Osteoporosis Care Pathway

Osteoporosis – clinical presentation

History and examination

Investigations

Fracture risk stratification (FRAX)

High risk

Go to ‘Osteoporosis management’

Intermediate risk

Assess bone mineral density (BMD)

Low risk

Prevention of osteoporosis

Reassess risk of fracture

High risk

Go to ‘Osteoporosis management’

Low risk

Prevention of osteoporosis
Pathway information

This pathway looks at:

- primary care management and indications for referral to secondary care in adults older than age 18 years
- risk assessment and investigations of osteoporosis and osteoporotic fracture, including bone mineral density (BMD) scanning
- primary and secondary prevention of osteoporosis fracture, including steroid-induced osteoporosis

Out of scope:

- secondary care management
- children younger than age 18 years

Definition:

- skeletal disorder characterised by decreased bone strength, predisposing to an increased risk of fracture
- net loss of bone and a change in the micro-architecture of the bone
- fractures commonly associated with osteoporosis involve the thoracic and lumbar spine, distal radius, and proximal femur
- osteoporotic fractures occur with minimal or no trauma

Incidence and prevalence:

- affects one in three women and one in twelve men age 50 years and over [1]
- estimated to affect more than 2 million women in England and Wales [2,3]
- prevalence increases with age, from approximately 2% at age 50 years, to more than 25% at age 80 years [2,3]
- in Scotland, there are over 20,000 cases of osteoporotic fractures annually [1]

Risk factors:

- prior fragility fractures
- history of previous fracture
- parental history of hip fracture
- current tobacco smoking
- long-term use of oral glucocorticoids
- rheumatoid arthritis (RA)
- daily alcohol use of three or more units
- advanced age (age 65 years or older)
- weight less than 127 pounds or body mass index (BMI) less than or equal to 20
- hypogonadism
- sedentary lifestyle
- diet deficient in calcium or vitamin D
• increased likelihood of falling
• secondary cause, eg:
  o renal insufficiency or failure
  o genetic diseases
  o immobilisation
  o anorexia nervosa
• female sex
• early menopause
• family history of osteoporosis, brittle bones, kyphosis, or low trauma fracture after age 50 years of age
• white people
• estrogen deficiency
• immobilisation
• amenorrhoea lasting longer than 6 months before age 45 years

References:


Resources for patients & carers

Osteoporosis Resources for Primary Care This osteoporosis resource is a joint initiative of the Royal College of General Practitioners and the National Osteoporosis Society. Its aim is to equip GPs, practice nurses and other members of the practice team with relevant information about osteoporosis in light of its recent inclusion in the
Osteoporosis clinical presentation

- **Guideline for Osteoporosis in Worcestershire.**

Osteoporosis is a silent disease until complicated by minimal trauma fractures [6].

Through early diagnosis and treatment, osteoporosis and its associated fractures can be prevented; this is termed primary prevention [6].

Even after the first fracture has occurred, effective treatments exist to decrease the likelihood of further fractures; this is termed secondary prevention [6]. Patients who have suffered one or more fragility fractures are top priority for investigation and treatment of osteoporosis [1].

Most common osteoporotic fractures [6]:

- thoracic and lumbar vertebrae
- proximal femur
- distal radius

Sequelaes of fractures include [6]:

- psychological symptoms – depression, loss of self-esteem, anxiety, fear
- hip fracture:
  - 10-20% excess mortality within one year
  - 2.5 fold increase in future fracture risk
  - 20% require long-term nursing care
  - only 40% fully return to pre-fracture independence level
- vertebral fractures:
  - increased mortality
  - back pain, height loss, and kyphosis
  - loss of height or new kyphosis without pain can indicate painless vertebral fractures [1]
  - multiple vertebral fractures may lead to restrictive lung disease
- wrist fractures:
  - less globally disabling
  - interfere with activities of daily living

**History and examination**
• **Guideline for Osteoporosis in Worcestershire.**

The aims of the clinical history, physical examination, and clinical tests are to [5]:

• exclude diseases that mimic osteoporosis, eg osteomalacia, myeloma
• identify the cause of osteoporosis and contributory factors
• assess the risk of subsequent fractures
• select the most appropriate form of treatment

Enquire about clinical risk factors used to assess fracture probability:

• age [1,5]:
  o as age increases, bone mineral density decreases leading to an increased osteoporosis risk [1]
  o osteoporosis prevalence increases significantly with each decade after age 60 years [1]
• sex [1,5]:
  o women have increased risk of osteoporosis due to lower total bone mass [1]
  o women lose bone more quickly following the menopause – the earlier the menopause, the higher the risk [1]
  o bone mineral density decreases most rapidly in the early postmenopausal years [1]
  o osteoporosis is less common in men [1]
• low weight and thin body habitus [1,5]:
  o weight loss or low body mass index (BMI) (less than 19kg/m²) [5] is an indicator of lower bone mass density [1]
  o post menopausal women with below average BMI have an increased risk of osteoporosis [1]
• previous fragility fractures, particularly of the wrist, hip, and spine [5]
• parental history of hip fracture [5]:
  o use of family history in assessing risk of osteoporosis should include maternal, paternal, and sororal history [1]
  o a positive family history is defined as a history of osteoporosis, kyphosis, or low trauma fracture after age 50 years [1]
• current glucocorticoid treatment for 3 months or longer [1,5]
• smoking history [1,5] – smokers are at greater risk than non-smokers and should be advised to stop [1]
• alcohol intake greater than 3 units/day [1,5]
• secondary causes:
  o rheumatoid arthritis [1,5]
  o untreated hypogonadism in men and women [1,5]
  o prolonged immobility [5]
  o organ transplantation [5]
  o type I diabetes [5]
  o hyperthyroidism [5]
  o gastrointestinal disease [1,5]
  o chronic liver disease [1,5]
- chronic obstructive pulmonary disease [5]
- anorexia nervosa [1]
- hyperparathyroidism [1]
- renal disease [1]
- vitamin D deficiency [1]

Enquire about lifestyle factors [6]:

- low calcium
- high caffeine intake
- high salt intake
- inadequate physical activity/immobilisation
- alcoholism

Enquire about causative medications [6]:

- glucocorticoids
- anticoagulants
- anticonvulsants
- lithium
- chemotherapy and immunosuppressants, eg tacrolimus, cyclosporine A

Complete a falls assessment [6]:

- environmental risk factors
- medical risk factors
- muscle weakness
- gait and balance disorders
- visual deficits

Enquire about associated endocrine disorders [6]:

- thyrotoxicosis
- diabetes mellitus (DM)
- adrenal insufficiency
- Cushing’s syndrome
- hyperparathyroidism

Enquire about associated gastrointestinal disorders [6]:

- coeliac
- inflammatory bowel disease
- malabsorption
- pancreatic insufficiency

Enquire about associated haematological disorders [6]:

- multiple myeloma
- sickle cell disease
- thalassaemia

Enquire about associated rheumatological disorders [6]:
- ankylosing spondylitis
- systemic lupus erythematosus (SLE)

Enquire about possible hypogonadal states [6]:
- anorexia nervosa and bulimia
- athletic amenorrhoea
- premature ovarian failure – women with an early menopause have a higher risk of osteoporosis than others at a similar age [1]
- hyperprolactinaemia
- Turner’s and Klinefelter’s syndrome

Enquire about other associated diseases [6]:
- end stage renal disease
- epilepsy

Perform a full medical examination:
- to measure patient’s body mass index (BMI)
- to elicit signs of possible secondary causes of osteoporosis
- to elicit any visual deficits
- to elicit any kyphosis, gait /imbalance, proprioceptive, muscle strength deficits

**Investigations**

- [Guideline for Osteoporosis in Worcestershire.](#)

Consider the following for all patients with osteoporosis [5]:

- full blood count (FBC)
- erythrocyte sedimentation rate (ESR) or C-reactive protein (CRP)
- biochemical profile to assess:
  - serum calcium:
    - elevated in hyperparathyroidism
    - decreased in malabsorption, vitamin D deficiency
    - alkaline phosphatase – elevated in Paget’s disease, prolonged immobilisation, acute fractures, and other bone diseases
  - phosphate – decreased in osteomalacia
  - albumin
  - creatinine – bisphosphonates are contraindicated in renal failure
  - liver transaminases
Consider the following tests where clinically indicated [5]:

- **vertebral fracture assessment (VFA):**
  - indicated when there is a pretest probability that a vertebral fracture will be found that will influence management
  - may be lateral radiographs of lumbar and thoracic spine, or DXA-based vertebral imaging
- **sex hormone profile in men:**
  - serum testosterone
  - sex hormone-binding globulin (SHBG)
  - follicle-stimulating hormone (FSH)
  - luteinising hormone (LH)
- **myeloma screen:**
  - serum and urine protein electrophoresis
  - urinary Bence-Jones proteins
  - serum prolactin
- **24 hour urinary cortisol/dexamethasone suppression test**
- **endomysial and/or tissue transglutaminase antibodies to test for coeliac disease**
- **isotope bone scan**
- **urinary calcium excretion**

### Fracture Risk Stratification (FRAX)

- **FRAX tool**

Fracture risk should be assessed in [5]:

- **men age 50 years or more (with or without fracture) but with a World Health Organisation (WHO) risk factor, as listed below, or a body mass index (BMI) less than 19kg/m\(^2\)**

- **all postmenopausal women without fracture but with a WHO risk factor or a BMI less than 19kg/m\(^2\)**

Fracture risk need not always need to be assessed in postmenopausal women with a prior fragility fracture [5]:

- they should be considered for treatment without the need for further risk assessment
- bone mineral density (BMD) measurements may however be appropriate in younger postmenopausal women
The **FRAX tool** for the assessment of fracture risk integrates clinical risk factors, with or without femoral neck BMD, to calculate the 10-year probability of a major osteoporotic fracture (clinical spine, hip, forearm, or proximal humerus) and hip fracture [5].

The following risk factors from the WHO Fracture risk assessment model are used:

- age
- sex
- low BMI – less than 19kg/m²
- previous fragility fractures, particularly of the wrist, hip, and spine, occurring spontaneously or following low trauma
- parental history of hip fracture
- current glucocorticoid treatment – 3 months or longer at a daily dose of 5mg prednisolone daily
- current smoker
- alcohol intake – 3 or more units/day
- rheumatoid arthritis
- secondary causes:
  - untreated hypogonadism or premature ovarian failure
  - type I diabetes
  - untreated hyperthyroidism
  - gastrointestinal disease – malnutrition or malabsorption
  - chronic liver disease
  - osteogenesis imperfect in adults

Following the assessment of fracture risk using FRAX, the patient may be classified as low, intermediate, or high risk [5].

**High risk**

In those deemed high risk, consider treatment without the need for bone mineral density (BMD) measurement, although this may sometimes be appropriate, particularly in younger postmenopausal women [5].

NB: This includes postmenopausal women with a prior fragility fracture [5].

**Intermediate risk**

Measure bone mineral density (BMD) [5].

**Low risk**

Reassure and reassess in 5 years or less depending on the clinical context [5].

**Assess Bone Mineral Density (BMD)**
- Bone Densitometry Unit contact details: Tuesday - Thursday 8am - 4.30pm Tel: 01905 760419 (internal 30302)
- ICE online request form (Login required)
- DEXA referral form
- Birmingham Children’s Hospital contact details

The CT scanners across the county no longer have the Bone Density software package so they are no longer able to do CT bone density scans. Therefore children (under 17) need to be referred to Birmingham Children's Hospital and those who are 18 - 20 will need to be referred to the Queen Elizabeth Hospital. For referrals liaise with secondary care.

Measurement of bone mineral density (BMD) can be used to [5]:

- diagnose osteoporosis
- monitor of treatment
- determine the extent of bone loss
- assess suitability of certain therapies

Assess BMD with dual energy X-ray absorptiometry (DEXA) scan [1,5]:

- **DEXA is only available at Worcester. Please let Densitometry Unit know of any patient mobility issues.**
- Weight limit for Worcester DEXA scanner is 23 Stones (146 kg)
- The DEXA scanner has the necessary software to do children but for the machine to calculate the correct findings the staff would need to know the child’s skeletal/pubertal age. This is often only available from paediatricians and hence the patient is sent to Birmingham Children’s Hospital
- can measure BMD at the spine, hip, forearm, and in the total body [1]
- it is not possible to exclude diagnosis on the basis of a DEXA measurement at only one site [1]
- BMD should normally be measured by DEXA at two sites, the anteroposterior spine and hip [1]
- the spine is preferred for monitoring of treatment [1]
- the hip provides best prediction of hip fracture risk [1]
- it is normal to perform both hip and spine scan at same visit [1]
- reassure patient that radiation dose is extremely small [1]

Diagnosis of osteoporosis is based on:

- DEXA scan T-score [1-3,5]:
  - normal – T-score greater than or equal to -1
  - Osteopenia – T-score between -1 and -2.5
  - osteoporosis – T-score less than or equal to -2.5
- following a DEXA scan of the hip, the annual hip fracture risk (or 10 year fracture risk) should be included in the DEXA report [1]
- patients with T-score between 0 and -1.5 need repeat dual energy X-ray absorptiometry (DEXA) assessment every 1-3 years
- conventional radiographs should not be used for the diagnosis or exclusion of osteoporosis [1]

NB: A diagnosis of osteoporosis can be assumed in women age 75 years or older if a DXA scan is clinically inappropriate or unfeasible [2,3].

**Prevention of osteoporosis**

Public Health web pages, including contact details for Worcestershire Healthy Living Hub (available Mon. - Fri. 8 a.m. to 8 p.m. & Sat. 9 a.m. to 5 p.m.) for referral to all local healthy living services including exercise, smoking and alcohol services

**Smoking**

- [NHS Smokefree website](#)
- [Worcestershire Public Health Stop Smoking web pages](#)

Health care professionals needing clinical advice can contact

**Victoria Moulston**  
Health Improvement Practitioner (Smoking Cessation)  
Public Health Department  
NHS Worcestershire  
Pavilion B Zero  
County Hall  
Spetchley Road  
Worcester  
WR5 2NP  
Direct Line - 01905 733153  
Internal - 37198

**Alcohol**

- [Worcestershire Pathways to recovery Leaflet](#)  
- [Alcoholics Anonymous](#)  
- [NHS Choices Alcohol](#)  
- Drinkline: 0800 9178282 (National drink helpline)  
- [Traffic light drink calculator](#)

**Offer lifestyle advice:**

- Encourage a healthy diet  
- body mass index (BMI) less than 20 is a strong risk factor for osteoporosis [1]  
- maintain a healthy body weight (BMI between 20 and 25) [1]

**Exercises:** (From 'Guidelines for Osteoporosis in Worcestershire')
Bones, like muscles, become weaker if not exercised. Regular weight bearing exercise can improve bone density and reduce fracture risk. (Wolf I, 1999). Exercise can also improve balance and co-ordination, strength and flexibility all of which decrease the risk of falls and hence the risk of fracture.

Because of the varying degrees of osteoporosis and the risk of fracture certain flexibility exercises, strength training and weight bearing aerobic exercise may be unsuitable.

Three types of exercise are recommended (CSP, 2001):

1) Flexibility exercises such as stretching to improve posture (Kelley G, 1998).

These can help to reduce harmful stress on bones and maintain bone density.

2) Strength training including resistance training with weights (Kerr D, 1996).

To be most effective these should be site specific, of sufficient intensity, progressive and low repetition.

3) Weight bearing aerobic exercises (Bassey EJ, 1995).

- Generally, in pre-menopausal women without a diagnosis of osteoporosis high impact exercise such as skipping, jogging and jumping has the greatest potential to improve BMD.
- For those not used to exercising and those over 50 years of age, low to medium impact exercise, such as step aerobics, intermittent jogging, brisk walking is more appropriate.
- In those patients with a diagnosis of osteoporosis stair climbing, low impact aerobics, line dancing, and Tai Chi will improve balance and strength. High impact exercises, high impact aerobics, sharp reflex actions e.g. squash, badminton and exercise which involves excessive forward bending should be avoided. These activities increase compression in the spine and lower extremities and can lead to fractures in weakened bones. Swimming and cycling are non-weight bearing exercises and therefore do not increase bone density. However, they improve fitness levels and joint mobility which allows weight bearing exercises to be performed more effectively.

**Alcohol restriction** – discourage excessive alcohol intake [6]

- ensure adequate calcium intake – postmenopausal women should maintain intake of at least 1,000mg calcium per day, whether through diet or supplements [1,5]
- ensure adequate vitamin D intake – consider supplements to meet daily requirements, eg 800IU vitamin D daily supplement [1,5]
- avoid excessive dieting and exercise resulting in amenorrhoea
- falls prevention [5,6]
Reassess risk of fracture

**FRAX tool**

Consider referral to geriatrician, Rheumatology or Endocrinology as appropriate

- **Geriatrician contact details**: via switchboard 01905 760760
- **Rheumatology contact details**: Highfield Unit 01905 760296 (direct line) or internal ext. 33471
- **Endocrinology contact details**: 01905 760780 (direct line) or internal ext. 33811

Recalculate the fracture risk to determine whether an individual's risk lies above or below the intervention threshold [5].

Men and women with restratified risks above the intervention threshold should be treated [5].

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