



OSTEOPOROSIS AND BONE MINERAL DENSITY (BMD)

- 'Osteoporosis is characterised by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in the risk of fracture' [1](#)
- The World Health Organization (WHO) has designated the first decade of the 21st century, as the 'Decade of Bone and Joint Diseases' recognising the importance of Osteoporosis as a public health issue [2](#)
- The cost to Australian Economy of Osteoporosis is estimated to be \$7.4 billion dollars per year [4](#)
- Osteoporosis is often described as a 'silent disease', with the radiological prevalence of the disease far in excess of diagnosis and active treatment to prevent further bone loss and future fracture
- Risk Factors associated with osteoporosis [4](#)
 - Increasing age
 - Menopause
 - Family history of osteoporosis
 - Previous low trauma fracture - A recent study that followed patients after an initial low fragility fracture, demonstrated a Relative Risk (RR) for women of 1.97 (95% CI 1.7-2.26) and men 3.47 (95%CI 2.69-4.48) during the trial [11](#)



- Low calcium intake
- Low body weight (BMI <20)
- Eating disorders
- Immobilisation
- Lifestyle factors (smoking, alcohol or lack of exercise)

INDICATIONS FOR DEXA (DUAL X-RAY ABSORPTIOMETRY)

- The main high risk groups for whom BMD measurement should be considered include: [1](#)
 1. History of minimal traumatic fracture (especially hip and spine fractures)
 2. Premature menopause in females
 3. Conditions or therapy associated with glucocorticoid excess
 4. Established secondary causes such as hypogonadism, hyperparathyroidism, thyrotoxicosis, chronic renal failure, myeloma, chronic liver disease, proven malabsorption disorder and rheumatoid arthritis.
 5. Monitoring therapy
 6. Family history of osteoporosis
- Items 1-5 are rebatable under medicare . [8](#)
- Guidelines or evidence based reviews on the indications for BMD testing have been published by many organisations. Those of the International Society for Clinical Densitometry for bone density testing are the most comprehensive and clinically useful: [5](#)
 1. Women Aged 65 years and older
 2. Postmenopausal women under age 65 with risk factors for osteoporosis
 3. Men aged 70 years and older
 4. Adults with fragility fracture
 5. Adults with disease or condition associated with low bone mass or bone loss
 6. Adults taking medication associated with low bone mass or bone loss
 7. Anyone being considered for pharmacological osteoporosis therapy
 8. Anyone being treated for low bone mass to monitor treatment effect
 9. Anyone not receiving therapy in whom evidence of bone loss would lead to treatment
 10. Women discontinuing estrogen therapy
- Note: The disparity between indications for DEXA scan and the Medicare Benefits Schedule

DUAL-ENERGY X-RAY ABSORPTIOMETRY (DEXA SCAN)

- The current "gold standard" for the diagnosis of osteoporosis. [1](#)
- DEXA is superior to other techniques for assessing BMD because of its: [9](#)
 - Low precision error
 - Low radiation dose and short scan time
 - Capacity to measure multiple skeletal sites
- Limitations of DEXA include; [1](#)
 - Hip replacement precludes measurement of hip BMD
 - In the spine, degenerative disease cause falsely elevated results owing to features such as osteophytes and compression fractures
 - Measurements of different DEXA machines may vary considerably for the same individual
 - It is important to have follow-up scans on the same machine if possible





- Results are expressed as Z or T scores, defined as the number of standard deviations (SDs) from the age and sex matched control means and from the mean values in the 30 year olds respectively. [1](#)
- Based on bone densitometry, measured by DEXA and the T-score, the World Health Organization classifies the patients into three categories: [6,7](#)
 - Normal bone density: T-score greater than -1.
 - Osteopenia (low bone mass): T-score between -1 and -2.5.
 - Osteoporosis: T-score less than -2.5
- Threshold for pharmacological therapy [10](#)

T-Score	Fracture	Management
<-2.5	Present	Treat
<-2.5	Absent	Treat
-1.0 to -2.5	Present	Treat
-1.0 to -2.5	Absent	Advise and Follow Up
> -1.0	Absent	Advise and Follow Up

- Further radiological investigations in the assessment of Bone Mineral Density
 1. Peripheral DEXA - The use of these devices is increasing due to their ease of use and portability. However individual manufacturers have established their own guidelines that have not been validated in the assessment of bone mineral density in large randomised trials. [16](#)
 2. Spinal Quantitative Computed Tomography (QCT) - QCT is the most accurate tool to measure bone density, being 2-3 times more sensitive than DXA in detecting loss of bone mineral. It is the only technique allowing volumetric measurement of the trabecular interior of bone. A major clinical limitation is the radiation exposure when compared to DEXA, as well as cost and resources availability issues. [17](#)
 3. Quantitative ultrasound (QUS) - Several large prospective cohort studies have clearly demonstrated that this modality can predict future fracture risk. [12,13](#) There are several potential advantages over DEXA including expense, portability and lack of ionising radiation. However a recent large meta-analysis found the sensitivity and specificity of calcaneal ultrasound low when compared to DEXA as the standard reference. [14](#) Furthermore cost-effective analysis utilising QUS as a pre-screening tool prior to DEXA in postmenopausal women has failed to show a benefit. [15](#)

OSTEOPOROSIS TREATMENT

- Pharmacological Treatment for Osteoporosis includes; [4](#)
 - Lifestyle Measures - Adequate and appropriate diet, smoking cessation, exercise and falls prevention
 - Medications Bisphosphonates
 - Selective Estrogen Receptor Modulators
 - Hormone Therapy
 - Tibolone
 - Calcium and Vitamin D
 - Strontium Ranelate

Patients with Z score less than 1.5 should be evaluated for secondary causes of osteoporosis. The following routine examinations should be performed; [4](#)

- Full Blood Count
- Erythrocyte Sedimentation Rate
- Calcium
- Creatinine





- Total alkaline phosphatase and albumin
- Thyroid stimulating hormone
- Protein Electrophoresis
- Anti-tissue transglutaminase antibody or anti-endomysial antibody
- Parathyroid Hormone
- 25-Hydroxy Vitamin D

MEDICAL MANAGEMENT

- The following points should be addressed in those patients who do not have an indication for DEXA scan or whose scan result does not qualify them for Osteoporotic treatment;
 - General Lifestyle advise
 - Advise to stop smoking and consume minimal alcohol
 - Evaluate and rectify possible causes of falls
 - Advocate a regular weight bearing or strengthening exercise program
 - Exposure to indirect sunlight for 15mins, four to six times a week
- Ongoing monitoring for osteopenia/osteoporosis. Regularly monitor height as a loss of height of 2.5cm is a surrogate marker for osteoporosis. Plain X-rays of the spine should be considered for an asymptomatic vertebral fracture [10](#)

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Website

For more information go to www.imagingpathways.health.wa.gov.au

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