

---

1317

Final decision analytic  
protocol (DAP) to  
guide the assessment  
of bone mineral  
density using Dual  
Energy X-Ray  
Absorptiometry (DXA)  
in patients with HIV

---

July 2013

---

## Table of Contents

<b>MSAC and PASC .....</b>	<b>4</b>
Purpose of this document.....	4
<b>Purpose of application .....</b>	<b>5</b>
<b>Intervention .....</b>	<b>5</b>
Description .....	5
Bone Loss in HIV infected Patients .....	6
Bone Loss Associated with Antiretroviral Therapy .....	7
Methods for detecting BMD .....	8
Fracture risk.....	8
<b>Administration, dose, frequency of administration, duration of the intervention.....</b>	<b>9</b>
BMD assessment by DXA.....	Error! Bookmark not defined.
Co-administered interventions .....	10
<b>Background .....</b>	<b>13</b>
Current arrangements for public reimbursement .....	13
<b>Regulatory status.....</b>	<b>16</b>
DXA scanning.....	16
<b>Patient population.....</b>	<b>17</b>
Proposed MBS listing .....	19
Clinical place for proposed intervention .....	20
<b>Comparator .....</b>	<b>24</b>
<b>Clinical claim .....</b>	<b>24</b>
Considerations .....	Error! Bookmark not defined.
<b>Outcomes and health care resources affected by introduction of proposed intervention .....</b>	<b>26</b>
Outcomes .....	26
Health care resources .....	27
<b>Proposed structure of economic evaluation (decision-analytic) .....</b>	<b>29</b>
<b>Clinical research questions for public funding.....</b>	<b>31</b>

<b>References .....</b>	<b>33</b>
<b>Appendix 1        Examples of treatments currently listed on the ARTG for the treatment of osteoporosis .....</b>	<b>36</b>
<b>Appendix 2        Indications, contraindications and potential complications of the co-administered interventions .....</b>	Error! Bookmark not defined.
<b>Appendix 3        PBS eligibility for anti-osteoporotic medication .</b>	Error! Bookmark not defined.
<b>Appendix 4        PBS anti-osteoporotic medication, listed according to eligible indication .....</b>	Error! Bookmark not defined.
<b>Appendix 5        Medicare Benefits Schedule - Note D1.27.....</b>	Error! Bookmark not defined.

## **MSAC and PASC**

The Medical Services Advisory Committee (MSAC) is an independent expert committee appointed by the Australian Government Health Minister to strengthen the role of evidence in health financing decisions in Australia. MSAC advises the Commonwealth Minister for Health and Ageing on the evidence relating to the safety, effectiveness, and cost-effectiveness of new and existing medical technologies and procedures and under what circumstances public funding should be supported.

The Protocol Advisory Sub-Committee (PASC) is a standing sub-committee of MSAC. Its primary objective is the determination of protocols to guide clinical and economic assessments of medical interventions proposed for public funding.

### **Purpose of this document**

This document is intended to provide a draft decision analytic protocol that will be used to guide the assessment of an intervention for a particular population of patients. The draft protocol will be finalised after inviting relevant stakeholders to provide input to the protocol. The final protocol will provide the basis for the assessment of the intervention.

The protocol guiding the assessment of the health intervention has been developed using the widely accepted "PICO" approach. The PICO approach involves a clear articulation of the following aspects of the research question that the assessment is intended to answer:

Patients – specification of the characteristics of the patients in whom the intervention is to be considered for use;

Intervention – specification of the proposed intervention

Comparator – specification of the therapy most likely to be replaced by the proposed intervention

Outcomes – specification of the health outcomes and the healthcare resources likely to be affected by the introduction of the proposed intervention

## Purpose of application

The Department of Health and Ageing received a proposal for the listing of dual energy X-ray absorptiometry (DXA) on the Medicare Benefits Schedule (MBS) in June 2011. Osteoporosis Australia subsequently became involved in the preparation of the draft Decision Analytic Protocol (DAP) in March 2012. This proposal is for the provision of an MBS item for bone densitometry by DXA scan to women and men with HIV infection, regardless of whether or not they are using anti-retroviral therapy. This submission was originally formulated as a proposed Decision Analytic Protocol (DAP) by Osteoporosis Australia in conjunction with the Department of Health and Ageing.

## Intervention

### Description

Osteoporosis (OP) is a 'skeletal disorder characterised by compromised bone strength predisposing a person to an increased risk of fracture', and is an established and well defined disease assessed on the basis of bone mineral densitometry (BMD). In terms of bone mineral density, osteoporosis can be defined as "a BMD that lies 2.5 standard deviations (SD) or more below the average value for young healthy women (a T-score of  $\leq -2.5$  SD)" (WHO 2007). According to the AIHW (2011) 692,000 Australians (3.4% of the total population) received a principle diagnosis of osteoporosis in 2007–08, of which women accounted for 82% of cases.

Bone remodelling is a continual process which exists in adults to maintain bone mass and is mediated through osteoblasts, osteocytes and osteoclasts (Santen et al, 2011).

- Osteoblasts are bone forming cells which produce organic bone matrix and aid its mineralisation
- Osteoclasts are bone resorptive cells which digest bone mineral and degrade extracellular matrix proteins and form bone resorptive "pits".
- Osteocytes are osteoblasts which do not undergo apoptosis and become incorporated into the bone matrix and are important in the coupling mechanism of bone formation and resorption.

Maintenance of bone mineral density relies upon equilibrium between the processes of bone formation and bone resorption. Bone formation refers to the deposition of bone matrix and the fixing of calcium in its mineral form. Bone resorption is the process of bone breakdown by osteoclasts and the release of minerals from bone. Coupled these processes are referred to as bone remodelling.

The processes underlying bone remodelling are complex and not completely understood. Osteoporosis and low BMD are thought to occur as a result of increased numbers and activity of osteoclasts (Santen et al, 2011). Risk factors for osteoporosis are shown in Table 1.

Bone formation exceeds bone resorption from birth until the age of approximately 20 years. At the end of this period, peak bone mass is achieved and between the ages of 20 and 40 is roughly maintained through equilibrium between bone formation and resorption (Marcus et al 2008). However, the rate of bone resorption exceeds that of formation in menopausal and post-menopausal

women and men 60 years or older, resulting in net bone loss. This reduction in bone density frequently remains undiagnosed, and is most often clinically manifest as a skeletal fracture sustained with minimal trauma (WHO 2007).

Minimal trauma fractures are defined as fractures as a result of falls from standing height or less and comprise a significant portion of the health burden caused by osteoporosis. Patients with minimal trauma fractures have increased morbidity, complications, and increased mortality compared to age- and gender- matched peers (Center et al 2007). Common sites of minimal trauma fracture are the hip, pelvis, wrist, forearm and spine (AIHW 2011).

**Table 1 Risk factors for the development of osteoporosis**

Type of risk factor	Examples
Fixed (non-modifiable) risk factors	Age (increases with the age after 40-50) Sex (osteoporosis affects women at an earlier age) Menopause Family history of osteoporosis (genetic predisposition) Previous low trauma fracture (fragility fracture) particularly of the hip, spine or wrist.
Lifestyle (modifiable) risk factors	Physical inactivity Diet: low calcium intake Vitamin D deficiency Tobacco smoking Excessive alcohol consumption Low body mass index (BMI <18.5) Anorexia/exercise induced amenorrhoea Excessively high body mass index
Diseases implicated in OP	Rheumatoid arthritis Hyperthyroidism Hyperparathyroidism Hypogonadism, including early menopause Cushing's syndrome Chronic gut conditions including coeliac disease, and inflammatory bowel disease Chronic liver disease Chronic renal disease Some cancers (e.g. myeloma) Type 1 diabetes Gastrectomy Ankylosing spondylitis
Drug therapies implicated in OP	Chemotherapy Aromatase inhibitors for the treatment of breast cancer Long-term corticosteroid use Anti-androgenic treatments for prostate cancer

OP: osteoporosis; Source: AIHW (2008 and 2010), Osteoporosis Australia 2011, Smith 2006 and Bjarnson et al 2008

### Bone loss in HIV infected patients

Osteoporosis may be more common in people infected with human immunodeficiency virus (HIV) and is likely to become an important cause of morbidity and mortality as the HIV-infected population ages and as patients are living longer due to the improvements in therapeutic management. The aetiology of osteoporosis in HIV-infected patients is likely to be multifactorial, encompassing traditional risk

factors such as low body weight (Bolland 2007), hypogonadism, smoking, etc. as well as the direct effects of chronic HIV infection and therapy with certain anti-retrovirals.

HIV infection and antiretroviral therapy are now recognised as independent risk factors for fragility fractures due to osteoporosis (Ofotokun 2011). Current data suggest that two of every three HIV-seropositive individuals never exposed to anti-retroviral therapy exhibit osteopenia and have a 3.7 times greater risk of developing osteoporosis (Brown 2006).

The presence of HIV infection and the associated chronic immune activation are believed to play an important role in bone remodelling (Walker Harris 2012). The normal process of bone resorption and bone formation is usually tightly linked. In untreated HIV infection the direct effects of the virus together with the inflammatory effects of the disease cause the bone formation and bone resorption cycle to become uncoupled. Certain HIV viral proteins (Vpr and gp 120) stimulate osteoclast activity (Fakruddin 2003, Fakruddin 2005) and others (p55-gag) suppress osteoblast activity and increase osteoblast apoptosis (Cotter 2007). High concentrations of HIV RNA have also been associated with increased levels of nuclear factor  $\kappa$ B ligand (RANKL), an osteoblast-secreted cytokine that promotes osteoclast formation and function (Gibellini et al 2007).

### **Bone loss associated with antiretroviral therapy**

Specific components of antiretroviral therapy have also been implicated in the pathogenesis of reduced BMD in HIV-infected persons. This finding is not consistent across all types of anti-retroviral therapy, but greater reductions in BMD have been observed with protease inhibitors, nucleoside reverse transcriptase inhibitors or both (Cotter 2011). Randomised clinical trials comparing tenofovir with non-tenofovir regimens have consistently found that tenofovir is associated with significant decreases in BMD at the hip and the spine (Gallant 2004; McComsey 2011; Stellbrink 2010, Haskelberg 2012) and that the risk of fractures is also higher (Bedimo 2011). The mechanisms for this are not clear. Another effect of tenofovir is the impairment of bone mineralisation through renal phosphate handling which leads to an increase in bone turnover and osteomalacia. This effect is worse when there is concomitant vitamin D deficiency. Studies have shown 2-6% loss of BMD after 48-96 weeks of anti-retroviral therapy, regardless of the type of therapy initiated. This is comparable to the bone loss expected in women aged 50-59 over 2 years (Walker et al 2012).

#### **Note**

- Recent systematic review evidence reporting on a number of longitudinal studies of bone mineral density in HIV suggests that bone mineral density may be stable in this population (Bolland et al 2011).
- The assessment should provide evidence to establish that HIV infection, with or without the use of anti-retroviral therapy, is associated with an increased risk of minimal trauma fracture.

## Methods for detecting BMD

Dual energy X-ray absorptiometry (DXA) and quantitative computed tomography (QCT) can be used in measuring BMD. DXA is more widely used, has better reproducibility, and is considered more appropriate in general use than QCT which delivers higher doses of radiation. QCT is often preferred when measuring BMD in the presence of fractures, but has been excluded from this DAP (see Summary box below). Another tool for measuring BMD is quantitative ultrasound (QUS).

The DXA scan is used to generate T-scores which is a comparison of a patient's bone density to that of peak bone density for the patient's gender and is the number of standard deviations above or below the normal young adult mean BMD (WHO 2007).

DXA is currently reimbursed through the MBS to men and women aged 70+, for people who have previously experienced a minimal trauma fracture and for those with one of several risk factors including: prolonged corticosteroid use, hypogonadism, primary hyperparathyroidism, chronic liver disease, chronic renal disease, proven malabsorptive disorders, rheumatoid arthritis, or conditions associated with thyroxine excess (Table 3).

Bone mineral density in OP is defined by the WHO as a T-score that is less than or equal to 2.5 standard deviations below the young normal mean (a T-score of -2.5 or less) (WHO 2007). Bone mineral density reflects the amount of bone and, indirectly, bone strength, its spatial distribution (i.e. shape and microarchitecture) and the intrinsic properties of the materials that comprise it, such as density, matrix mineralization, collagen traits and micro-damage (Marcus et al 2008). 'Osteopenia' (low bone mass) is a precursor to OP and according to WHO is defined by a T-score between -1.0 and -2.5 (Table 2). The Z-score is a comparison of a person's bone mineral density with that of the average person of the same age and sex. Although the Z-score does not form part of the diagnosis according to WHO guidelines which quote T-scores, it may be used in premenopausal women and in men < 50 years of age to give the physician some idea of the patient's risk in relation to other patients of the same age (National Institutes of Health 2012).

**Table 2 Diagnosis according to T-score and WHO classification of osteoporosis**

T-score	Diagnosis
Equal or greater than -1.0	Normal bone density
Between -1.0 and -2.5	Low bone mass ("osteopenia": at risk for developing osteoporosis and increasing fracture risk)
Equal to or less than -2.5	Osteoporosis

Source: WHO 2007, RACGP 2010b

## Fracture risk

Ten-year fracture risk can be estimated through the use of on-line tools such as the FRAX tool developed by the University of Sheffield on behalf of the WHO (WHO 2007; WHO 2012). The assessment is likely to be less accurate for premenopausal women, young men (<50 years) and is not validated for children (Dasher et al 2010). A variation of FRAX supported with Australian data is available at: <http://www.shef.ac.uk/FRAX/tool.jsp?country=31>. Unfortunately this calculator does not

take into account additional risks for fracture associated with HIV nor any of the medications used in the treatment of HIV, and is not designed for use in premenopausal women or men < 50 years.

In terms of normative data, RACGP guidelines state: 'In Australia as a reference for fracture risk calculation in women, the T-scores calculated from the Geelong Osteoporosis Study database are used for the lumbar spine and the proximal femur. Normative data in Australian men are not currently available. Most BMD assessments currently report T-scores for men based on the US National Health and Nutrition Examination Survey (NHANES) normative data or reference ranges provided by densitometer manufacturers' (RACGP 2010b).

## **Administration, dose, frequency of administration, duration of the intervention**

Bone density scanning can be performed at any location which has both a DXA machine and qualified technician. A radiologist, nuclear medicine physician or other accredited specialist is required to interpret the results. The result is communicated to the patient through the referring practitioner. Diagnosis of low bone mineral density is dependent on the measurement site and number of sites measured. According to local guidelines, bone mineral density should be measured by DXA scanning performed on two sites, preferably anteroposterior spine and hip (RACGP 2010b).

Absorbed radiation doses from DXA are negligible for first-generation pencil beam scanners (below the estimated dose from natural background radiation of 7 µSv per day). Newer fan beam scanners produce slightly more radiation, with absorbed dose ranging from approximately 10 to 20 µSv per examination (Damilakis and Guglielmi 2010), and generating a combined dose from anterior-posterior (AP) spine, lateral spine, and hip scans of <30 µSv (SIGN 2003). The estimated dose of radiation is lower for DXA measurements than most diagnostic X-ray examinations including mammography. However, the radiation dose can vary considerably between sites and DXA systems from different manufacturers based on scanning technique, x-ray tube filtration, efficiency of detection systems, exposure parameters, scan speed, scan size and patient body size (Damilakis and Guglielmi 2010).

Although the DXA device measures total density, the use of both high- and low-energy X-rays facilitates the separation of soft tissue and bone contributions to overall density (Dasher et al 2010). Scanning of the hip and spine usually takes up to a maximum of approximately 15-20 minutes (Dasher et al 2010). Several different MBS items provide services on a variety of indications with repeat scans dependent on the indication (Table 3).

Current guidelines suggest general practitioners to evaluate patients at increased risk for osteoporotic fractures who are not receiving specific preventive anti-osteoporotic therapy in regard to future fracture risk at intervals adequate to the risk in question. BMD measurement can identify some non-fragility causes of fracture, for example T-score above -1.5. If a decision is made to not recommend specific preventive anti-osteoporotic therapy following evaluation of BMD, this must be formally reviewed in relation to future fracture risk at intervals relevant to the risk in question. In most cases BMD testing is recommended for intervals of 2 years or longer (RACGP 2010b).

In patients with confirmed OP and receiving anti-osteoporotic treatment, repeat DXA scans are recommended to be considered at 1 year if there is a change to anti-osteoporotic therapy, and recommended at 2 year intervals when BMD is likely to be approaching -2.5 (average decrease in T-score is 0.1/ year) (RACGP 2010b). The BMD at the time of screening is the most important factor in determining treatment and the time to repeat scan. The rates of change between scans are not as important in overall management decisions.

#### **Summary of the approach to assessment for the test**

The **proposed test** is DXA.

Bone density testing with QCT is excluded for the following reasons:

- QCT results are less reproducible than DXA
- There is less robust evidence currently available to support the use of QCT
- Although QCT radiation doses are reducing over time, currently the use of QCT involves a higher dose of radiation than DXA so exposes patients to a greater degree of harm.
- There are no standardised Australian normative data for QCT.
- QCT assessment of the spine may overestimate osteoporosis compared to DXA using the WHO standard definitions.
- PASC recognise that QCT may be considered an alternative to DXA in the future.

#### **Co-administered interventions**

A variety of options exist for the prevention and treatment of OP. Preventive options include calcium and vitamin D supplementation, exercise and education (awareness). Additionally, prescription medication is available for certain conditions (RACGP 2010b). Different preventive and treatment modalities include:

- Exercise - regular, progressive weight-bearing and resistance exercise aids in the preservation and increase of bone density
- Calcium and vitamin D – it is recommended that to optimise clinical efficacy, adequate calcium and vitamin D are required. If sufficient calcium cannot be obtained from diet, and adequate vitamin D levels are not achieved by sun exposure, supplements may be required. Total calcium intake of 1000-1300 mg/day (combination of food and supplement) is recommended. (RACGP 2010b) Where sun exposure is not adequate to generate sufficient Vitamin D levels, supplementation of vitamin D 700-800 IU/day is recommended (Nowson et al 2012).
- Selective oestrogen receptor modulators (SERMs) – decrease bone resorption via binding to oestrogen receptors and may best be used as an alternative to hormone therapy in women with contraindications (RACGP 2010b).

- Bisphosphonates – The bisphosphonates currently used in Australia include alendronate, disodium etidronate, risedronate, and zoledronic acid. These drugs reduce the risk of fractures by increasing bone density through the reduction of osteoclast activity. On average, these drugs lead to an increase in bone density by approximately 4-8% at the spine and 1-3% at the hip over the first 3-4 years of treatment.
- Monoclonal antibodies (Denosumab) – the RANK Ligand inhibitor, monoclonal antibody Denosumab binds to a specific ligand which is required for osteoclast formation. This inhibition of osteoclast formation, activity and viability results in decreased bone resorption and increased bone mass and strength in both cortical and trabecular bone.
- Teriparatide (parathyroid hormone) – Teriparatide increases new bone formation through a reduction in osteoblast apoptosis. Due to its expense and potential side effects (including a potential increased risk of osteogenic sarcoma), teriparatide is only reimbursed by the PBS for severe established OP in patients with a very high risk of fracture (RACGP 2010b).

Examples of anti-osteoporotic medication listed on the ARTG are shown in Appendix 1. Indications, contraindications and potential complications of anti-osteoporotic medication are presented in Appendix 2. PBS-listed anti-resorptive pharmaceuticals are listed by drug in Appendix 3 and by indication in Appendix 4.

Anti-osteoporotic medications on the ARTG are listed according to relatively broad indications. For example, alendronate is available to post-menopausal women and to men for the treatment of osteoporosis to help prevent fractures. Other medications are available confirmed by the finding of low bone mass, for patients on long-term corticosteroid therapy, or in the presence or history of osteoporotic fracture.

#### **Clinical research questions for the assessment relating to the intervention:**

- What is the effect of anti-resorptive medication on the rate of bone mineral density loss and minimal trauma fracture in the defined population? The assessment phase should consider patients with HIV infection who are being treated with antiretroviral therapy and those with HIV infection who are not being treated with antiretroviral therapy separately.
- What is the rate of bone loss over time in the population who are not provided test and therapy? What is the rate of bone loss over time in the population who are provided test and therapy? Evidence provided in response to these questions will inform the number and frequency of DXA re-testing and monitoring (respectively). The frequency of re-testing and monitoring should be justified by the submission of available evidence.
- What proportion of the population, with or without anti-retroviral therapy, will reach the threshold T-score for therapy?
- Should the threshold for therapy be the same in HIV patients who are being treated with anti-retrovirals as those not treated with anti-retrovirals?
- What impact should patient age have on the threshold to therapy and the frequency of re-testing and monitoring?

## **Summary of the approach to assessment for the intervention**

### Test

**The proposed test** is DXA. PASC consider that testing for serum vitamin D sufficiency would occur during standard clinical evaluation of a patient for low bone mineral density. Therefore the use of this resource would be the same in both the current and proposed scenario.

### Therapy

**The proposed therapy** is management informed by the result of a BMD test. The proposed thresholds are:

- For T-score from -2.5 (excluded) to -1.0 (excluded), management would be through lifestyle and dietary advice;
- For T-score  $\leq -2.5$ , management would involve treatment with anti-resorptive medications.

No specific PBS-listed medication is associated with this proposal.

The evaluation phase should provide evidence to determine the best **threshold for therapy** for anti-resorptive drug therapy. The assessment phase should address threshold to therapy as:

- The proposed T-score of  $\leq -2.5$ .
- The assessment phase should provide evidence to inform on the appropriate threshold T-score(s) for access to therapy, including consideration of threshold T-score dependent on whether the patient is being treated with anti-retrovirals or not.
- The assessment phase should examine a T-score of -1.0 (the current trigger for PBS eligibility in patients taking glucocorticoid therapy) and sensitivity analyses around T-scores of -1.5, -2.0 and -2.5 could also be conducted.
- Any evidence identified to establish thresholds for therapy based on Z-scores in younger patients should be presented.

PASC considers that the **timing and frequency of monitoring and re-testing** should be informed by evidence of change in BMD as a surrogate for risk of minimal trauma fracture over time. The assessment phase will need to address the rate of bone loss in men and women with HIV infection on or off anti-retroviral therapy as well as when receiving anti-resorptive drugs or not. This will inform questions around re-testing and monitoring.

For sensitivity analyses the following options should be evaluated regarding re-testing and monitoring of the proposed population:

- T-score  $\geq -1.0$ : no repeat scan
- T-score from -2.5 (excluded) to -1.0 (excluded): repeat scan every 24 months
- T-score from -2.5 (excluded) to -1.0 (excluded) and patient is on anti-retroviral therapy: repeat scan every 12 months

- T-score ≤ 2.5: repeat scan every 12 months (MBS item 12306)
- Re-scanning and monitoring using thresholds as advised by the evidence.

### Co-dependency

PASC noted that this application will be a **co-dependent application** involving prescription medicines not currently PBS subsidised for the patient population in question. However, at this stage there is **no concurrent co-dependent application**.

As the use of prescription medicines is essential to the overall cost-effectiveness of this proposal, the necessary co-dependencies will need to be addressed for PBS listing as well as MBS listing purposes.

Note that the final eligibility criteria including threshold T-score of the proposed population to any co-dependent anti-resorptive drug would be defined by the Pharmaceutical Benefits Advisory Committee (PASC).

The assessment phase should address the efficacy of co-dependent medicines with respect to the following populations reaching the threshold for therapy:

- Patients with HIV infection not on antiretroviral therapy
- Patients with HIV infection on antiretroviral therapy

## Background

### **Current arrangements for public reimbursement**

DXA scanning is not currently funded for men and women below the age of 70 unless they suffer from certain pre-defined conditions. Unconditional access to DXA scanning under the schedule is currently available to persons aged 70 years and over (MBS item number 12323). A variety of other patient populations are covered for DXA or QCT under the MBS (Table 3), including:

- Presumed low BMD following one or more fractures occurring after minimal trauma;
- Who have undergone prolonged glucocorticoid therapy and conditions associated with excess glucocorticoid secretion;
- Male (all) and female (lasting > 6 months before the age of 45) hypogonadism
- Primary hyperparathyroidism
- Chronic liver and/or renal disease
- Proven malabsorptive disorders;
- Rheumatoid arthritis; or
- Conditions associated with thyroxine excess

Table 3 lists the currently available MBS item numbers for DXA. Relevant explanatory notes are in Appendix 5.

Several different MBS items cover a variety of indications for repeat scans every 12 or 24 months depending on the indication (See Table 3). According to current Australian guidelines (RACGP 2010a), for patients with low risk factors and T-scores above osteopenic values ( $\geq -1.0$ ), repeat scans are not required unless substantial changes in circumstance (minimal trauma fracture or increased risk conditions). People diagnosed with osteoporosis ( $\leq -2.5$ ) would be eligible for repeat testing as required under MBS item 12306; however, patients with confirmed OP and receiving anti-osteoporotic treatment, repeat DXA scans are not generally required unless there is a change in, or cessation of, anti-osteoporotic therapy (RACGP 2010b).

Table 3: Current MBS item descriptors for dual-energy X-ray absorptiometry and quantitative computed tomography

<p><b>Category 2 – DIAGNOSTIC PROCEDURES AND INVESTIGATIONS, Bone Densitometry</b></p> <p><b>MBS 12306</b></p> <p>Bone densitometry (performed by a specialist or consultant physician where the patient is referred by another medical practitioner), using dual energy X-ray absorptiometry, for:</p> <ul style="list-style-type: none"> <li>• The confirmation of a presumptive diagnosis of low bone mineral density made on the basis of 1 or more fractures occurring after minimal trauma; or</li> <li>• For the monitoring of low bone mineral density proven by bone densitometry at least 12 months previously.</li> </ul> <p>Measurement of 2 or more sites – 1 service only in a period of 24 months – including interpretation and report; not being a service associated with a service to which item 12309, 12312, 12315, 12318 or 12321 applies (Ministerial Determination).</p> <p>Fee: \$102.40 Benefit: 75% = \$76.80 85% = \$87.05</p> <p>Relevant explanatory notes: See Note D1.27</p>
<p><b>Category 2 – DIAGNOSTIC PROCEDURES AND INVESTIGATIONS, Bone Densitometry</b></p> <p><b>MBS 12309</b></p> <p>Bone densitometry (performed by a specialist or consultant physician where the patient is referred by another medical practitioner), using quantitative computerised tomography, for:</p> <ul style="list-style-type: none"> <li>• the confirmation of a presumptive diagnosis of low bone mineral density made on the basis of 1 or more fractures occurring after minimal trauma; or</li> <li>• for the monitoring of low bone mineral density proven by bone densitometry at least 12 months previously.</li> </ul> <p>Measurement of 2 or more sites - 1 service only in a period of 24 months - including interpretation and report; not being a service associated with a service to which item 12306, 12312, 12315, 12318 or 12321 applies (Ministerial Determination)</p> <p>Fee: \$102.40 Benefit: 75% = \$76.80 85% = \$87.05</p> <p>Relevant explanatory notes: See Note D1.27</p>
<p><b>Category 2 – DIAGNOSTIC PROCEDURES AND INVESTIGATIONS, Bone Densitometry</b></p> <p><b>MBS 12312</b></p> <p>Bone densitometry (performed by a specialist or consultant physician where the patient is referred by another medical practitioner), using dual energy X-ray absorptiometry, for the diagnosis and monitoring of bone loss associated with 1 or more of the following conditions:</p> <ul style="list-style-type: none"> <li>• Prolonged glucocorticoid therapy;</li> <li>• Conditions associated with excess glucocorticoid secretion;</li> <li>• Male hypogonadism; or</li> </ul>

- Female hypogonadism lasting more than 6 months before the age of 45

Where the bone density measurement will contribute to the management of a patient with any of the above conditions – measurement of 2 or more sites – 1 service only in a period of 12 consecutive months – including interpretation and report; not being a service associated with a service to which item 12306, 12309, 12315, 12318 or 12321 applies (Ministerial Determination)

Fee: \$102.40 Benefit: 75% = \$76.80 85% = \$87.05

Relevant explanatory notes: See Note D1.27

#### Category 2 – DIAGNOSTIC PROCEDURES AND INVESTIGATIONS, Bone Densitometry

##### MBS 12315

Bone densitometry (performed by a specialist or consultant physician where the patient is referred by another medical practitioner), using dual energy X-ray absorptiometry, for the diagnosis and monitoring of bone loss associated with 1 or more of the following conditions:

- Primary hyperparathyroidism;
- Chronic liver disease;
- Chronic renal disease;
- Proven malabsorptive disorders;
- Rheumatoid arthritis; or
- Conditions associated with thyroxine excess

Where the bone density measurement will contribute to the management of a patient with any of the above conditions – measurement of 2 or more sites – 1 service only in a period of 24 consecutive months – including interpretation and report; not being a service associated with a service to which items 12306, 12309, 12312, 12318 or 12321 applies

(Ministerial Determination)

Fee: \$102.40 Benefit: 75% = \$76.80 85% = \$87.05

Relevant explanatory notes: See Note D1.27

#### Category 2 – DIAGNOSTIC PROCEDURES AND INVESTIGATIONS, Bone Densitometry

##### MBS 12318

Bone densitometry (performed by a specialist or consultant physician where the patient is referred by another medical practitioner), using quantitative computerised tomography, for the diagnosis and monitoring of bone loss associated with 1 or more of the following conditions:

- prolonged glucocorticoid therapy;
- conditions associated with excess glucocorticoid secretion;
- male hypogonadism;
- female hypogonadism lasting more than 6 months before the age of 45;
- primary hyperparathyroidism;
- chronic liver disease;
- chronic renal disease;
- proven malabsorptive disorders;
- rheumatoid arthritis; or
- conditions associated with thyroxine excess.

Where the bone density measurement will contribute to the management of a patient with any of the above conditions - measurement of 2 or more sites - 1 service only in a period of 24 consecutive months - including interpretation and report; not being a service associated with a service to which item 12306, 12309, 12312, 12315 or 12321 applies (Ministerial Determination)

Fee: \$102.40 Benefit: 75% = \$76.80 85% = \$87.05

Relevant explanatory notes: See Note D1.27

Category 2 – DIAGNOSTIC PROCEDURES AND INVESTIGATIONS, Bone Densitometry

MBS 12321

Bone densitometry (performed by a specialist or consultant physician where the patient is referred by another medical practitioner), using dual energy X-ray absorptiometry, for the measurement of bone density 12 months following a significant change in therapy for:

- Established low bone mineral density; or
- The confirmation of a presumptive diagnosis of low bone mineral density made on the basis of 1 or more fractures occurring after minimal trauma.

Measurement of 2 or more sites – 1 service only in a period of 12 consecutive months – including interpretation and report; not being a service associated with a service to which item 12306, 12309, 12312, 12315 or 12318 applies (Ministerial Determination)

Fee: \$102.40 Benefit: 75% = \$76.80 85% = \$87.05

Relevant explanatory notes: See Note D1.27

Category 2 – DIAGNOSTIC PROCEDURES AND INVESTIGATIONS, Bone Densitometry

MBS 12323

Bone densitometry (performed by a specialist or consultant physician where the patient is referred by another medical practitioner), using dual energy X-ray absorptiometry or quantitative computerised tomography, for the measurement of bone mineral density, for a person aged 70 years or over.

Measurement of 2 or more sites – including interpretation and report; not being a service associated with a service to which item 12306, 12309, 12312, 12315, 12318 or 12321 applies (Ministerial Determination)

Fee: \$102.40 Benefit: 75% = \$76.80 85% = \$87.05

Relevant explanatory notes: See Note D1.27

Taken from <http://www9.health.gov.au/mbs/search.cfm>, accessed 08 July 2013

Relevant explanatory notes are shown in Appendix 5. A test for vitamin D sufficiency is available through MBS item 66608 (Vitamin D or D fractions – 1 or more tests, Fee \$33.20). Anti-osteoporotic medication on the PBS is shown in Appendix 3 (by drug) and Appendix 4 (by indication). PBS eligibility is in general focused to specific indications. A T-score is required for most indications, other than where patients have a fracture due to minimal trauma, where the fracture has been established using radiology.

## Regulatory status

### DXA scanning

Four DXA devices are used in Australia – Hologic, Lunar, Norland and Medilink. All devices are listed in the ARTG as category IIb devices (medium-high level of risk; Table 4) (Global Medical Device Nomenclature (GMDN) code 37661).

Table 4: Regulatory status of dual energy X-ray absorptiometry devices

ARTG number	Approval date	Manufacturer	Product name	Approved indication
97975	10/11/2003	GE Medical Systems Lunar	GE Medical Systems Australia Pty Ltd - X-ray system, diagnostic, bone absorptiometer, dual-energy	X-ray imaging for bone densitometry
117461	16/03/2005	Norland Corp	Inderlec Medical Systems Pty Ltd - X-ray system, diagnostic, bone absorptiometer, dual-energy	For the estimation of bone density and other structural parameters using x-ray absorptiometry for the purpose of aiding in the diagnosis of osteoporosis including bone regeneration and loss.
119491	25/05/2005	Medilink	Inderlec Medical Systems Pty Ltd - X-ray system, diagnostic, bone absorptiometer, dual-energy	For the estimation of bone density and other structural parameters of bones using x-ray absorptiometry for the purpose of aiding in the diagnosis of osteoporosis including bone regeneration and loss.
158772	23/01/2009	Hologic Inc	Cytec Australia Pty Ltd - X-ray system, diagnostic, bone absorptiometer, dual-energy	Intended to be used to estimate bone density. The data can then be used to calculate bone mineral density.

Taken from <https://www.ebs.tga.gov.au/>, accessed 9 August 2012

## Patient population

DXA scanning is proposed for men and women of any age diagnosed with HIV infection regardless of whether or not they have been prescribed anti-retroviral therapy. This item would be in addition to existing MBS items.

Therefore for the purposes of this DAP the population is defined as people with HIV infection. Evidence should be reported separately for patients who are receiving, or not receiving, anti-retroviral therapy.

### Risk factors

The specific risk factors associated with this population are HIV infection and antiretroviral therapy.

### Baseline population

The baseline population for this application is age and gender matched peers who are otherwise healthy.

### Benchmark population

Men and women on prolonged glucocorticoid therapy, a medication associated with rapid bone loss and currently eligible for DXA scanning through MBS item 12312. These patients are also eligible for PBS subsidy of anti-resorptive medication. The PBS eligibility threshold for patients taking glucocorticoid medications is a T-score of -1.0 or -1.5 or less, depending on the drug.

**Questions for the review relating to the population:**

- What is the risk of minimal trauma fracture (possibly informed by the surrogate of rate of loss of bone mineral density) in the proposed population (with no intervention) compared to minimal trauma fracture in the baseline population (with no intervention)? This will confirm the clinical need for testing for bone mineral density in this population.
- What is the effect of HIV infection on minimal trauma fracture or bone mineral density, both with and without anti-retroviral therapy?
- Are there any prognostic factors such as patient age, disease progression or any options of anti-retroviral therapy which impact on the rate of bone mineral density loss or elevate the risk of minimal trauma fracture in this population? This may inform the frequency of re-testing and monitoring.
- What is the rate of bone mineral density loss in the proposed population? What is the rate of bone mineral density loss in the benchmark population? This will provide information regarding the frequency of re-testing and monitoring for the proposed population in light of evidence pertaining to the benchmark population who are already eligible for BMD scanning through the MBS. For the benchmark population (patients taking glucocorticoid therapy) annual retesting is supported by MBS item 12312.

**Summary of the approach to assessment for the population**

The **population** is men and women diagnosed with HIV infection. There is no age restriction. The relevant subpopulations are:

- patients being treated with anti-retrovirals
- patients not being treated with anti-retrovirals

Outcomes should be reported separately for these groups.

The **baseline population** for this DAP is age and gender matched peers who are otherwise healthy.

The **benchmark population** for this DAP is people taking glucocorticoid therapy.

The assessment of evidence should provide evidence on:

- the rate of bone loss and minimal trauma fracture in patients with HIV infection on antiretroviral therapy
- the rate of bone loss and minimal trauma fracture in patients with HIV infection not on antiretroviral therapy
- the rate of bone loss for people taking glucocorticoid therapy

This will be used to identify the baseline risk levels of minimal trauma fracture in the proposed population as PASC has identified a need to explore the question of whether there is evidence of accelerated bone loss and/or elevated risk of minimal trauma fracture in the proposed population.

In the context of this population the rate of bone loss as measured by bone density is an appropriate surrogate marker for minimal trauma fracture.

**Note** that a comparison of the rate of bone loss in the target population to the benchmark population will need to take into account the age and gender of persons within those populations as age and gender are also risk factors for bone mineral density loss.

### **Excluded populations**

- All patients at age 70 and over are excluded, as these are eligible for current MBS items for DXA scanning.
- Patients presenting with a minimal trauma fracture are excluded, as these are eligible for current MBS items for DXA scanning (12306, 12309).
- Patients presenting with premature menopause or male hypogonadism are excluded, as these are eligible for a current MBS item for DXA scanning (12312).
- Patients eligible for any other current MBS item for DXA scanning are excluded.

### **Proposed MBS listing**

The proposed MBS item is shown in Table 5. For patients with T-scores  $\leq -2.5$  repeat scans would be available through the existing MBS item 12306.

Table 5: Proposed MBS item

Category 2 – DIAGNOSTIC PROCEDURES AND INVESTIGATIONS, Bone Densitometry	
MBS XXXXX	
	Bone densitometry (performed by a specialist or consultant physician where the patient is referred by another medical practitioner), using dual energy X-ray absorptiometry, for the measurement of bone mineral density in patients with HIV infections
	Measurement of 2 or more sites – 1 service only in a period of 12 consecutive months - including interpretation and report; not being a service associated with a service to which item 12306, 12309, 12312, 12315, 12318, 12321 or 12323 applies
Fee:	\$102.40 Benefit: 75% = \$76.80 85% = \$87.05
[Relevant explanatory notes]	
(a) All patients diagnosed with HIV are eligible for a DXA scan. All patients are eligible for a repeat scan every 24 months thereafter.	
(b) Patients in this population would be eligible for repeat scans every 12 months if they have HIV and have been prescribed protease inhibitors or nucleoside analogue reverse transcriptase inhibitors	
(c) Patients in this population would be eligible for repeat scans every 12 months if they have low bone mineral density (T-score less than -2.5) [NOTE - this would be claimed through MBS 12306]	
(d) Other relevant notes from D1.27, Bone Densitometry – (Items 12306 to 12323)	

The proposed item would be in addition to existing MBS items for DXA. At 70 all patients will be eligible for existing MBS item 12323. In the event that the assessment phase identifies evidence for

patients with HIV infection taking anti-retroviral therapy but not for HIV infection alone the MBS item descriptor may need to be modified.

Currently, no specific PBS-listed medication is proposed for use in this population.

#### **Clinical place for proposed intervention**

The current diagnosis and management algorithm for suspected or proven low bone mineral density follows in Figure 1. The current and proposed algorithms for the defined patient population (patients with HIV who are not eligible for current MBS items for bone mineral density) follows in Figure 2 and Figure 3.

Figure 1

Current clinical management algorithm for eligibility  
to MBS and PBS items for osteoporosis

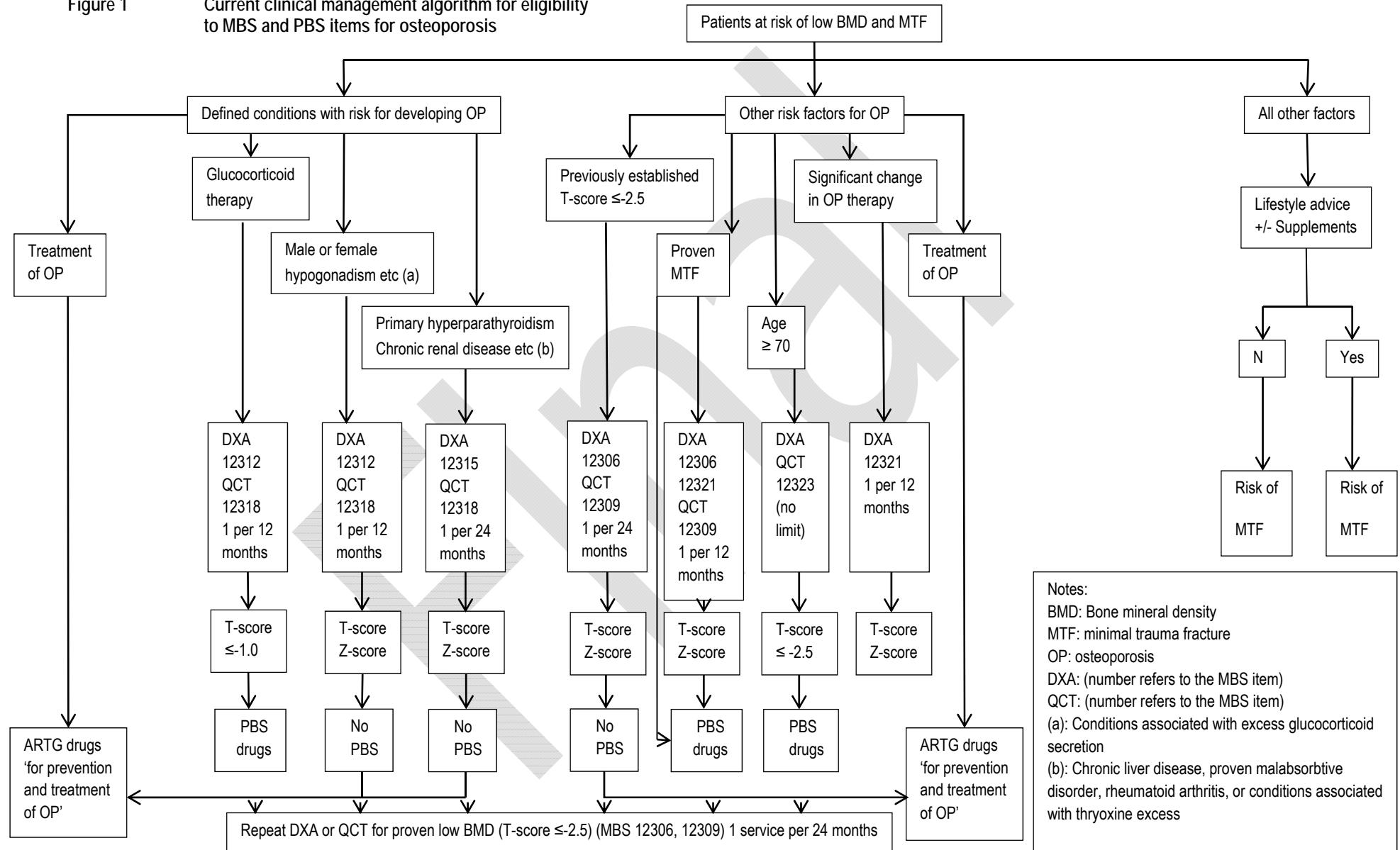


Figure 2 Current clinical management algorithm for osteoporosis management of HIV patients

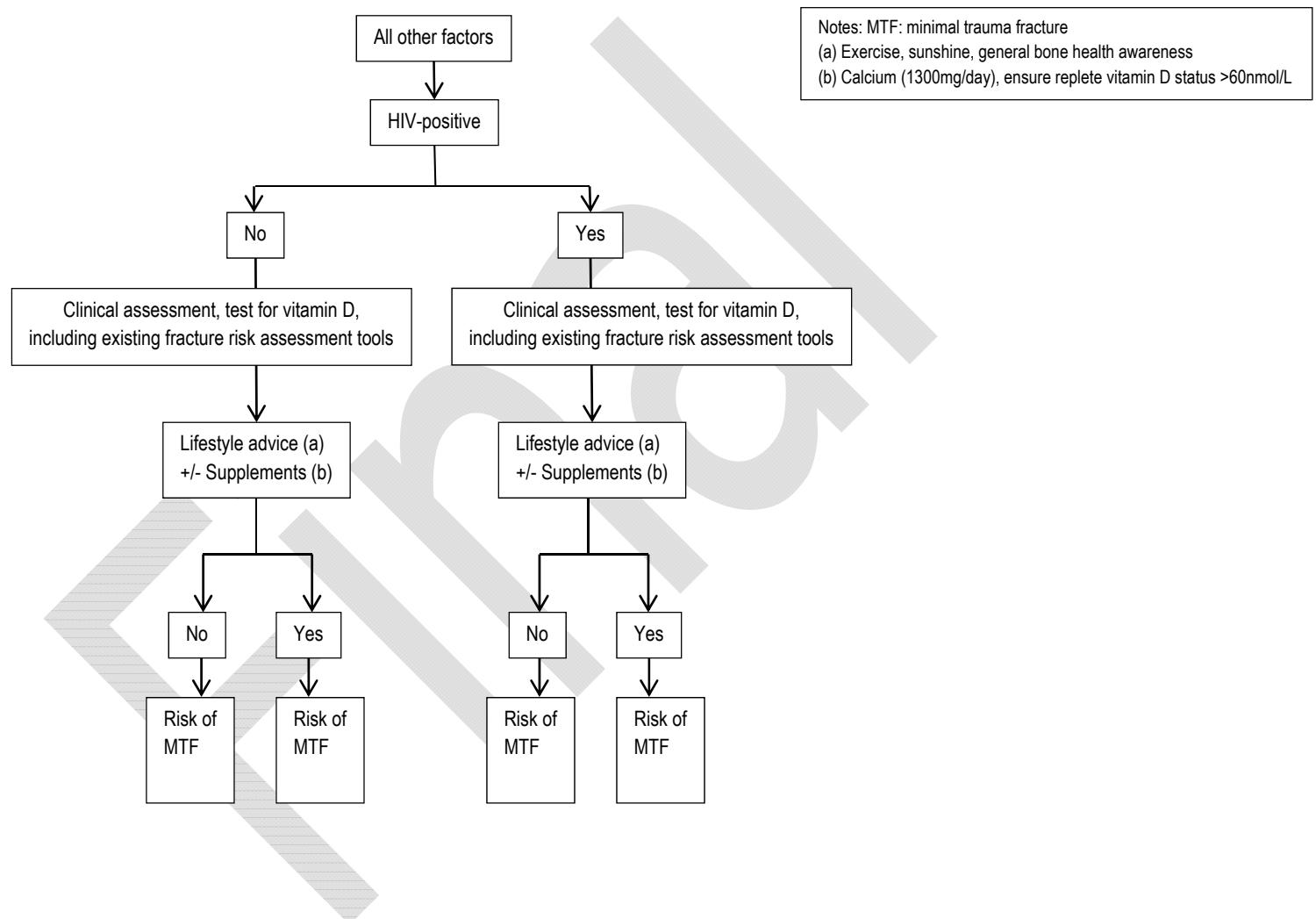
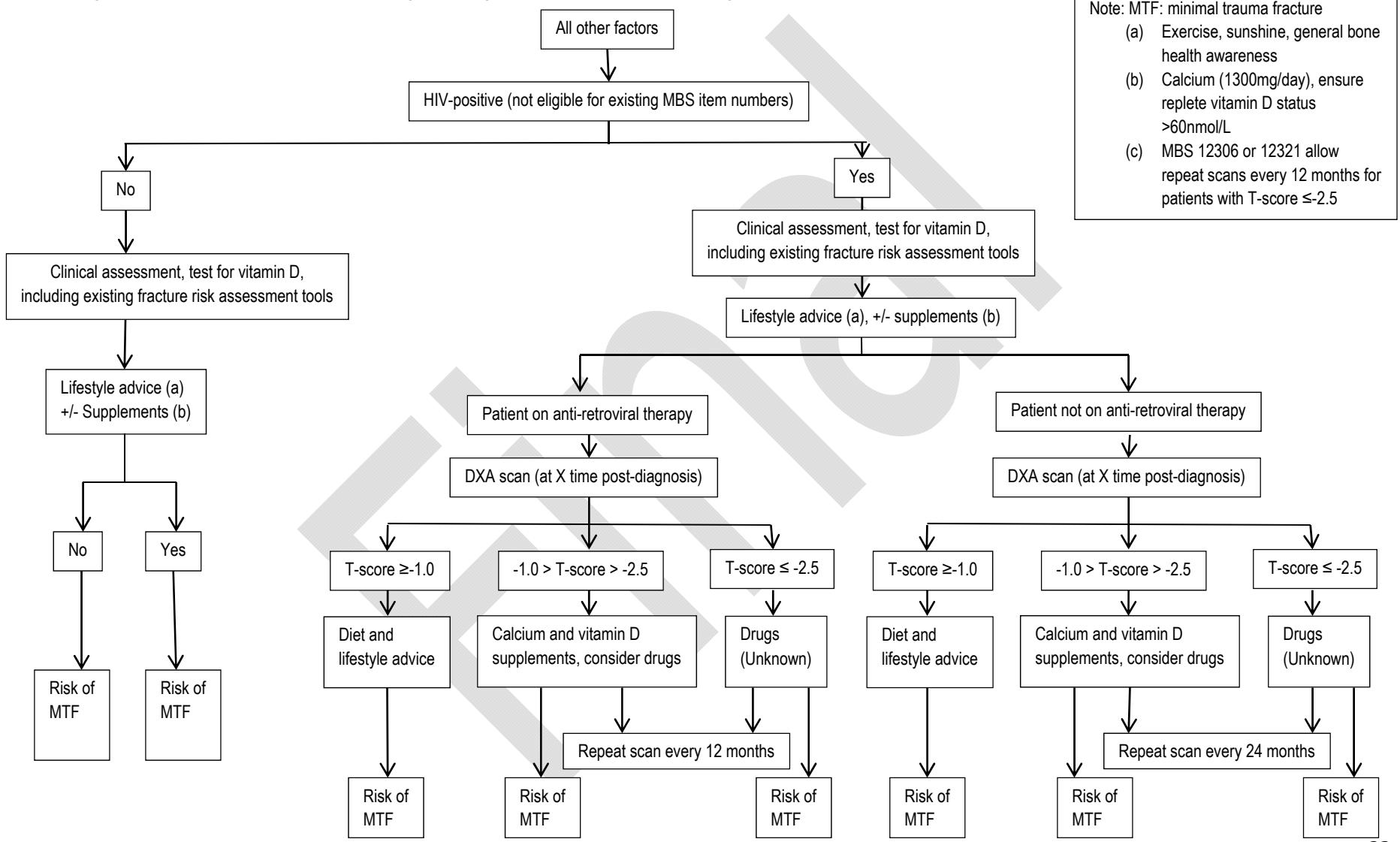


Figure 3 Proposed clinical management algorithm for osteoporosis management of HIV patients



## **Comparator**

Currently patients with HIV do not routinely receive DXA scanning, unless they are 70 years of age or older. Vulnerability to the condition may be predicted through a clinical assessment, including a test for vitamin D and the use of existing fracture determinant tools. Determining the probability of 10-year fracture risk can be estimated through use of the FRAX tool (WHO 2007). This tool and other similar tools can be used in combination with DXA results, or without DXA as a predictor of risk of fracture. Part of the population may take dietary and lifestyle measures to promote good bone health, including supplements (calcium and vitamin D), without a bone mineral density test. These supplements are available without prescription.

The comparator is:

- Lifestyle and dietary advice (calcium and vitamin D) based on a clinical assessment by a general practitioner using existing fracture risk assessment tools (for example the FRAX tool) without the results of a bone mineral density test. This clinical assessment would include a test for vitamin D sufficiency (MBS item 66608).

## **Clinical claim**

The body of evidence indicates that HIV infection leads to significant decreases in bone mineral density and may be exacerbated by anti-retroviral therapy such as protease inhibitors or nucleoside analogue reverse transcriptase inhibitors. The applicant claims that the proposed MBS item will facilitate the identification of patients with low BMD and potentially prevent fractures and thus the associated costs to the healthcare system and patient.

PASC agreed that the assessment of evidence will need to report the effectiveness of the co-dependent medicines in the proportion of the target population for BMD testing who achieve a threshold result to trigger the initiation of prescribed medication.

Table 6 Classification of an intervention for determination of economic evaluation to be presented

		Comparative effectiveness (DXA scanning, AI) versus comparator			
		Superior	Non-inferior	Inferior	
Comparative safety versus comparator	Superior	CEA/CUA	CEA/CUA	Net clinical benefit	
	Non-inferior			Neutral benefit	
	Inferior			Net harms	
	Superior	CEA/CUA		CEA/CUA*	
	Non-inferior	CEA/CUA		None^	
	Superior	Net clinical benefit	CEA/CUA	None^	
	Inferior	Neutral benefit	CEA/CUA*		

Abbreviations: CEA = cost-effectiveness analysis; CUA = cost-utility analysis

\* May be reduced to cost-minimisation analysis. Cost-minimisation analysis should only be presented when the proposed service has been indisputably demonstrated to be no worse than its main comparator(s) in terms of both effectiveness and safety, so the difference between the service and the appropriate comparator can be reduced to a comparison of costs. In most cases, there will be some uncertainty around such a conclusion (i.e., the conclusion is often not indisputable). Therefore, when an assessment concludes that an intervention was no worse than a comparator, an assessment of the uncertainty around this conclusion should be provided by presentation of cost-effectiveness and/or cost-utility analyses.

^ No economic evaluation needs to be presented; MSAC is unlikely to recommend government subsidy of this intervention

#### Questions for the review relating to the economic evaluation

Cost effectiveness models should be undertaken:

- To establish the baseline scenario: What are the downstream costs and outcomes without the proposed intervention?
- To assess the proposed scenario: What are the downstream costs and outcomes with the proposed intervention?
- As noted throughout the DAP, sensitivity analyses should be undertaken around:
  - The factors, ages and eligibility criteria as specified in the proposal;
  - The variables as advised by the available evidence;
  - The variables as advised by PASC as being informative for sensitivity analyses to inform the final decision making.
  - Specifically, what impact does the presence of the HIV infection have on bone mineral density as a surrogate for minimal trauma fracture, in the presence and in the absence of anti-retrovirals? This should include a consideration of the effect of other possible prognostic factors including age and different types of anti-retrovirals.
- The economic analysis should account for different thresholds for therapy as advised by the available evidence.
- The economic evaluation should account for all patients in the target population who become eligible for current MBS items (for example through age or minimal trauma fracture).

## **Outcomes and health care resources affected by introduction of proposed intervention**

### **Outcomes**

Primary effectiveness outcomes:

- Incidence of minimal trauma fracture
- Incidence of all fractures
- Patient-related quality of life

Secondary effectiveness outcomes:

- Change in morbidity/mortality
- Bone mineral density (for example as determined by the T-score) for patients 50 years or older, or Z-score for patients younger than 50 years of age

Safety outcomes and adverse events:

- Any adverse event or complication related to the DXA scanning or treatments for OP
- Any adverse event arising from exposure to ionising radiation

Please note:

- It will be important to note the use and type of anti-retroviral medication in all populations, and to report all outcomes according to this criterion.
- Incidence of minimal trauma fracture is the main primary outcome; however, for this DAP PASC considers that bone mineral density loss is an appropriate surrogate for minimal trauma fracture.
- Where possible, the outcome of minimal trauma fracture should be disaggregated to type and location of fracture (eg hip vs non-hip) as this is important to translate to any possible effects on life-years and quality-adjusted life-years.
- The site of the DXA exam (for example, proximal femur, lumbar spine, hip, distal radius) should be reported for all studies where possible. This is to account for any variability related to the site of the body where the testing is conducted.
- Where men and women are re-tested or monitored, it should be noted whether subsequent tests are undertaken on the same machine, or a different machine but the same model, or at

the same or different practice. This is to account for any variability of test results between machines.

- PASC acknowledges that DXA is associated with low radiation doses, but that increasing the availability of DXA may significantly increase the exposure of the proposed population to ionising radiation, especially when this population includes young adults. This issue should be addressed in the assessment of evidence.

### Health care resources

The following section has been provided by the applicant. All issues and data inputs will be examined and reported in full in the assessment report.

Between 2001 and 2004 the percentage of all HIV cases in patients older than 50 increased from 17% to 24%; and by 2015 it is estimated that almost 50% of people with HIV will be over 50 years of age (Cotter 2011).

Studies spanning the past decade have reported the prevalence of low BMD in the HIV infected population to range between 32% and 71% (Cotter 2011).

People with osteoporosis and HIV will have similar risks of fractures as the HIV negative population. The cost of the management of fractures in the HIV positive population has the potential to be significant.

Table 7 Estimate of patient population that will utilize the proposed item

	Estimate	Upper estimate
People Living with HIV	17,444*	21,391‡
Estimated percentage accessing DXA in a given year	85%	85%¶
Max number of patients requiring a scan annually	14,827	18,182

\*Sixth National HIX Strategy 2010-2013 - 2008 figures  
† <http://www.avert.org/aids-hiv-australia.htm> Dec 2010 figures accessed June 25,2012  
¶ HIV +ve patients generally have good medical care and will have a high uptake of treatment

By 31 December 2010, 30 486 cases of HIV infection had been diagnosed in Australia. An estimated 21,391 people were living with diagnosed HIV infection in Australia at the end of 2010. The number of new HIV diagnoses in Australia in 2010 was 1043. The annual number of new HIV diagnoses has remained relatively stable at around 1000 over the past five years. In addition, the per capita rate of HIV diagnosis in the Aboriginal and Torres Strait Islander population was similar to that in the non-Indigenous population (Kirby Institute 2011).

The applicant has provided data from industry sources that suggests that 34.5% of patients with HIV in Australia are on protease inhibitors. Nearly all HIV patients in Australia receiving treatment are on some sort of nucleoside analogue reverse transcriptase inhibitor. An estimated 69.5% of HIV patients in Australia receive tenofovir, which is the anti-retroviral most associated with bone mineral density loss.

There may be a significant number of patients who will not require annual scans, and this will be investigated in the submission.

Table 8 List of resources to be considered in the economic analysis

Provider of resource	Setting in which resource is provided	Proportion of patients receiving resource	Number of units of resource per relevant time horizon per patient receiving resource	Disaggregated unit cost				
				MBS	Safety nets*	Other govt budget	Private health insurer	Patient
<u>Resources provided to identify eligible population</u>								
- Confirmation of HIV status	Specialist or GP	public	100%					
-								
<u>Resources provided to deliver comparator 1</u>								
-		public	100%					
- Dietary supplements								Patient cost
- Vitamin D test					Fee \$33.20			
<u>Resources provided in association with comparator 1 (e.g., pre-treatments, co-administered interventions, resources used to monitor or in follow-up, resources used in management of adverse events, resources used for treatment of down-stream conditions)</u>								
- N/A								
-								
<u>Resources provided to deliver comparator 2, etc</u>								
- N/A								
-								
<u>Resources provided in association with comparator 2, etc</u>								
- N/A								
-								
<u>Resources provided to deliver proposed intervention</u>								
- Dual-Energy X-ray absorptiometry device	Technician	Mainly private, but there may be some public	100%	1 per patient at 12 - 24 months intervals				
-								
<u>Resources provided in association with proposed intervention</u>								
- Dietary supplements								Patient cost
- Reporting of results to patient	Specialist or GP	Public	100%	Per scan				
- Vitamin D test					Fee \$33.20			
- Treatment	Pharmacy	Private	Unknown	Variable**	\$37.38 to \$589.17	\$5.60 to \$34.20		

\*eligible patients will be referred to have a DXA scan performed through their GP or other health professional in each case

\*\*although the duration of treatment per prescription varies, prescriptions usually contain sufficient medicine to treat the patient for 28 days.

## Proposed structure of economic evaluation (decision-analytic)

Table 9 Summary of extended PICO to define research question that assessment will investigate

Patients	Intervention	Comparator	Outcomes to be assessed	Healthcare resources to be considered
<p>People who are HIV positive Sub-groups of interest:</p> <ul style="list-style-type: none"> <li>• Patients treated with anti-retrovirals</li> <li>• Patients not treated with anti-retroviral medication</li> </ul> <p>Follow-up options:</p> <ul style="list-style-type: none"> <li>• T-score <math>\geq 1.0</math>: no repeat scan</li> <li>• <math>-1.0 &gt; \text{T-score} &gt; -2.5</math>: repeat scan every 24 months</li> <li>• T-score <math>\leq 2.5</math>: repeat scan every 12 months (MBS item 12306)</li> </ul> <p>Sensitivity analyses should investigate other options of repeat scanning as advised by the evidence.</p> <p>Exclude:</p> <p>All men and women at age 70 and over, with a previous minimal trauma fracture, or currently eligible for MBS items for DXA scanning.</p>	<p>DXA scan and treatment with a prescription anti-resorptive drug at a T-score of <math>\leq -2.5</math>. Threshold to therapy options for sensitivity analysis: T-scores of -1.0, -1.5, -2.0. Sensitivity analyses should investigate other options of threshold to therapy as advised by the evidence. QCT is excluded. Different thresholds of access to therapy should be investigated</p>	<p>Clinical assessment including the use of existing fracture risk assessment tools (including vitamin D test) with lifestyle and dietary advice. DXA and QCT scanning are excluded,</p>	<p>Primary effectiveness outcomes:</p> <ul style="list-style-type: none"> <li>• Incidence of minimal trauma fracture</li> <li>• Incidence of all fractures</li> <li>• Patient-related quality of life</li> </ul> <p>Secondary effectiveness outcomes:</p> <ul style="list-style-type: none"> <li>• Change in morbidity/mortality</li> <li>• Bone mineral density (for example as measured by T-score for patients 50 years or older, or Z-score for patients younger than 50 years of age).</li> </ul> <p>Safety outcomes and adverse events:</p> <ul style="list-style-type: none"> <li>• Any adverse event or complication related to the DXA scanning or treatments for OP</li> <li>• Any adverse event arising from exposure to ionising radiation</li> </ul>	See Table 10

MTF: minimal trauma fracture; OP: osteoporosis; MBS: Medicare Benefits Schedule

PASC has specified a range of questions which will need to be addressed during the assessment phase. These questions will guide the evaluation and have been raised throughout the DAP. The assessment should address the questions raised throughout the DAP in relation to the population and intervention in order to provide MSAC with the necessary information to make an informed decision.

PASC also identified a need to appropriately structure the assessment phase so as to inform on broad issues of testing thresholds and monitoring protocols. Given the number and complexity of the questions for the assessment phase the key components and requests from PASC are summarised in Table 10 below.

Table 10 Summary of issues relating to the approach to assessment

Population	Men and women diagnosed with HIV infection. Sub-populations include patients being treated with anti-retroviral therapy and patients not being treated with anti-retroviral therapy.
Context	PASC noted that there was conflicting evidence as to the clinical need for BMD testing in the proposed population and agreed that whether there is a clinical need would need to be explored in the assessment of evidence. All people at age 70 and over are excluded, as these are eligible for current MBS items for DXA scanning.

	People with a history of minimal trauma fracture are excluded, as these are eligible for current MBS items for DXA scanning (12306, 12309).
Baseline population	The baseline population is age and gender matched peers who are otherwise healthy.
Benchmark population	The benchmark population is people being treated with long-term glucocorticoid therapy. This benchmark population may be at similar risk and is eligible for access to current MBS and PBS items. The benchmark population should align in terms of age and gender with the target population.
Approach to assessment	<p>The assessment phase should present evidence to define:</p> <ul style="list-style-type: none"> <li>• the rate of bone loss and minimal trauma fracture in patients with HIV infection on antiretroviral therapy</li> <li>• the rate of bone loss and minimal trauma fracture in patients with HIV infection not on antiretroviral therapy</li> <li>• All outcomes should be reported in terms of any potential prognostic indicator such as patient age, disease severity or type of anti-retroviral therapy.</li> </ul> <p>The assessment phase should also present evidence to inform on the following:</p> <ul style="list-style-type: none"> <li>• The rate of bone loss in the above populations compared to the baseline population (to establish the clinical need for the intervention in the proposed population).</li> <li>• The rate of bone loss in the above populations compared to that in the benchmark population (to establish the clinical need in the proposed population in comparison with a population already eligible for relevant MBS and PBS services).</li> </ul> <p>This will be used to inform the cost effectiveness analysis and establish the clinical need for the proposed intervention.</p>
Intervention	DXA test for bone density, with lifestyle and dietary advice. Therapy with anti-resorptive medicines when patients meet the threshold.
Context	The proposed test is DXA.
Co-dependency	The proposed therapy is lifestyle and dietary advice and treatment with anti-resorptives. There is a co-dependency for this DAP. The assessment of evidence will be required to present evidence with regards to the efficacy of the co-dependent medicines in the proportion of the target population for BMD testing who achieve a threshold result to trigger the initiation of prescribed medication. At this stage no co-dependent submission has been received.
Treatment threshold	The proposed threshold to lifestyle and dietary advice is T-score from -2.5 (excluded) to -1.0 (excluded). The proposed threshold for anti-resorptive therapy is a T-score of less than or equal to -2.5.
Context	The proposal specifies a range of management options for patients depending on their T-score at baseline. A T-score of less than or equal to -2.5 is proposed as the threshold for initiation of anti-resorptive therapies.
Approach to assessment	<p>The assessment phase will be required to present evidence examining various thresholds for initiating therapy. The assessment should examine the following thresholds through sensitivity analysis:</p> <ul style="list-style-type: none"> <li>• T-score -1.0 and -1.5 (PBS eligibility for patients on glucocorticoid therapy), also -2.0</li> <li>• T-score - 2.5 (proposed threshold for anti-resorptive drugs)</li> <li>• T-score as advised by the evidence.</li> </ul> <p>The assessment phase will also be required to examine the question of whether BMD testing will promote patient adherence to lifestyle advice. PASC noted that the proposed population is already in receipt of a substantial amount of lifestyle advice.</p>
Re-testing and monitoring Context	The benchmark population (patients taking glucocorticoid therapy) are currently eligible for annual retesting under MBS item 12312 The proposal has nominated re-testing regimes depending on patients T-score at initial testing and on the management pathway followed. The evidentiary basis for re-testing and monitoring will need to be examined by the assessment phase.
Approach to assessment	<p>The assessment phase is required to provide evidence to inform the question of with what frequency re-testing and monitoring should occur in the population of interest. This should include information on the:</p> <ul style="list-style-type: none"> <li>• rate of bone loss in patients taking antiretroviral therapies but not anti-resorptives (re-testing)</li> <li>• rate of bone loss in patients not taking antiretroviral therapies and not anti-resorptives (re-testing)</li> <li>• rate of bone loss in patients taking antiretroviral therapies and anti-resorptives (monitoring)</li> <li>• rate of bone loss in patients not taking antiretroviral therapies but taking anti-resorptives (monitoring)</li> </ul> <p>This information will inform the appropriate rate of re-testing in the proportion of the population who do not reach the threshold for therapy at their initial test and the appropriate schedule of monitoring in the proportion of the population which has initiated therapy following their initial test.</p> <p>Sensitivity analysis should investigate the following options of re-testing and monitoring:</p>

---

	<ul style="list-style-type: none"> <li>• T-score <math>\geq -1.0</math>: no repeat scan</li> <li>• T-score from -2.5 (excluded) to -1.0 (excluded): repeat scan every 24 months</li> <li>• T-score from -2.5 (excluded) to -1.0 (excluded) and patient is on anti-retroviral therapy: repeat scan every 12 months</li> <li>• T-score <math>\leq 2.5</math>: repeat scan every 12 months (MBS item 12306)</li> <li>• Re-scanning and monitoring using thresholds as advised by the evidence.</li> </ul>
Comparator	Lifestyle and dietary advice (calcium and vitamin D) based on a general clinical assessment by a general practitioner using existing fracture risk assessment tools (for example the FRAX tool) without the results of a bone mineral density test. This clinical assessment would include a test for vitamin D sufficiency (MBS item 66608).
Outcomes	Outcomes include primary effectiveness, secondary effectiveness and safety outcomes. Minimal trauma fracture is a primary effectiveness outcome.
	<p>Primary effectiveness outcomes:</p> <ul style="list-style-type: none"> <li>• Incidence of minimal trauma fracture</li> <li>• Incidence of all fractures</li> <li>• Patient-related quality of life</li> </ul> <p>Secondary effectiveness outcomes:</p> <ul style="list-style-type: none"> <li>• Change in morbidity/mortality</li> <li>• Bone mineral density (for example as measured by T-score for patients 50 years or older, or Z-score for patients younger than 50 years of age).</li> </ul> <p>Safety outcomes and adverse events:</p> <ul style="list-style-type: none"> <li>• Any adverse event or complication related to the DXA scanning or treatments for OP</li> <li>• Any adverse event arising from exposure to ionising radiation</li> </ul> <p>Please note:</p> <p>It will be important to note the use and type of anti-retroviral medication in all populations, and to report all outcomes according to this criterion.</p>
Context	PASC has stated that change in BMD as measured by a T-score or Z-score is an acceptable surrogate marker for the risk of MTF.
Approach to assessment	<p>Where possible, the outcome of minimal trauma fracture should be disaggregated to type and location of fracture (e.g. hip vs non-hip) as this is important to translate to any possible effects on life-years and quality-adjusted life-years.</p> <p>The location of the DXA exam (for example, proximal femur, lumbar spine, hip, distal radius) should be reported for all studies where possible.</p> <p>Where patients are re-tested, it should be noted whether subsequent tests are undertaken on the same machine, or a different machine but the same model, or at the same or different practice.</p> <p>PASC acknowledges that DXA is associated with low radiation doses, but that increasing the availability of DXA may significantly increase the exposure of the proposed population to ionising radiation, especially when this population includes young adults. This issue should be addressed in the assessment of evidence.</p> <p>Any evidence relating to the proportion of patients in the target population who will have a T-score below each nominated threshold should be reported.</p> <p>Outcomes should be separated according to subpopulations if possible.</p>

---

## Clinical research questions for public funding

- Is the proposed population of men and women with HIV infection, with and without antiretroviral therapy, at greater risk of minimal trauma fracture than the baseline population? Are there any other prognostic indicators to bone loss, such as patient age, disease progression or type of anti-retroviral medication?
- What is the safety of DXA and management of bone mineral density compared with no DXA and no bone loss management (or non-prescription bone loss management) for HIV patients with or without retroviral therapy?

- What is the effectiveness of DXA and management of bone mineral density compared with no DXA and no bone loss management (or non-prescription bone loss management) for HIV patients with or without retroviral therapy?
- What is the cost effectiveness of DXA and management of bone mineral density compared with no DXA and no bone loss management (or non-prescription bone loss management) for HIV patients with or without retroviral therapy?
  - Sensitivity analyses should be undertaken to provide information on the range of variables identified throughout this DAP.
- At what threshold should therapy be made available to the population?
- At what frequency should re-testing and monitoring be made available to the population?

PASC is interested to define the baseline fracture rate and bone mineral density loss in the HIV population, how this differs from fracture rate and BMD loss in the broader population with age, and how a specific intervention (scanning and medication) can improve bone loss outcomes. Ideally the main outcome measure should be fracture rate. In the absence of this information change in BMD as measured by a T-score or Z-score is an acceptable surrogate marker for the risk of MTF.

## References

- Australian Institute of Health and Welfare 2008. A picture of osteoporosis in Australia. Arthritis
- Australian Institute of Health and Welfare 2010a. Use of health services for arthritis and osteoporosis. Arthritis series no. 14. Cat. no. PHE 130. Canberra: AIHW.
- Australian Institute of Health and Welfare 2010b. Medication use for arthritis and osteoporosis. Cat. no. PHE 121. Canberra: AIHW.
- Australian Institute of Health and Welfare 2011. A snapshot of osteoporosis in Australia 2011. Arthritis series no. 15. Cat. no. PHE 137. Canberra: AIHW.
- Australian Medicines Handbook (AMH), URL: <https://shop.amh.net.au/January> [accessed March 2012]
- Bedimo R, Zhang S, Dreschler H, Tebas P, Mallouf N. Risk of osteoporotic fractures associated with cumulative exposure to tenofovir and other antiretroviral agents. In: Program and abstracts of the 13th International Workshop on Adverse Drug Reactions and Comorbidities (Rome). London: International Medical Press, 2011.
- Bolland MJ, et al Low Body Weight Mediates the relationship between HIV infection and Low Bone Mineral Density: A Meta-Analysis. *Journal of Clinical Endocrinology and Metabolism* 92 (12) 4522-4528 2007
- Bolland MJ, Wang TKM, Grey A et al 2011. Stable bone density in HAART-treated individuals with HIV: a meta-analysis. *J Clin Endocrinol Metab* 96:2721-2731.
- Brown TT et al. Antiretroviral therapy and the prevalence of osteopenia and osteoporosis: a meta-analytic review. *AIDS* 2006;20(17):2165-74.
- Center JR, Bliuc D, Nguyen TV & Eisman JA 2007. Risk of subsequent fracture after low-trauma fracture in men and women. *Journal of American Medical Association* 297:387–94.
- Cotter, EJ et al. HIV Proteins Regulate bone marker secretion and transcription factor activity in cultured human osteoblasts and consequent potential implications for osteoblast function and development. *AIDS Res Hum Retroviruses* 2007; 23:1521-30
- Cotter, AG and Mallon PWG, HIV Infection and Bone Disease: implications for an aging population. *Sexual Health* 2011, 8, 493-501
- Damilakis J, Guglielmi G. Quality Assurance and Dosimetry in Bone Densitometry. *Radiology Clinics of North America* (2010):48(3):629-640
- Dasher LG, Newton CD, Lenchik L. Dual X-ray Absorptiometry in Today's Clinical Practice. *Radiologic Clinics of North America* 2010;48(3):541-560.

Elders, P.J.M., Netelenbos, J.C., et al 1988. 'Accelerated vertebral bone loss in relation to menopause: a cross-sectional study on lumbar bone density in 286 women of 46-55 years of age', *Bone and Mineral*, 5 (1), 11-19.

Ewald, D.P., Eisman, J.A., et al 2009. 'Population rates of bone densitometry use in Australia, 2001-2005, by sex and rural versus urban location'. *Medical Journal of Australia*, 190 (3), 126-128.

Fakruddin JM et al HIP envelope gp120-mediated regulation of osteoclastogenesis via receptor activator of nuclear factor kappa B ligand (RANKL) secretion and its modulation by certain HIV protease inhibitors through interferon-gamma/RANKL cross-talk. *J. Biol Chem* 2003; 278:48251-8.

Fakruddin JM et al, HIV-1 Vpr enhances production of receptor activated NF-kappaB ligand (RANKL) via potentiation of glucocorticoid receptor activity. *Ach Virol* 2005; 150:67-78

Gallant JE, Staszewski S, Pozniak AL, et al. Efficacy and safety of tenofovir DF vs stavudine in combination therapy in antiretroviralnaive patients: a 3-year randomized trial. *JAMA* 2004; 292:191–201.

Gibellini D, Borderi M, De Cognis E, et al. RANKL/OPG/TRAIL plasma levels and bone mass loss evaluation in antiretroviral naïve HIV-1-positive men. *J Med Virol* 2007; 79:1446–54.

Haskelberg H, Hoy JF, Amin J, Ebeling PR, Emery S, et al. (2012) Changes in Bone Turnover and Bone Loss in HIV-Infected Patients Changing Treatment to Tenofovir-Emtricitabine or Abacavir-Lamivudine. *PLoS ONE* 7(6): e38377. doi:10.1371/journal.pone.0038377

Kirby Institute. HIV, viral hepatitis and sexually transmissible infections in Australia Annual Surveillance Report 2011. The Kirby Institute, the University of New South Wales, Sydney, NSW

Marcus R, Feldman D, Nelson DA, Rosen CJ (editors). Osteoporosis (Third Edition), Chapter 2 – The Nature of Osteoporosis, by Marcus R and Bouxsein M. Elsevier Inc. 2008 pp. 27-36

McComsey GA, Kitch D, Daar ES, et al. Bone mineral density and fractures in antiretroviral-naive persons randomized to receive abacavir-lamivudine or tenofovir disoproxil fumarate-emtricitabine along with efavirenz or atazanavir-ritonavir: AIDS Clinical Trials Group A5224s, a substudy of ACTG A5202. *J Infect Dis* 2011; 203:1791–801.

National Institutes of Health (NIH). 2012, Bone Mass Measurement: What the Numbers Mean [internet]. Available from:  
[http://www.niams.nih.gov/Health\\_Info/Bone/Bone\\_Health/bone\\_mass\\_measure.asp](http://www.niams.nih.gov/Health_Info/Bone/Bone_Health/bone_mass_measure.asp) [Accessed 3 June 2013].

Nowson, C.A., McGrath, J.J., et al 2012. 'Working Group of the Australian and New Zealand Bone and Mineral Society, Endocrine Society of Australia and Osteoporosis Australia; Vitamin D and health in adults in Australia and New Zealand: a position statement', *Medical Journal of Australia*, 196 (11), 686-687.Ofotokun I. et al, HIV:Inflammation and Bone; *Curr HIV/AIDS Rep* (2012) 9:16-25

RACGP 2010a, Algorithm for the prevention and treatment of osteoporosis in postmenopausal women and older men. The Royal Australian College of General Practitioners, [Internet]. Available from: <<http://www.racgp.org.au/guidelines/musculoskeletaldiseases/osteoporosis>> [Accessed July 2013].

RACGP 2010b, Clinical guideline for the prevention and treatment of osteoporosis in postmenopausal women and older men. The Royal Australian College of General Practitioners, [Internet]. Available from: <<http://www.racgp.org.au/guidelines/musculoskeletaldiseases/osteoporosis>> [Accessed Julyne 2013].

Santen, R.J.2011. 'Effect of endocrine therapies on bone in breast cancer patients', Journal of Clinical Endocrinology and Metabolism, 98 (2), 308-319.

SIGN – Scottish Intercollegiate Guidelines Network – Management of osteoporosis, A national clinical guideline, June 2003. Website: [Accessed June 2011]

Stellbrink HJ, Orkin C, Arribas JR, et al. Comparison of changes in bone density and turnover with abacavir-lamivudine versus tenofovir-emtricitabine in HIV-infected adults: 48-week results from the ASSERT study. Clin Infect Dis 2010; 51:963–72.

The Royal Australian College of General Practitioners (2010) Clinical guideline for the prevention and treatment of osteoporosis in postmenopausal women and older men. *The Royal Australian College of General Practitioners*

Walker Harris, Vanessa and Brown,Todd. Bone Loss in the HIV- Infected Patient: Evidence, Clinical Implications, and Treatment Strategies, Journal of Infectious Diseases, 2012:205 (Suppl 3) S397

World Health Organisation (2007) Assessment of osteoporosis at the primary health care level. Summary Report of a WHO Scientific Group. WHO, Geneva,  
[http://www.shef.ac.uk/FRAZ/pdfs/WHO\\_Technical\\_Report.pdf](http://www.shef.ac.uk/FRAZ/pdfs/WHO_Technical_Report.pdf)

## Appendix 1 Examples of treatments currently listed on the ARTG for the treatment of osteoporosis

ARTG number	Product name	Approved indication
<b>Selective oestrogen receptor modulators (SERMs)</b>		
161797	Femarelle	Standard: For the symptomatic relief of menopause. Specific: Maintenance of bone health.
64709	Evista	Evista is indicated for the prevention and treatment of osteoporosis in post-menopausal women. Evista is indicated for the reduction in the risk of invasive breast cancer in postmenopausal women with osteoporosis. Evista is indicated for the reduction in the risk of invasive breast cancer in postmenopausal women at high risk of invasive breast cancer.
<b>Bisphosphonates</b>		
ARTG number	Product name	Approved indication
113482, 120028, 136846, 1 57805, 161137, 53158, 54380, 67262, 68428, 73520, 73772, 76851, 93333, 98944	Fosamax	Specific: Treatment of osteoporosis in postmenopausal women to prevent fractures, including those of the hip and spine (vertebral compression fractures) and to help ensure vitamin D adequacy and/or to reduce the risk of Vitamin D insufficiency. Treatment of osteoporosis in men to prevent fractures and to help ensure vitamin D adequacy and/or to reduce the risk of Vitamin D insufficiency indicated for the treatment of Paget's disease of bone in men & women.
46852	Didrocal	Specific: Treatment of osteoporosis. Osteoporosis must be confirmed by the finding of low bone mass (at least two standard deviations below the gender-specific mean for young adults) or by the presence or history of osteoporotic fracture. Prevention of bone loss in patients for whom long-term treatment with high-dose corticosteroids is either about to be commenced or has been recently initiated
117667, 138211, 141530, 150618, 166838, 166853, 166942, 74135, 74136, 82746	Actonel	Specific: Treatment of osteoporosis. Treatment of glucocorticoid-induced osteoporosis. Preservation of bone mineral density in patients on long-term corticosteroid therapy.
134664	Aclasta	Specific: Treatment of osteoporosis in postmenopausal women to reduce the incidence of hip, vertebral and non-vertebral fractures. - Treatment of osteoporosis in patients over 50 years of age with a history of at least one low trauma hip fracture, to reduce the incidence of further fractures. - To increase bone mineral density in men with osteoporosis. - To increase bone mineral density in patients with osteoporosis associated with long term glucocorticoid use. To prevent glucocorticoid-

---

induced bone mineral density loss. - Treatment of Paget's disease of bone.

---

**Monoclonal antibodies**

ARTG number	Product name	Approved indication
159322, 159323, 159324	Denosumab	The treatment of osteoporosis in postmenopausal women. Prolia significantly reduces the risk of vertebral, non-vertebral and hip fractures.

---

**Parathyroid hormone**

ARTG number	Product name	Approved indication
80333	Teriparatide	indicated for the treatment of osteoporosis in postmenopausal women and the treatment of primary osteoporosis in men when other agents are considered unsuitable and when there is a high risk of fractures. Teriparatide is indicated for the treatment of osteoporosis associated with sustained systemic glucocorticoid therapy in women and men at high risk for fracture.

---

**Strontium ranelate**

ARTG number	Product name	Approved indication
99978	Strontium ranelate (Protos)	Treatment of postmenopausal osteoporosis to reduce the risk of fracture. Treatment of osteoporosis in men at increased risk of fracture.

---

Source: Australian Register of Therapeutic Goods (ARTG) searched on 01/08/2012 <  
<https://www.ebs.tga.gov.au/>>

## Appendix 2 Indications, contraindications and potential complications of the co-administered interventions

Co-administered interventions		
<b>Bisphosphonates; Alendronate (Fosamax), Disodium etidronate (Didrocal), Risedronate (Actonel), Zoledronic Acid (Aclasta)</b>		
Indication	Contraindication	Side effects
Paget's disease of bone	Abnormalities of the oesophagus which delay oesophageal emptying, such as stricture or achalasia.	<i>Common</i> nausea, vomiting, diarrhoea, headache, hypocalcaemia, musculoskeletal pain (may rarely be severe and/or disabling) <i>IV:</i> fever, flu-like symptoms, injection site reaction, increased creatinine concentration, hypophosphataemia, myalgia, bone pain, hypertension
Prevention and treatment of osteoporosis (including postmenopausal and corticosteroid-induced)	Inability to stand or sit upright for at least 30 minutes.	<i>Infrequent</i> oesophagitis, oesophageal erosions and ulcers (mainly with alendronate), gastritis, duodenitis, glossitis, rash <i>IV:</i> hypotension, hypomagnesaemia, hypokalaemia
Hypercalcaemia of malignancy	Hypersensitivity to any component of bisphosphonates. Hypocalcaemia. Severe hypercalciuria.	<i>Rare</i> heart failure, renal impairment, ocular inflammation, osteonecrosis of the jaw, allergic reactions including angioedema <i>IV:</i> anaphylactic shock
Prevention of skeletal-related events in patients with malignancies involving bone		<i>Possible associations</i> Atypical low-energy femoral fractures have occurred rarely during long-term bisphosphonate treatment for osteoporosis. It is possible that bisphosphonates slightly increase the risk of AF, although this association was not found in all studies. Some epidemiological data suggest an association between long-term use of oral bisphosphonates and an increased risk of oesophageal cancer; further
Prevention and treatment of heterotopic ossification due to spinal cord injury or complicating total hip replacement		*Osteonecrosis of the jaw Risk appears to be associated with the potency, route and total dose of bisphosphonate and a history of dental surgery, trauma or disease.

---

evidence is needed.

---

**Hormone Replacement Therapy**  
**[prevention (Grade A), treatment (Grade A)]**

<b>Indication</b>	<b>Contraindication</b>	<b>Side effects</b>
Prevention of postmenopausal osteoporosis when there is a high risk of fractures and alternative treatment is inappropriate	Breast cancer or other oestrogen-dependent tumour. Unexplained vaginal bleeding. History of endometriosis Uterine fibroids Migraine—may be exacerbated or relieved. Diabetes—HRT may improve glycaemic control Epilepsy Treatment with enzyme-inducing drugs Smoking Systemic lupus erythematosus Hereditary angioedema	<p><i>Common</i> breast enlargement and tenderness, abnormal mammogram, headache, depression, change in libido, irregular or breakthrough bleeding, spotting, endometrial hyperplasia (oestrogen-only HRT; infrequent with combined HRT), leg cramps, dry eye syndrome (oestrogen-only HRT; infrequent with combined HRT)</p> <p><i>Infrequent</i> benign proliferative breast disease, breast cancer, premenstrual-like syndrome, dementia, migraine, cardiovascular events, fluid retention, oedema, increased BP, exacerbation or recurrence of endometriosis, acne, itch, nausea, increased triglycerides, gall stones</p> <p><i>Rare</i> cholestatic jaundice, pancreatitis, glucose intolerance, galactorrhoea, visual changes, chloasma, hypersensitivity (angioedema, urticaria), ovarian cancer, endometrial cancer, enlargement of uterine fibroids, enlargement of hepatic haemangiomas</p>

---

**Selective oestrogen receptor modulators (SERMs); Raloxifene hydrochloride (Evista)**  
**[treatment (Grade A)]**

ARTG: Evista: 64709; Femarelle: 161797

<b>Indication</b>	<b>Contraindication</b>	<b>Side effects</b>
For the symptomatic relief of menopause.	Venous thromboembolism (VTE) — contraindicated in patients with a history of VTE or risk factors for VTE .	<p><i>Common</i> hot flushes, sweating, leg cramps, peripheral oedema, sleep disorders</p>
Maintenance of bone health, indicated for the prevention and treatment of osteoporosis.	Prolonged immobilisation—increases risk of VTE. Women with or at risk of coronary heart disease—increased risk of VTE or fatal stroke.	<p><i>Infrequent</i> VTE</p>
Hormone receptor-positive breast cancer	History of hypertriglyceridaemia induced by oestrogens—increased risk of hypertriglyceridaemia. History of breast cancer—raloxifene is not indicated for treating, or reducing risk of recurrence of, breast cancer. hepatic impairment Surgery Pregnancy Breastfeeding Contraindicated.	

---

**Monoclonal antibodies; Denosumab (Prolia)**

ARTG: 159322, 159323, 159324

<b>Indication</b>	<b>Contraindication</b>	<b>Side effects</b>
Treatment of postmenopausal osteoporosis	Hypocalcaemia Renal increased risk of hypocalcaemia if CrCl <30 mL/minute.	<i>Common</i> eczema, hypercholesterolaemia  <i>Infrequent</i> skin infections (mainly cellulitis)  <i>Rare</i> hypocalcaemia, osteonecrosis of the jaw

**Teriparatide (Forteo) (parathyroid hormone) [treatment – (Grade A)]**

ARTG: 80333

<b>Indication</b>	<b>Contraindication</b>	<b>Side effects</b>
Postmenopausal osteoporosis when there is a high risk of fractures and other agents are unsuitable	Paget's disease of bone Hyperparathyroidism Urolithiasis, hypercalcaemia Skeletal malignancies, history of skeletal radiation treatment, unexplained increases in ALP— manufacturer discourages use. Treatment with alendronate—may reduce the effectiveness of teriparatide; combination not recommended. Effect of combination with other bisphosphonates is not known. Renal Limited clinical experience in renal impairment; avoid if CrCl <30mL/minute. manufacturer discourages use in children and young adults with open epiphyses. Avoid in women planning to conceive or who are not using adequate contraception. Pregnancy Breastfeeding	<i>Common</i> nausea, headache, dizziness, muscle cramp, arthralgia, hyperuricaemia, injection site reactions  <i>Infrequent</i> hypercalcaemia, myalgia, increased ALP  <i>Rare</i> allergic reactions
Primary osteoporosis in men when there is a high risk of fractures and other agents are unsuitable		
Corticosteroid-induced osteoporosis in patients at high risk of fractures		

**Strontium Ranelate (Protos)**

[treatment – (Grade A)]

<b>Indication</b>	<b>Contraindication</b>	<b>Side effects</b>
Treatment of postmenopausal osteoporosis to reduce the risk of fracture.	Known hypersensitivity to strontium ranelate or to any of the excipients	<i>Common</i> Headache, disturbances in consciousness, memory loss, nausea, diarrhoea, loose stools, venous thromboembolism, blood creatinine phosphokinase (CPK) increase
Treatment of osteoporosis in men at increased risk of fracture.	Severe renal impairment (see Pharmacokinetics – Special Populations)	
	Current or previous venous thromboembolic events (VTE), including deep vein thrombosis and pulmonary embolism.	<i>Uncommon</i> Seizures.
	Temporary or permanent immobilisation (e.g. post-surgical recovery or prolonged bed rest).um	

---

ranelate or to any of the excipients

Severe renal impairment (see  
Pharmacokinetics – Special  
Populations)

Current or previous venous  
thromboembolic events (VTE),  
including deep vein thrombosis and  
pulmonary embolism.

- Temporary or permanent  
immobilisation (e.g. post-surgical  
recovery or prolonged bed rest).

---

**Calcium and vitamin D [prevention (Grade C), treatment (Grade C)]**

---

<b>Indication</b>	<b>Contraindication</b>	<b>Side effects</b>
Calcium; Adjunctive treatment in osteoporosis	Hypercalcaemia Hypercalciuria, history of nephrolithiasis Treatment with digoxin Treatment with calcitriol Decreased gastric acidity Phenylketonuria Sodium restriction Renal Monitor plasma calcium concentration in renal impairment; if necessary, reduce dosage or stop.	<i>Common</i> belching, flatulence, abdominal distension, constipation  <i>Infrequent</i> hypercalcaemia, alkalosis, hypophosphataemia  <i>Rare</i> renal calculi, milk-alkali syndrome IV skin necrosis (extravasation), irritation
Vitamin D; Treatment of osteoporosis, when vitamin D supplementation is recommended	Vitamin D; Hyperphosphataemia (Vitamin D only)	Vitamin D; hypercalcaemia, renal and cardiovascular damage may occur because of ectopic calcification.

All information obtained from the Australian Medicines Handbook (AMH), January 2012 or the NHMRC clinical guidelines 2010

## Appendix 3 PBS listed pharmaceuticals (by drug) for the treatment of diseases of bone structure and mineralisation

Drug	strength	Indication code	Specific indication	BMD / T-score
<b>Bisphosphonates</b>				
Alendronate Sodium	40 mg alendronic acid	3256	Symptomatic Paget disease of bone	N/A
	70 mg alendronic acid	4122	<p>Corticosteroid-induced osteoporosis in a patient currently on long-term (<math>\geq 3</math> months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.</p> <p>Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.</p> <p>Duration and dose of corticosteroid therapy together with the date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.</p>	$\leq -1.5$
		4133	<p>Osteoporosis in a patient aged 70 years or older.</p> <p>Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.</p> <p>Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.</p>	$\leq -2.5$
		4123	<p>Established osteoporosis in a patient with fracture due to minimal trauma.</p> <p>Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.</p> <p>Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated.</p> <p>A vertebral fracture is defined as a <math>\geq 20\%</math> reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a <math>\geq 20\%</math> reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.</p>	N/A
Alendronate	70 mg	N/A	For preservation of bone mineral density in patients on long-term glucocorticoid therapy where patients	$< -1.0$

Sodium with Colecalciferol	alendronic acid + 70 micrograms colecalciferol		are undergoing continuous treatment with a dose $\geq 7.5$ mg of prednisone or equivalent per day. Prescribers need to demonstrate that the patient has been on continuous therapy for $\geq 3$ months and demonstrate that the patient is osteopenic.	
		4070	Corticosteroid-induced osteoporosis in a patient currently on long-term ( $\geq 3$ months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Duration and dose of corticosteroid therapy together with the date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	$\leq -1.5$
		4087	Osteoporosis in a patient aged 70 years or older.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	$\leq -2.5$
		4087	Established osteoporosis in a patient with fracture due to minimal trauma.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated. A vertebral fracture is defined as a $\geq 20\%$ reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a $\geq 20\%$ reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.	N/A
	70 mg + 140 microg	N/A	For preservation of bone mineral density in patients on long-term glucocorticoid therapy where patients are undergoing continuous treatment with a dose $\geq 7.5$ mg of prednisone or equivalent per day. Prescribers need to demonstrate that the patient has been on continuous therapy for $\geq 3$ months and demonstrate that the patient is osteopenic.	$< -1.0$
		4122	Corticosteroid-induced osteoporosis in a patient currently on long-term ( $\geq 3$ months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.	$\leq -1.5$

			Duration and dose of corticosteroid therapy together with the date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	
		4133	Osteoporosis in a patient aged 70 years or older.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	≤-2.5
		4123	Established osteoporosis in a patient with fracture due to minimal trauma.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated. A vertebral fracture is defined as a ≥20% reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a ≥ 20% reduction in any of these heights compared to the vertebral body above or below the affected vertebral body	N/A
Alendronate Sodium with Colecalciferol and Calcium Carbonate	70 mg + 140 microg + 500 mg	N/A	For preservation of bone mineral density in patients on long-term glucocorticoid therapy where patients are undergoing continuous treatment with a dose ≥7.5 mg of prednisone or equivalent per day. Prescribers need to demonstrate that the patient has been on continuous therapy for ≥ 3 months and demonstrate that the patient is osteopenic.	<-1.0
		4122	Corticosteroid-induced osteoporosis in a patient currently on long-term (≥ 3 months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Duration and dose of corticosteroid therapy together with the date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	≤-1.5
		4133	Osteoporosis in a patient aged 70 years or older.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be	≤-2.5

			documented in the patient's medical records when treatment is initiated.	
		4123	<p>Established osteoporosis in a patient with fracture due to minimal trauma.</p> <p>Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.</p> <p>Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated.</p> <p>A vertebral fracture is defined as a ≥20% reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a ≥ 20% reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.</p>	N/A
Risedronate Sodium	5 mg	N/R	<p>For preservation of bone mineral density in patients on long-term glucocorticoid therapy where patients are undergoing continuous treatment with a dose ≥7.5 mg of prednisone or equivalent per day.</p> <p>Prescribers need to demonstrate that the patient has been on continuous therapy for≥ 3 months and demonstrate that the patient is osteopenic.</p>	<-1.0
		4122	Corticosteroid-induced osteoporosis in a patient currently on long-term (≥ 3 months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.	≤-1.5
		4117	<p>Osteoporosis in a patient aged 70 years or older.</p> <p>Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.</p> <p>Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.</p>	≤-3.0
		4123	<p>Established osteoporosis in a patient with fracture due to minimal trauma.</p> <p>Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.</p> <p>Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated.</p> <p>A vertebral fracture is defined as a ≥20% reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a ≥ 20% reduction in any of these heights compared to the vertebral body above or below the affected vertebral body</p>	N/A
	30 mg	3256	Symptomatic Paget disease of bone	N/A
	35 mg	N/R	For preservation of bone mineral density in patients on long-term glucocorticoid therapy where patients are undergoing continuous treatment with a dose equal to or greater than 7.5 mg of prednisone or equivalent per day. Prescribers need to demonstrate that the patient has been on continuous therapy	<-1.0

			for 3 months or more and demonstrate that the patient is osteopenic.	
	4122		Corticosteroid-induced osteoporosis in a patient currently on long-term ( $\geq 3$ months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.	$\leq 1.5$
	4117		Osteoporosis in a patient aged 70 years or older.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	$\leq 3.0$
	4123		Established osteoporosis in a patient with fracture due to minimal trauma.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated. A vertebral fracture is defined as a $\geq 20\%$ reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a $\geq 20\%$ reduction in any of these heights compared to the vertebral body above or below the affected vertebral body	N/A
Tablet 35 mg (enteric coated)	N/A		For preservation of bone mineral density in patients on long-term glucocorticoid therapy where patients are undergoing continuous treatment with a dose equal to or greater than 7.5 mg of prednisone or equivalent per day. Prescribers need to demonstrate that the patient has been on continuous therapy for 3 months or more and demonstrate that the patient is osteopenic.	$< 1.0$
	4122		Corticosteroid-induced osteoporosis in a patient currently on long-term ( $\geq 3$ months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.	$\leq 1.5$
	4117		Osteoporosis in a patient aged 70 years or older.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	$\leq 3.0$
	4123		Established osteoporosis in a patient with fracture due to minimal trauma.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must	N/A

			be documented in the patient's medical records when treatment is initiated. A vertebral fracture is defined as a ≥20% reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a ≥ 20% reduction in any of these heights compared to the vertebral body above or below the affected vertebral body	
150 mg	4122	4122	Corticosteroid-induced osteoporosis in a patient currently on long-term (≥ 3 months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.	≤-1.5
		4117	Osteoporosis in a patient aged 70 years or older.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.  Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	≤-3.0
		4123	Established osteoporosis in a patient with fracture due to minimal trauma.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.  Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated.  A vertebral fracture is defined as a ≥20% reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a ≥ 20% reduction in any of these heights compared to the vertebral body above or below the affected vertebral body	N/A
Risedronate Sodium and Calcium Carbonate	35 mg + 500 mg	N/R	For preservation of bone mineral density in patients on long-term glucocorticoid therapy where patients are undergoing continuous treatment with a dose equal to or greater than 7.5 mg of prednisone or equivalent per day. Prescribers need to demonstrate that the patient has been on continuous therapy for 3 months or more and demonstrate that the patient is osteopenic.	<-1.0
		4122	Corticosteroid-induced osteoporosis in a patient currently on long-term (≥ 3 months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.	≤-1.5
		4117	Osteoporosis in a patient aged 70 years or older.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.  Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	≤-3.0
		4123	Established osteoporosis in a patient with fracture due to minimal trauma.	N/A

			Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.  Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated.  A vertebral fracture is defined as a ≥20% reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a ≥ 20% reduction in any of these heights compared to the vertebral body above or below the affected vertebral body	
	35 mg + 1.25g (enteric coated)	N/A	For preservation of bone mineral density in patients on long-term glucocorticoid therapy where patients are undergoing continuous treatment with a dose equal to or greater than 7.5 mg of prednisone or equivalent per day. Prescribers need to demonstrate that the patient has been on continuous therapy for 3 months or more and demonstrate that the patient is osteopenic.	<-1.0
		4122	Corticosteroid-induced osteoporosis in a patient currently on long-term (≥ 3 months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.	≤-1.5
		4117	Osteoporosis in a patient aged 70 years or older.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.  Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	≤-3.0
		4123	Established osteoporosis in a patient with fracture due to minimal trauma.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition.  Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated.  A vertebral fracture is defined as a ≥20% reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a ≥ 20% reduction in any of these heights compared to the vertebral body above or below the affected vertebral body	N/A
Risedronate Sodium and Calcium Carbonate with Colecalciferol	35 mg + 2.5 g + 22 microg	N/R	For preservation of bone mineral density in patients on long-term glucocorticoid therapy where patients are undergoing continuous treatment with a dose equal to or greater than 7.5 mg of prednisone or equivalent per day.  Prescribers need to demonstrate that the patient has been on continuous therapy for 3 months or more and demonstrate that the patient is osteopenic.	<-1.0
		4122	Corticosteroid-induced osteoporosis in a patient currently on long-term (≥ 3 months), high-dose (7.5 mg/day prednisolone or equivalent) corticosteroid therapy.	≤-1.5

		4117	Osteoporosis in a patient aged 70 years or older.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	≤-3.0
		4123	Established osteoporosis in a patient with fracture due to minimal trauma.  Patient must not receive concomitant treatment with any other PBS-subscribed anti-resorptive agent for this condition. Fracture must have been demonstrated radiologically and the year of plain x-ray, CT or MRI scan must be documented in the patient's medical records when treatment is initiated. A vertebral fracture is defined as a ≥20% reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body or a ≥ 20% reduction in any of these heights compared to the vertebral body above or below the affected vertebral body	N/A
Disodium Etidronate	200 mg	3257	Paget disease of bone when calcitonin has been found to be unsatisfactory due to lack of efficacy	N/A
		3258	Paget disease of bone when calcitonin has been found to be unsatisfactory due to unacceptable side effects	
		1153	Heterotopic ossification	
Disodium Etidronate and Calcium Carbonate	200 mg + 1.25g	2646	Established osteoporosis in patients with fracture due to minimal trauma	N/A
Dosodium Pamidronate	15 mg/5 mL injection, 1 x 5	3341	Hypercalcaemia of malignancy refractory to anti-neoplastic therapy	N/A
	30 mg/10 mL injection, 1 x 10 mL vial	3341	Hypercalcaemia of malignancy refractory to anti-neoplastic therapy	N/A
	60 mg/10 mL injection, 1 x 10 mL vial	3341	Hypercalcaemia of malignancy refractory to anti-neoplastic therapy	N/A
	90 mg	3341	Hypercalcaemia of malignancy refractory to anti-neoplastic therapy	N/A
		3342	Multiple myeloma	

	3343	Bone metastases from breast cancer		
	4 vials powder 15 mg + 4 ampoules solvent 5 ml	3341	Treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy	
	2 vials powder 30 mg + 2 ampoules solvent 10 ml	3256	Paget disease of bone	
	Concentrated injection 15 mg in 5 mL	N/R 3256	Treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy Symptomatic Paget disease of bone	
	Concentrated injection 30 mg in 10 mL	N/R 3256	Treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy Symptomatic Paget disease of bone	
	Concentrated injection 60 mg in 10 mL	N/R 3256	Treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy Symptomatic Paget disease of bone	
	Concentrated injection 90 mg in 10 mL	N/R	Treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy	
	90 mg injection [1 x 90 mg vial] (&) inert substance diluent [1 x 10 mL ampoule], 1 pack	N/R	Hypercalcaemia of malignancy refractory to anti-neoplastic therapy Multiple myeloma Bone metastases from breast cancer	
	30 mg injection [2 x 30 mg vials] (&) inert substance	N/R 3256	Treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy Symptomatic Paget disease of bone	

	diluent [2 x 10 mL ampoules], 1 pack			
	15 mg injection [4 x 15 mg vials] (&) inert substance diluent [4 x 5 mL ampoules]	N/R 3256	Treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy Symptomatic Paget disease of bone	N/A
Clodronate sodium	400 mg	N/R	Maintenance treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy; Multiple myeloma Bone metastases from breast cancer	N/A
	800 mg	N/R	Maintenance treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy; Multiple myeloma Bone metastases from breast cancer	N/A
-Tiludronate Disodium	200 mg	3256	Symptomatic Paget disease of bone	N/A
-Ibandronic Acid	6 mg/6 mL injection, 1 x 6 mL vial	3343	Bone metastases from breast cancer	N/A
	50 mg	N/R	Bone metastases from breast cancer	N/A
Zoledronic Acid	4 mg/5 mL injection, 1 x 5 mL vial	N/R 3342 3343 4052 3341	Multiple myeloma Bone metastases from breast cancer Bone metastases from castration-resistant prostate cancer Treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy	N/A
	5 mg/100 mL injection, 1 x 100 mL vial	4100	Corticosteroid-induced osteoporosis in a patient currently on (prednisolone or equivalent) corticosteroid therapy. The Clinical criteria is: Patient must currently be on long-term (at least 3 months), high-dose (at least 7.5 mg per day prednisolone or equivalent) corticosteroid therapy, AND the Clinical criteria is:	≤1.5

		Patient must have a Bone Mineral Density (BMD) T-score of -1.5 or less, AND the Clinical criteria is: Patient must not receive concomitant treatment with any other PBS-subsidised anti-resorptive agent for this condition, AND the Clinical criteria is: Patient must not receive more than one PBS-subsidised treatment per year. The duration and dose of corticosteroid therapy together with the date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	
	4149	Osteoporosis The Population criteria is: Patient must be aged 70 years or older, AND the Clinical criteria is: Patient must have a Bone Mineral Density (BMD) T-score of -3.0 or less, AND the Clinical criteria is: Patient must not receive concomitant treatment with any other PBS-subsidised anti-resorptive agent for this condition, AND the Clinical criteria is: Patient must not receive more than one PBS-subsidised treatment per year. The date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.	≤-3.0
	4157	Established osteoporosis The Clinical criteria is: Patient must have fracture due to minimal trauma, AND the Clinical criteria is: Patient must not receive concomitant treatment with any other PBS-subsidised anti-resorptive agent for this condition, AND the Clinical criteria is: Patient must not receive more than one PBS-subsidised treatment per year. The fracture must have been demonstrated radiologically and the year of plain x-ray or computed tomography (CT) scan or magnetic resonance imaging (MRI) scan must be documented in the patient's medical records when treatment is initiated. A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of	N/R

			these heights compared to the vertebral body above or below the affected vertebral body.	
	N/R		Symptomatic Paget disease of bone. Only 1 treatment each year per patient will be PBS-subsidised	
	3947		Osteoporosis in a patient aged 70 years of age or older	≤-3.0
	3946		Established osteoporosis in a patient with fracture due to minimal trauma	N/A
	N/R		Symptomatic Paget disease of bone Only 1 treatment each year per patient will be PBS-subsidised	N/A
4 mg/5 mL injection, 1 x 5 mL vial10 mg	3342		Multiple myeloma	N/A
	3343		Bone metastases from breast cancer	N/A
	4052		Bone metastases from castration-resistant prostate cancer	N/A
	3341		hypercalcaemia of malignancy refractory to anti-neoplastic therapy	N/A
<b>Selective estrogen receptor modulator (SERM)</b>				
raloxifene hydrochloride	60 mg	4071	Established post-menopausal osteoporosis  The Clinical criteria is:  Patient must have fracture due to minimal trauma, AND the Clinical criteria is:  Patient must not receive concomitant treatment with any other PBS-subsidised anti-resorptive agent for this condition.  The fracture must have been demonstrated radiologically and the year of plain x-ray or computed tomography (CT) scan or magnetic resonance imaging (MRI) scan must be documented in the patient's medical records when treatment is initiated.  A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.	N/A
<b>Monoclonal antibody</b>				
Denosumab	120 mg/1.7ml	4158 4150	Bone metastases from breast cancer  Bone metastases from castration-resistant prostate cancer	N/A
	60 mg/ml	4094	Osteoporosis  The Population criteria is:  Patient must be female, AND the Population criteria is:	≤-2.5  N/A

			<p>Patient must be aged 70 years or older, AND the Clinical criteria is: Patient must have a Bone Mineral Density (BMD) T-score of -2.5 or less, AND the Clinical criteria is: Patient must not receive concomitant treatment with any other PBS-subsidised anti-resorptive agent for this condition. The date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.</p>	
	4145		<p>Established post-menopausal osteoporosis The Clinical criteria is: Patient must have fracture due to minimal trauma, AND the Clinical criteria is: Patient must not receive concomitant treatment with any other PBS-subsidised anti-resorptive agent for this condition. The fracture must have been demonstrated radiologically and the year of plain x-ray or computed tomography (CT) scan or magnetic resonance imaging (MRI) scan must be documented in the patient's medical records when treatment is initiated. A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.</p>	
Carbamazepine	200 mg		<p>Continuing therapy only. For prescribing by nurse practitioners as continuing therapy only, where the treatment of, and prescribing of medicine for, a patient has been initiated by a medical practitioner. Further information can be found in the Explanatory Notes for Nurse Practitioners. Note For item codes 2419H and 1706T, pharmaceutical benefits that have the form tablet 200 mg are equivalent for the purposes of substitution.</p>	N/A
	N/R		<p>For item codes 5040G and 1724R, pharmaceutical benefits that have the form tablet 200 mg are equivalent for the purposes of substitution.</p>	N/A
<b>Parathyroid Hormone</b>				

Teriparatide	20 microgram/dose injection, 1 x 2.4 mL cartridge	<p>Initial treatment, as the sole PBS-subsidised agent, by a specialist or consultant physician, for severe, established osteoporosis in a patient with a very high risk of fracture who:</p> <ul style="list-style-type: none"> <li>(a) has a bone mineral density (BMD) T-score of -3.0 or less; and</li> <li>(b) has had 2 or more fractures due to minimal trauma; and</li> <li>(c) has experienced at least 1 symptomatic new fracture after at least 12 months continuous therapy with an anti-resorptive agent at adequate doses.</li> </ul> <p>A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.</p> <p>If treatment with anti-resorptive therapy is contraindicated according to the relevant TGA-approved Product Information, details of the contraindication must be provided at the time of application.</p> <p>If an intolerance of a severity necessitating permanent treatment withdrawal develops during the relevant period of use of one anti-resorptive agent, alternate anti-resorptive agents must be trialled so that the patient achieves the minimum requirement of 12 months continuous therapy. Details of accepted toxicities including severity can be found on the Medicare Australia website at <a href="http://www.medicareaustralia.gov.au">www.medicareaustralia.gov.au</a> and must be provided at the time of application.</p> <p>Anti-resorptive therapies for osteoporosis and their adequate doses which will be accepted for the purposes of administering this restriction are alendronate sodium 10 mg per day or 70 mg once weekly, risedronate sodium 5 mg per day or 35 mg once weekly or 150 mg once monthly, raloxifene hydrochloride 60 mg per day (women only), denosumab 60 mg once every 6 months, disodium etidronate 200 mg with calcium carbonate 1.25 g per day, strontium ranelate 2 g per day and zoledronic acid 5 mg per annum.</p> <p>Details of prior anti-resorptive therapy, fracture history including the date(s), site(s), the symptoms associated with the fracture(s) which developed during the course of anti-resorptive therapy and the score of the qualifying BMD measurement must be provided to Medicare Australia at the time of application.</p> <p><b>Note</b></p> <p>No applications for increased maximum quantities and/or repeats will be authorised.</p>	≤-3.0
--------------	---	---	-------

			<p>Continuing treatment for severe established osteoporosis where the patient has previously been issued with an authority prescription for this drug.</p> <p>Teriparatide must only be used for a lifetime maximum of 18 months therapy (18 pens). Up to a maximum of 18 pens will be reimbursed through the PBS.</p> <p><b>Note</b></p> <p>No applications for increased maximum quantities and/or repeats will be authorised.</p> <p>Continuing treatment for severe established osteoporosis where the patient has previously been issued with an authority prescription for this drug.</p> <p>Teriparatide must only be used for a lifetime maximum of 18 months therapy (18 pens). Up to a maximum of 18 pens will be reimbursed through the PBS.</p> <p><b>Note</b></p> <p>No applications for increased maximum quantities and/or repeats will be authorised.</p>	
<b>strontium ranelate</b>	2 g	4117	<p>Osteoporosis</p> <p>The Population criteria is:</p> <p>Patient must be aged 70 years or older,</p> <p>AND the Clinical criteria is:</p> <p>Patient must have a Bone Mineral Density (BMD) T-score of -3.0 or less,</p> <p>AND the Clinical criteria is:</p> <p>Patient must not receive concomitant treatment with any other PBS-subsidised anti-resorptive agent for this condition.</p> <p>The date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.</p>	≤-3.0
		4123	<p>Established osteoporosis</p> <p>The Clinical criteria is:</p> <p>Patient must have fracture due to minimal trauma,</p> <p>AND the Clinical criteria is:</p> <p>Patient must not receive concomitant treatment with any other PBS-subsidised anti-resorptive agent for this condition.</p> <p>The fracture must have been demonstrated radiologically and the year of plain x-ray or computed tomography (CT) scan or magnetic resonance imaging (MRI) scan must be documented in the patient's medical records when treatment is initiated.</p>	N/A

			A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of these heights compared to the vertebral body above or below the affected vertebral body..	
<b>Calcitriol</b>	0.25 microg	1165	Hypocalcaemia due to renal disease.	N/A
		1166	Hypoparathyroidism.	N/A
		1167	Hypophosphataemic rickets.	N/A
		1467	Vitamin D-resistant rickets.	N/A
		2636	Established osteoporosis in patients with fracture due to minimal trauma.	N/A
<p>1153 Heterotopic ossification.</p> <p>1165 Hypocalcaemia due to renal disease.</p> <p>1166 Hypoparathyroidism.</p> <p>1167 Hypophosphataemic rickets.</p> <p>1467 Vitamin D-resistant rickets.</p> <p>2636 Treatment for established osteoporosis in patients with fracture due to minimal trauma. The fracture must have been demonstrated radiologically and the year of plain x-ray or CT-scan or MRI scan must be documented in the patient's medical records when treatment is initiated. A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.</p> <p>2645 Treatment as the sole PBS-subsidised anti-resorptive agent for osteoporosis in a patient aged 70 years of age or older with a Bone Mineral Density (BMD) T-score of -3.0 or less. The date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.</p> <p>2646 Treatment as the sole PBS-subsidised anti-resorptive agent for established osteoporosis in patients with fracture due to minimal trauma. The fracture must have been demonstrated radiologically and the year of plain x-ray or CT-scan or MRI scan must be documented in the patient's medical records when treatment is initiated. A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.</p> <p><b>Note</b> Anti-resorptive agents in established osteoporosis include alendronate sodium, risedronate sodium, denosumab, disodium etidronate, raloxifene hydrochloride, strontium ranelate and zoledronic acid.</p>				

2647 Treatment as the sole PBS-subsidised anti-resorptive agent for established post-menopausal osteoporosis in patients with fracture due to minimal trauma. The fracture must have been demonstrated radiologically and the year of plain x-ray or CT-scan or MRI scan must be documented in the patient's medical records when treatment is initiated.

A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.

Note

Anti-resorptive agents in established osteoporosis include alendronate sodium, risedronate sodium, denosumab, disodium etidronate, raloxifene hydrochloride, strontium ranelate and zoledronic acid.

2758 Treatment as the sole PBS-subsidised anti-resorptive agent for osteoporosis in a woman aged 70 years or older with a bone mineral density (BMD) T-score of -3.0 or less.

The date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.

3070 Treatment as the sole PBS-subsidised anti-resorptive agent for corticosteroid-induced osteoporosis in a patient currently on long-term (at least 3 months), high-dose (at least 7.5 mg per day prednisolone or equivalent) corticosteroid therapy with a Bone Mineral Density (BMD) T-score of -1.5 or less. The duration and dose of corticosteroid therapy together with the date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.

3256 Symptomatic Paget disease of bone.

3257 Symptomatic Paget disease of bone when calcitonin has been found to be unsatisfactory due to lack of efficacy

3258 Symptomatic Paget disease of bone when calcitonin has been found to be unsatisfactory due to unacceptable side effects

3341Treatment of hypercalcaemia of malignancy refractory to anti-neoplastic therapy

3342 Multiple myeloma

3343 Bone metastases from breast cancer

3256 Symptomatic Paget disease of bone.

3257 Symptomatic Paget disease of bone when calcitonin has been found to be unsatisfactory due to lack of efficacy.

3258 Symptomatic Paget disease of bone when calcitonin has been found to be unsatisfactory due to unacceptable side effects.

3933 Treatment as the sole PBS-subsidised anti-resorptive agent for osteoporosis in a patient aged 70 years of age or older with a Bone Mineral Density (BMD) T-score of -2.5 or less. The date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.

3945 Treatment as the sole PBS-subsidised anti-resorptive agent for corticosteroid-induced osteoporosis in a patient currently on long-term (at least 3 months), high-dose (at least 7.5 mg per day prednisolone or equivalent) corticosteroid therapy with a Bone Mineral Density (BMD) T-score of -1.5 or less.

3946 Treatment as the sole PBS-subsidised anti-resorptive agent for established osteoporosis in a patient with fracture due to minimal trauma.

A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.

In all cases, the fracture must have been demonstrated radiologically and the year of plain x-ray or CT-scan or MRI scan must be documented in the patient's medical records when treatment is initiated.

Only 1 treatment each year per patient will be PBS-subsidised.

3947 Treatment as the sole PBS-subsidised anti-resorptive agent for osteoporosis in a patient aged 70 years of age or older with a Bone Mineral Density (BMD) T-score of -3.0 or less.

The date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.

Only 1 treatment each year per patient will be PBS-subsidised.

3987

Treatment as the sole PBS-subsidised anti-resorptive agent for established post-menopausal osteoporosis in a woman with fracture due to minimal trauma. The fracture must have been demonstrated radiologically and the year of plain x-ray or CT-scan or MRI scan must be documented in the patient's medical records when treatment is initiated.

A vertebral fracture is defined as a 20% or greater reduction in height of the anterior or mid portion of a vertebral body relative to the posterior height of that body, or, a 20% or greater reduction in any of these heights compared to the vertebral body above or below the affected vertebral body.

Note

Anti-resorptive agents in established osteoporosis include alendronate sodium, risedronate sodium, denosumab, disodium etidronate, raloxifene hydrochloride, strontium ranelate and zoledronic acid.

4052 Bone metastases from castration-resistant prostate cancer.

4054 Treatment as the sole PBS-subsidised anti-resorptive agent for osteoporosis in a woman aged 70 years of age or older with a Bone Mineral Density (BMD) T-score of -2.5 or less.

The date, site (femoral neck or lumbar spine) and score of the qualifying BMD measurement must be documented in the patient's medical records when treatment is initiated.

Source: Pharmaceutical Benefits Scheme (PBS) as on 01/09/2012 <<http://www.pbs.gov.au/browse/body-system?depth=3&codes=m05b>>. Authority required to access details of indication for each drug.

## Appendix 4 PBS listed pharmaceuticals (by indication) for treatment of diseases of bone structure and mineralisation

Indication	ARTG	PBS (indicated T-score)
Prevention and/or treatment of osteoporosis	Alendronate sodium:120028, 76851; Risedronate sodium: 141530, 150618, 166838, 166853, 166942, 74135, 82746	No drug specifically indicated
Treatment for established osteoporosis (T-score ≤-2.0) (MBS item 12321)	Alendronate sodium: 76851, 9333, 161137, 73520, 67262, 73772; Disodium etidronate: 46852	No drug specifically indicated
<b>Risk factors for osteoporosis</b>		
Postmenopausal women, with fracture	Alendronate sodium: 157805, 68428, 120028, 53158, 67262, 76851, 98944; Disodium etidronate: 46852; Zoledronic acid: 134664	Raloxifene hydrochloride , Raloxifene hydrochloride (with fractures), Denosumab (with fractures), Strontium ranelate (with fractures)
Previous fractures (including minimal trauma fractures)(MBS item 12306, 12321)	Alendronate sodium: 161137, 67262, 73772, 76851, 93333, 98944; Zoledronic acid: 134664	Alendronate sodium , Alendronate sodium with Colecalciferol , Alendronate sodium with Colecalciferol and Calcium carbonate , Risedronate sodium , Risedronate sodium and Calcium carbonate , Risedronate sodium and Calcium carbonate with Colecalciferol , Disodium etidronate and Calcium carbonate , Zolendronic acid , Denosumab (for postmenopausal women), Teriparatide (≤-3.0), Strontium ranelate (for postmenopausal women), Raloxifene hydrochloride (for postmenopausal women), Calcitriol .
70 years or over (MBS item 12323)	No drug specifically indicated	Alendronate sodium (≤-2.5), Alendronate sodium with Colecalciferol (≤-2.5), Alendronate sodium with Colecalciferol and Calcium carbonate (≤-2.5), Risedronate sodium (≤-3.0), Risedronate sodium and Calcium carbonate (≤-3.0), Risedronate sodium and Calcium carbonate with Colecalciferol (≤-3.0), Zolendronic acid (≤-3.0), Denosumab (≤-2.5), Strontium ranelate (≤-3.0 for women)
Corticosteroids use (MBS item 12312)	Alendronate sodium: 68428, 80333, 53158, 67262, 76851, 9333, 98944; Disodium etidronate: 46852; Risedronate	Alendronate sodium (≤-1.5), Alendronate sodium with Colecalciferol (≤-1.5), Alendronate sodium with

	sodium: 117667, 138211, 141530, 150618, 166838, 166853, 166942, 74135, 82746; Zoledronic acid: 134664;	Colecalciferol and Calcium carbonate ( $\leq$ 1.5), Risedronate sodium ( $\leq$ 1.0 if patients on steroids for > 3 months), Risedronate sodium ( $\leq$ 1.5), Risedronate sodium and Calcium carbonate (NR), Risedronate sodium and Calcium carbonate with Colecalciferol ( $\leq$ 1.5), Zolendronic acid ( $\leq$ 1.5)
Male Hypogonadism (MBS item 12312)	No drug specifically indicated	No drug specifically indicated
Famale Hypogonadismlasting >6 months before age of 45 (MBS item 12312)	No drug specifically indicated	No drug specifically indicated
Primary Hyperparathyroidism (MBS item 12315)	No drug specifically indicated	No drug specifically indicated
Chronic renal disease (MBS item 12315)	No drug specifically indicated	No drug specifically indicated
Chronic liver disease (MBS item 12315)	No drug specifically indicated	No drug specifically indicated
Rheumatoid arthritis (MBS item 12315)	No drug specifically indicated	No drug specifically indicated
Conditions associated with thyroxine excess (MBS item 12315)	No drug specifically indicated	No drug specifically indicated
Proven malabsorptive disorders (MBS item 12315)	No drug specifically indicated	No drug specifically indicated
Breast cancer patients receiving aromatase inhibitor treatment	No drug specifically indicated	No drug specifically indicated
HIV	No drug specifically indicated	No drug specifically indicated
Paget's disease *	Risedronate sodium: 74136	Alendronate sodium, Risedronate sodium, Disodium etidronate, Disodium pamidronate, Zolendronic acid, Tiludronate disodium
Heterotopic ossification*	No drug specifically indicated	Disodium etidronate
hypercalcaemia of malignancy*	Sodium clodronate tetrahydrate: 181921, 181922, 66703, 66704,	Disodium pamidronate, Sodium clodronate tetrahydrate, Zolendronic acid
Multiple myeloma*	No drug specifically indicated	Disodium pamidronate, Sodium clodronate tetrahydrate, Zolendronic acid
Bone metastases from breast cancer*	No drug specifically indicated	Ibandronic acid, Disodium pamidronate, Sodium clodronate tetrahydrate, Zolendronic acid
Bone metastases from prostate cancer*	No drug specifically indicated	Zolendronic acid

\*not considered as a risk factor for osteoporosis; NR: Not reported.

Source: Pharmaceutical Benefits Scheme (PBS) as on 01/09/2012 <<http://www.pbs.gov.au/browse/body-system?depth=3&codes=m05b>>. Authority required to access details of indication for each drug (including indicated T-score)

## **Appendix 5 Medicare Benefits Schedule - Note D1.27**

Category 2 - DIAGNOSTIC PROCEDURES AND INVESTIGATIONS D1.27 Bone Densitometry - (Items 12306 to 12323)

Item 12321 is intended to allow for bone mineral density measurement following a significant change in therapy - e.g. a change in the class of drugs - rather than for a change in the dosage regimen.

Item 12323 enables the payment of a Medicare benefit for a bone densitometry service performed on a patient aged 70 years or over. The Government has decided to expand access to Medicare subsidised bone mineral density testing to coincide with the expanded eligibility for the osteoporosis medication 'alendronate' under the Pharmaceutical Benefits Scheme.

An examination under any of these items covers the measurement of 2 or more sites, interpretation and provision of a report. Two or more sites must include the measurement of bone density of the lumbar spine and proximal femur. If technical difficulties preclude measurement at these sites, other sites can be used for the purpose of measurements. The measurement of bone mineral density at either forearms or both heels or in combination is excluded for the purpose of Medicare benefit.

### **Referrals**

Bone densitometry services are available on the basis of referral by a medical practitioner to a specialist or consultant physician. However, providers of bone densitometry to whom a patient is referred for management may determine that a bone densitometry service is required in line with the provisions of Items 12306, 12309, 12312, 12315, 12318, 12321 and 12323.

For Items 12306 and 12309 the referral should specify the indication for the test, namely:

- (a) 1 or more fractures occurring after minimal trauma; or
- (b) monitoring of low bone mineral density proven by previous bone densitometry.

For Item 12312 the referral should specify the indication for the test, namely:

- (a) prolonged glucocorticoid therapy;
- (b) conditions associated with excess glucocorticoid secretion;
- (c) male hypogonadism; or
- (d) female hypogonadism lasting more than 6 months before the age of 45.

For Item 12315 the referral should specify the indication for the test, namely:

- (a) primary hyperparathyroidism;
- (b) chronic liver disease;

- (c) chronic renal disease;
- (d) proven malabsorptive disorders;
- (e) rheumatoid arthritis; or
- (f) conditions associated with thyroxine excess.

For Item 12318 the referral should specify the indication for the test, namely:

- (a) prolonged glucocorticoid therapy;
- (b) conditions associated with excess glucocorticoid secretion;
- (c) male hypogonadism;
- (d) female hypogonadism lasting more than 6 months before the age of 45;
- (e) primary hyperparathyroidism;
- (f) chronic liver disease;
- (g) chronic renal disease;
- (h) proven malabsorptive disorders;
- (i) rheumatoid arthritis; or
- (j) conditions associated with thyroxine excess.

#### Definitions

Low bone mineral density is present when the bone (organ) mineral density falls more than 1.5 standard deviations below the age matched mean or more than 2.5 standard deviations below the young normal mean at the same site and in the same gender.

For Items 12312 and 12318

- (a) 'Prolonged glucocorticoid therapy' is defined as the commencement of a dosage of inhaled glucocorticoid equivalent to or greater than 800 micrograms beclomethasone dipropionate or budesonide per day; or
  - (b) a supraphysiological glucocorticoid dosage equivalent to or greater than 7.5 mg prednisolone in an adult taken orally per day;

for a period anticipated to last for at least 4 months.

Glucocorticoid therapy must be contemporaneous with the current scan. Patients no longer on steroids would not qualify for benefits.

For Items 12312 and 12318

- (a) Male hypogonadism is defined as serum testosterone levels below the age matched normal range.
- (b) Female hypogonadism is defined as serum oestrogen levels below the age matched normal range.

For Items 12315 and 12318

A malabsorptive disorder is defined as one or more of the following:

- (a) malabsorption of fat, defined as faecal fat estimated at greater than 18 gm per 72 hours on a normal fat diet; or
- (b) bowel disease with presumptive vitamin D malabsorption as indicated by a sub-normal circulating 25-hydroxyvitamin D level; or
- (c) histologically proven Coeliac disease.

Related Items: 12306, 12309, 12312, 12315, 12318, 12321, 12323