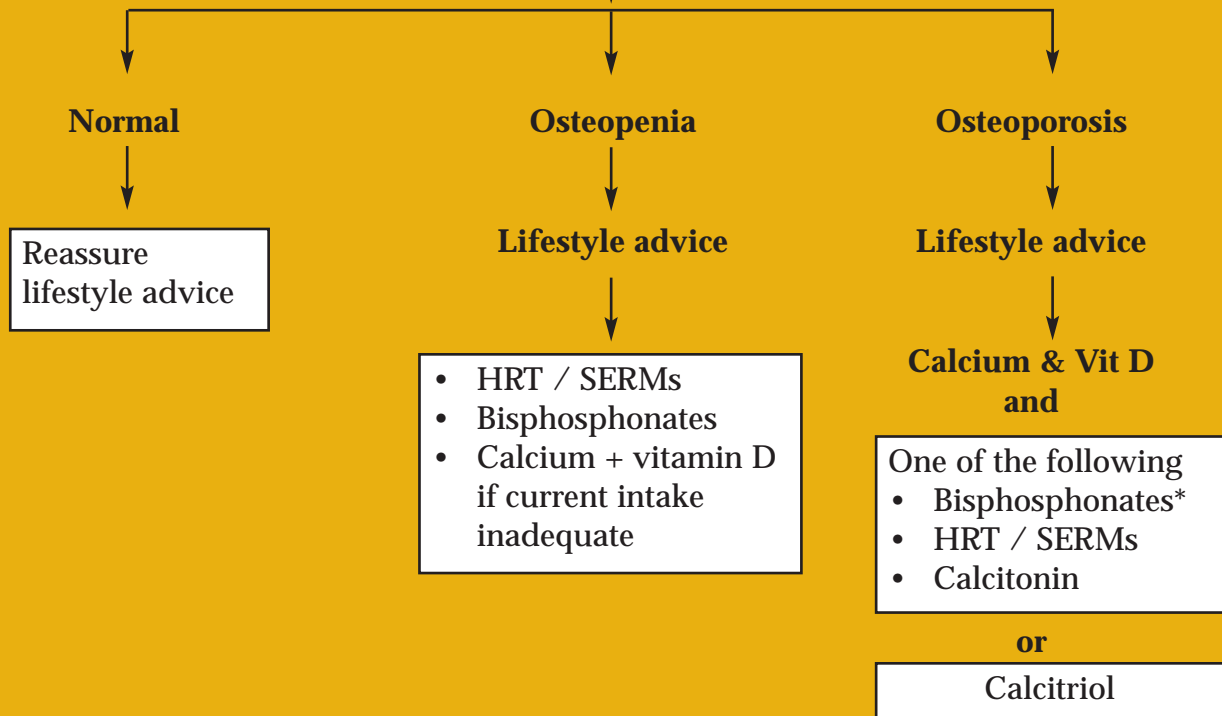
- Adequate nutrition especially with Calcium and Vitamin D
- Regular weight bearing exercise
- Avoidance of tobacco use and alcohol abuse

↓

**Counsel on risks and benefits of HRT for women at menopause**

↓

**Confirm diagnosis of osteoporosis by DXA if it will alter management, or is clinically indicated**



**\*Note: Cyclical Etidronate contains calcium carbonate**



## Indications for the diagnostic use of bone densitometry

TARGET GROUP	REASON FOR REFERRAL
<p>1. Presence of strong risk factors</p> <p>(a) Oestrogen deficiency:</p> <ul style="list-style-type: none"> <li>- Premature menopause (age &lt; 45 years)</li> <li>- Prolonged secondary amenorrhoea (&gt; 1year)</li> <li>- Primary hypogonadism in women</li> </ul> <p>(b) Primary or secondary hypogonadism in men</p> <p>(c) Corticosteroid therapy:</p> <ul style="list-style-type: none"> <li>- Prednisolone &gt; 7.5mg/day for 6/12 or more</li> </ul> <p>(d) Maternal family history of hip fracture</p> <p>(e) Low body mass index (&lt; 19 kg/m<sup>2</sup>)</p> <p>(f) Other disorders associated with osteoporosis:</p> <ul style="list-style-type: none"> <li>Anorexia nervosa</li> <li>Malabsorption syndromes</li> <li>Primary hyperparathyroidism</li> <li>Post-transplantation</li> <li>Chronic renal failure</li> <li>Chronic liver disease</li> <li>Hyperthyroidism</li> <li>Prolonged immobilisation</li> <li>Cushing's syndrome</li> </ul>	<p>HRT contraindicated and in those who are uncertain about or do not wish to take HRT</p> <p>Assess bone density to decide need for treatment</p> <p>“</p> <p>“</p> <p>“</p>
2. Radiographic evidence of osteopenia and/or vertebral deformity	“
3. Previous fragility fracture, particularly of the hip, spine or wrist*	“
4. Loss of height, thoracic kyphosis (after radiographic confirmation of vertebral deformities)	“

### NOTE

1. There is no scientific evidence to support mass screening, of asymptomatic individuals including menopausal females.
2. Scan only if result will influence management.  
\*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.
3. To monitor treatment – consider scan at 2 yearly intervals.
4. Patients with renal failure and those in whom steroid therapy is being prescribed should be considered for an early scan.

# OSTEOPOROSIS AND PHYSIOTHERAPY

## General Aims



To Improve Muscle Strength  
 To Improve Patient Posture  
 To Improve Patient Well-Being and Confidence  
 To Improve Patient Knowledge of Osteoporosis

**GROUP 1**  
**Those at Risk**  
**Aims**  
 General Aims as Listed  
 Also to Increase/Maintain Bone Mass

**GROUP 2**  
**Osteoporotic Patients who have not Sustained A Fracture**  
**Aims**  
 General Aims as Listed  
 Also to Prevent Fractures  
 To Maintain Bone Strength  
 To Reduce Falls

**GROUP 3**  
**Those With Severe Osteoporotic Changes**  
**Aims**  
 General Aims as Listed  
 Also to Prevent Further Fractures  
 To Reduce Risk of Falls  
 To Improve Balance  
 To Reduce/Control Pain

**EXERCISE MANAGEMENT**

**EXERCISE MANAGEMENT**

**EXERCISE MANAGEMENT**

ACTIVITY	EFFECTS ON BMD	GENERAL EFFECTS
Jogging	Potential to Improve BMD	Good Functional Activity
Skipping	Potential to Improve BMD	Good Aerobic Activity
Stairs	No Effect on BMD	Good Functional Activity
Cycling	No Effect on BMD	Best to Recommend
Brisk Walking	No Effect on BMD	To Over 50's
Step Aerobics		

ACTIVITY	GENERAL EFFECTS
Brisk Walking	Good Functional Activity
Stair Climbing	Good Functional Activity
Strength Training	Progressive but Low Ratio
Aerobic Activity	Low Impact Only
Balance Training	Falls Prevention
Postural Correction	Trunk Extension Exercise

ACTIVITY	GENERAL EFFECTS
Walking	As Pain Allows
Strength Training	Progressive
Swimming/	Psychological
Hydrotherapy	Well Being
Balance Activities	Falls Prevention
Pain Management	Interferential/Tens/Heat

**PRECAUTIONS**

**PRECAUTIONS**

**PRECAUTIONS**

Those with Joint Conditions  
 Those With Pelvic Floor Problems  
 Those who Cannot Perform the Activity Correctly

No High Impact Exercise  
 Reduce Trunk Flexion  
 Reduce Trunk Rotation especially with loading  
 Avoid Lifting

No High Intensity Exercise  
 Reduce Trunk Flexion  
 Reduce Trunk Rotation especially with loading  
 Avoid Lifting

## SUMMARY OF DIETARY ADVICE FOR PREVENTION OF OSTEOPOROSIS

**A healthy diet at all stages of life is essential for prevention of osteoporosis. Calcium and vitamin D are two nutrients of particular importance for healthy bones.**

### CALCIUM

- Adult requirement 700 mg/day
- Requirement is increased in adolescence and during lactation
- Aim for 1 pint milk or equivalent daily
- 1/3 pint milk = 1 pot yoghurt = 1 oz cheese
- Low fat dairy products suitable from age 5+ but skimmed milk **not** suitable for under 5s
- Calcium also found in:
  - ⇒ fish with bones
  - ⇒ wheaten, soda and white bread and flour
  - ⇒ nuts, dried fruit and pulses
  - ⇒ green leafy vegetables
  - ⇒ fortified soya milk

Calcium from diary products is easier to absorb

### CALCIUM INTAKE MAY BE LOW IN:

- ⇒ adolescents
- ⇒ sports people
- ⇒ vegan diets
- ⇒ malabsorption
- ⇒ supplementation may be necessary in eg coeliac disease, lactose intolerance

### CALCIUM CONTENT OF SOME FOODS

	Calcium (mg)
Milk (whole) 1/3 pint (200ml)	230
Milk (semi-skimmed) 1/3 pint (200ml)	240
Milk (skimmed) 1/3 pint (200ml)	240
Fruit yoghurt 1 pot (125g)	200
Cheddar cheese 1oz (28g)	224
Cheese - 1 slice	119
Cheese spread - 1 triangle	71

### OTHER SOURCES

Cabbage (cooked) 4oz (112g)	59
Spring greens (cooked) 4oz (112g)	34
Broccoli - 3 1/2oz (100g)	76
Baked Beans - small tin	95
White bread - 1 round	30
Soda bread - 1 slice	84
Wheaten bread - 1 slice	70
Muesli - 2 oz (56g)	112
Porridge (made with milk) - 1 bowl	216
Salmon (tinned) - 2oz (56g)	52
Sardines (tinned) - 2oz (56g)	258
Almonds - 2oz (56g)	140
Dairy ice-cream - 1 scoop	78
Milk chocolate - 1 small bar	108
Soya milk (fortified) - 1/3 pint (200ml)	230

### VITAMIN D

- Sunlight is most important source
- Ageing reduces absorption of sunlight
- Food source of vitamin D include:
  - ⇒ Margarine and spreads
  - ⇒ Fish oils and oily fish
  - ⇒ Egg yolks
  - ⇒ Fortified foods

### INTAKE MAY BE LOW IN:

- Infants - supplement breastfed infants with vitamin D from 6 months
- Pre-school 1-5 years
- Ethnic groups
- Residents of Mental Health Institutions
- Pureed diets
- Older people

### OTHER DIETARY INFLUENCES:

- Protein - supplement malnourished elderly with hip fracture
- Trace elements - may be low in malabsorption
- Alcohol - follow guidelines - men 3-4 units/day, women 2-3 units/day
- Caffeine - may interfere with bone regeneration
- Phylates and osylates - excess may reduce calcium absorption



## Classification of DXA Scan Results and Guidance for Management

T-score	Fracture risk	Action
Normal T >-1.0	Low	Lifestyle advice
Low bone mass (osteopenia) T-1.0 to -2.5	Above average	Lifestyle advice. HRT therapy (especially women 50-60 years). SERMs/bisphosphonates calcium and vitamin D supplementation, if current intake inadequate.
Osteoporosis T <-2.5	High	Lifestyle advice. Treat :- HRT/bisphosphonates/SERMs/calcitonin and calcium and vitamin supplementation or Calcitriol.
Established Osteoporosis T <-2.5 and one or more fractures	Very high	Lifestyle advice. Pain control. Exclude secondary causes. Treat :- HRT/bisphosphonates/SERMs/calcitonin and calcium and vitamin D supplementation or Calcitriol. Consider referral.

