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## EDITOR'S MESSAGE

Osteoporosis is a worldwide medical issue as the aging population is increasing globally in a dramatical fashion. Bone fracture as a complication from osteoporosis also leads to hospitalization and increased mortality. As osteoporosis develops without symptoms, it is important to know its associated risk factors in order to plan for preventive care and the therapeutic options for treatment of this condition. In this issue, you will read about diagnosis and treatment of osteoporosis in an article written by rheumatologist, Dr Helen Tsang. Orthopaedic colleagues, Dr Zhang and Dr Yan, provide us with information on the surgical treatment of osteoporotic fracture with illustrative X-ray images. Ms Cheung, a Traditional Chinese Medicine (TCM) practitioner, enlightens us on the treatment of this condition from the TCM perspective. A physiotherapist, Mr Ryan Choi, is in the best position to educate us on the types of exercise as non-pharmacological method in the management of osteoporosis. Last but not the least, a nurse specialist Dr Minnie Siu, wrote about nursing care plan involving patient education and home modification to minimize fall risk.

Happy reading!

## CLINICAL FEATURES, DIAGNOSIS AND TREATMENT OF OSTEOPOROSIS

### Dr Helen Tsang Hoi Lun

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### Introduction

Osteoporosis represents a growing public health problem in the aging population worldwide. In a community-based study in Hong Kong, 36.8% of women have osteoporosis and the risk of osteoporosis increases with age (9.6% vs 35.8% for women aged between 45-65 years and  $\geq 65$  years, respectively).<sup>1</sup> One of the most serious consequences of osteoporosis is bone fracture, which can lead to pain, reduced mobility, severe debilitation and even death. The most common osteoporotic fractures are fractures of the hip, spine and distal forearm. Up to 20% of hip fracture patients die within a year of the event, and of those patients who survive, almost 60% of them remain disabled and require assistance with activities of daily living.<sup>2</sup> Osteoporosis poses a socioeconomic burden on the society by incurring the costs related to acute management and rehabilitation of bone fracture and related complications, as well as loss of working abilities.

### Definition

Osteoporosis is characterized by low bone mass and alteration of bone architecture, resulting in increased bone fragility and fracture risk. The World Health Organization (WHO) has defined the diagnostic thresholds for low bone mass (osteopenia) and osteoporosis using dual-energy x-ray absorptiometry (DXA) based on the standard deviation (SD) difference between a patient's bone mineral density (BMD) compared to a young adult reference population (T-score) (Table 1). Osteopenia is defined as a T-score between 1.0 and 2.5 SDs below the young adult mean and osteoporosis is defined as a T-score more than 2.5 SDs below the young adult mean, provided all the other causes of low BMD have been ruled out.<sup>3</sup>

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**Table 1** The World Health Organization criteria for diagnosis of osteoporosis

Diagnostic category	Definitions
Normal	BMD within 1 SD of the young adult mean (T-score $\geq -1.0$ )
Osteopenia	BMD $>1$ SD below the young adult mean, but $<2.5$ SD below this value (T-score $< -1.0$ and $> -2.5$ )
Osteoporosis	BMD $\geq 2.5$ SD below the young adult mean (T-score $\leq -2.5$ )
Severe (established) Osteoporosis	BMD $\geq 2.5$ SD below the young adult mean (T-score $\leq -2.5$ ) in the presence of $\geq 1$ fragility fractures)

BMD denotes bone mineral density and SD standard deviation.

## Diagnosis

A clinical diagnosis of osteoporosis may be made in the presence of a fragility fracture. In the absence of a fragility fracture, osteoporosis can be diagnosed based on BMD measurement by DXA scan (T-score  $\leq 2.5$  SDs at any site). Vertebral fracture is the most common clinical manifestation of osteoporosis and is usually diagnosed incidentally on radiographs. It can also present as height loss and back pain.

Since osteoporosis is usually asymptomatic until the patient presents with a fracture, it is important for healthcare providers to identify patients with clinical risk factors (Table 2) and medical conditions associated with osteoporosis (Table 3), as well as recognizing the radiographic finding of osteopenia. In doing so, these at-risk patients can be offered appropriate investigations and timely treatment.

**Table 2** Clinical risk factors for osteoporosis

Clinical risk factors for osteoporosis
<b>Constitutional factors</b> Female Small body frame (BMI $<19$ ) Family history of fractures Premature menopause ( $<40$ years of age) or early menopause (age 40–45 years)
<b>Lifestyle and nutritional factors</b> Smoking Excessive alcohol intake Sedentary lifestyle Prolonged immobilization Low calcium intake

**Table 3** Secondary causes of osteoporosis

<b>Medications</b> Glucocorticoids Anti-convulsants (phenytoin, phenobarbital) Anti-coagulant (heparin) Immunosuppressants (cyclosporine) Aromatase inhibitors Proton pump inhibitors	<b>Gastrointestinal disorders / nutritional disorders</b> Chronic liver disease Malabsorption syndrome Gastrectomy Inflammatory bowel disease Pancreatic insufficiency
<b>Endocrine disorders</b> Hypogonadism Cushing's syndrome Adrenal insufficiency Hyperthyroidism Hyperparathyroidism Hyperprolactinaemia Eating disorders (e.g. anorexia nervosa)	<b>Disorders of calcium balance</b> Hypercalciuria Vitamin D deficiency
	<b>Others</b> Multiple myeloma Lymphoma Amyloidosis Rheumatological conditions (e.g. ankylosing spondylitis, rheumatoid arthritis) Alcoholism

## Treatment

### Non-pharmacological treatment

Non-pharmacological management of osteoporosis include consumption of a balanced diet rich in calcium and vitamin D, regular weight-bearing and muscle-strengthening exercises, adequate sunlight exposure, and avoidance of smoking and excessive alcohol consumption. The Institute of Medicine (IOM) of the US National Academy of Sciences reported that the recommended daily allowance (RDA) for calcium was 1000 mg daily for adults of both genders, and a higher 1200 mg daily for women over 50 years and men older than 70 years of age.<sup>4</sup> The Institute also recommended a RDA for vitamin D of 600 IU daily for adults and 800 IU daily for elderly ( $>70$  years).<sup>4</sup> A higher dose of vitamin D (up to 2000 IU/day) may be required for individuals who have high risk for vitamin D deficiency, obese, limited sun exposure or malabsorption, and for those who have osteoporosis.

### Pharmacological treatment

Pharmacological treatment for osteoporosis can be broadly classified into anti-resorptive and bone-forming (anabolic) agents. Anti-resorptive agent reduces bone resorption by binding to osteoclasts. Anabolic agents stimulate new bone formation by acting on the osteoblasts. Locally-available anti-resorptive agents that have been approved by the US Food and Drug Administration (FDA) for treatment of osteoporosis include hormone replacement therapy, calcitonin, bisphosphonates, raloxifene and denosumab. Teriparatide is an anabolic agent that has been approved by the FDA for treatment osteoporosis.

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### Hormone replacement therapy

Hormone replacement therapy (HRT) suppresses osteoclastic bone resorption and maintains a positive calcium balance through its effects on the intestine and kidneys. Current evidence supports the use of HRT for young post-menopausal women (age 50-59 years or <10 years post-menopause), for treatment and prevention of osteoporosis, especially for those with climacteric symptoms.<sup>5</sup> Potential side effects of HRT include venous thromboembolism and breast cancer.

### Raloxifene

Raloxifene is a selective estrogen receptor modulator (non-hormonal agent) that is available for prevention and treatment of postmenopausal osteoporosis in Hong Kong. Due to the limited evidence for non-vertebral fracture risk reduction, raloxifene is recommended more preferably for use in younger postmenopausal women when the risk of hip fracture is not particularly high. However, switching to a more potent agent may be necessary when the risk of hip fracture increases as the woman ages.

### Bisphosphonates

Bisphosphonates are considered as first-line treatment for osteoporosis. They act by binding to osteoclasts, leading to apoptosis and reduced bone turnover. Currently approved bisphosphonates include alendronate, ibandronate, risedronate and zoledronic acid. Bisphosphonates can be administered orally as a daily (alendronate, risedronate), weekly (alendronate, risedronate), or monthly (ibandronate, risedronate) dose, or given intravenously every 3 months (ibandronate) or 12 months (zoledronic acid). The infrequent dosing interval may improve acceptance and compliance to treatment.

Bisphosphonates are poorly absorbed from the gastro-intestinal tract and patients receiving oral preparations must be instructed to take bisphosphonates after prolonged fasting with a full glass of water, after which they have to remain upright for at least 30 minutes. Other potential but rare side effects of bisphosphonates include osteonecrosis of the jaw and atypical femur fractures. Contraindications to oral bisphosphonates include hypersensitivity reaction, hypocalcaemia, active peptic ulcers and esophageal abnormalities such as reflux esophagitis. Bisphosphonates is contraindicated in patients with creatinine clearance < 30ml/min/1.73m<sup>2</sup> and should be given with caution in patients with renal impairment.

### Teriparatide

Teriparatide was approved by the FDA in 2002 as the only bone-forming agent for treatment of osteoporosis. It is structurally the 1-34 amino-terminal fragment of the human parathyroid hormone (PTH). Intermittent PTH administration increases cortical and trabecular thickness, leading to improved bone strength and architecture. Teriparatide is given as a daily subcutaneous injection and is usually well-tolerated with transient adverse effects including nausea, headache and orthostatic hypotension. It is contraindicated in patients with history of skeletal malignancy or irradiation involving the skeleton, Paget's disease and hyperparathyroidism. Teriparatide has been shown to significantly reduce vertebral and non-vertebral fractures and hence it is especially indicated in patients with established osteoporosis ( $\geq 1$  osteoporotic fractures), with very low BMD (T-score < -3), and those who experience fracture or continued bone loss while taking antiresorptive agents. The main limitations to the widespread use of teriparatide are its relatively high cost and the need for daily injection.

### Denosumab

Denosumab is a fully human monoclonal antibody that binds to the receptor activator of nuclear factor-kappa B ligand, a cytokine that is essential for the differentiation, activity, and survival of osteoclasts. It was approved by FDA in 2010 as an injectable treatment for osteoporosis, which is given every 6 months subcutaneously. Denosumab has been shown to be efficacious in reduction of vertebral, non-vertebral and hip fractures. It is particularly indicated in patients with poor compliance to oral medications, and those who have contraindications or intolerance to bisphosphonates or other anti-osteoporotic medications. Denosumab can also be used in patients in renal impairment up to stage 4 chronic kidney disease. Some potential adverse effects of denosumab include eczema and cellulitis.

### Indications

Treatment is recommended for postmenopausal women and men  $\geq 50$  years who have: (i) prior low-energy hip or vertebral fractures, (ii) BMD T-score of  $\leq -2.5$  at the lumbar spine or proximal femur on DXA scan, and (iii) osteopenia on DXA scan and one of the following: (a) 10-year probability of any major osteoporotic fracture of  $\geq 20\%$  according to the WHO Fracture risk assessment tool (FRAX) algorithm<sup>6</sup> or (b) 10-year probability of hip fracture  $\geq 3\%$  according to FRAX algorithm.<sup>7</sup> However, physicians should exercise their clinical judgement based on each individual patient's risk profile, comorbidities and fall risk.

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# SURGICAL MANAGEMENT OF OSTEOPOROSIS

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Osteoporosis is a common disease that is characterized by low bone mass with microarchitectural disruption and skeletal fragility, resulting in an increased risk of fracture, particularly at the spine, hip, wrist, humerus, and pelvis. Osteoporotic fractures (fragility fractures, low-trauma fractures) are those occurring from a fall without major trauma, from a standing height or less. Fractures of the hip and spine are associated with an increased mortality rate of 10 to 20 percent. Fractures may result in limitation of ambulation, depression, loss of independence, and chronic pain.

## 1) Spinal fractures

Spinal fracture is the most common type of osteoporotic fractures, typically in thoracic and lumbar spine. Symptoms of a spinal fracture may include:

- Sudden, severe back pain
- Pain that gets worse when stand or walk
- Trouble bending or twisting body
- Loss of height
- A curved, stooped shape to spine

Complications of such fractures include blood clots in the pelvis and legs as a result of prolonged bed rest or immobility), pulmonary embolism to the lungs, pneumonia, and pressure sores.

Diagnostic tests include X-ray (Figure 1) and CT scan.

Treatment in some patients only requires rest, pain medicine, exercises, and relieving treatment for muscle spasms during rehabilitation. Patients may need to wear a brace to keep their spine stable during the period.

Surgery is indicated if pain lasts and is severe:

- Vertebroplasty. Injection of bone cement into the spine to keep it stable. This procedure lessens pain and can also help prevent further fractures of the vertebrae and a curved spine.
- Kyphoplasty. Implantation of a balloon device into the fractured vertebra. This helps restore the height and shape of the vertebra. Once removed, the device leaves a small cavity that the surgeon then fills with special bone cement.

## 2) Hip fractures

Hip fracture, which is the most severe complication of osteoporosis, includes intertrochanteric fracture and femoral neck fracture. Signs and symptoms of a hip fracture include:

- Inability to move after a fall
- Severe pain in the hip or groin
- Inability to put weight on the leg on the side of injured hip
- Stiffness, bruising and swelling in and around the hip area
- Shorter leg on the side of injured hip
- Turning outward of the leg on the side of injured hip

Common complications of hip fracture include deep vein thrombosis (DVT), avascular necrosis of femoral head, urinary tract infection, pneumonia and pressure sores. Prolong bed rest may lead to further loss of muscle mass that increases the risk of falls and injury. Diagnostic tests include X-rays and CT scan (Figure 2).

Treating a hip fracture depends on where the hip is broken, how severe the fracture is, and the overall health. Treatment options may include:

- Surgical repair with screws, nails, or plates for intertrochanteric fractures (Figure 3).
- A partial or total hip replacement for femoral neck fractures.
- Exercises to facilitate movement and build muscle strength.

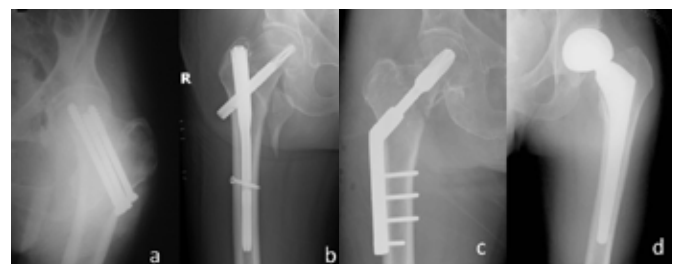


Figure 1. Typical X-ray of osteoporotic spinal fracture (arrow)



Figure 2. Typical X-ray of hip fracture (arrow)

Figure 3. Common surgical procedures for hip fractures.  
a) Cannulated screws, b) Intra-medullary nail,  
c) Dynamic hip screws, d) Hemiarthroplasty



## SURGICAL MANAGEMENT OF OSTEOPOROSIS

### 3) Distal radius fracture and Proximal humeral fracture

Distal radius fracture and proximal humeral fracture usually cause immediate pain, tenderness, bruising and swelling. Distal radius fracture cases often results in wrist deformity such that the wrist hanging in an odd or bent way.

Common complications of distal radius fracture include carpal instability, tendon rupture, ulnar-sided wrist pain and malunion. For proximal humeral fracture, necrosis of the humeral head, nerve or vascular injuries are not uncommon. Diagnostic tests include X-rays and CT scan (Figure 4). MRI scan can also rule out concomitant rotator cuff injury.



Figure 4. Typical X-rays of distal radius fracture, before and after open reduction and internal fixation.

The best treatment depends on the location and severity of the fracture. With appropriate protection, some fractures may heal on their own. The patients simply need:

- A cast, bandage or splint
- Exercises for hand, wrist, forearm, elbow, or shoulder
- If surgery is indicated, implantation of a plate, screws, wires, rods, pins, or an external fixator. These devices hold the bone in place while it heals. If the fractured bone has more than two pieces, a bone graft can facilitate faster healing.

## 淺談骨質疏鬆症的中醫診療

### 張靜如醫師

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中醫並沒有“骨質疏鬆症”這個病名，但根據臨床症狀，是屬於“骨痿”、“骨痹”、“骨蝕”、“骨枯”、“骨縮”、“腰背痛”等範疇。

在中醫診斷上，骨質疏鬆症可稱為“骨痿”。主要的症狀包括：周身骨痛，尤其是腰背酸軟疼痛；經常容易抽筋；下肢萎軟，不能持重；多汗。次要的症狀則為：乏力，畏寒肢冷，頭暈眼花，食少納呆，肌膚甲錯，舌淡暗或暗紅、或有瘀點瘀斑，苔白，脈沉細無力等。這些次要症狀有助辨別證型，“證”是中醫獨特的概念，反映了疾病某階段的本質變化，能指導治療方向。中醫的診斷需要辨病與辨證結合，兩者都很重要。

在病因方面，中醫認為骨痿與以下因素有關：先天稟賦不足、後天調養失宜、久病失治、年老衰變用藥失當。

在病機方面，暫時還沒有統一的說法，但縱觀各家的論述，大多與腎、肝、脾及瘀血相關。<sup>1</sup> 腎為先天之本，腎藏精，主骨生髓。腎精的盛衰和骨骼的生長發育關係密切。當年紀漸長，腎精虧虛，骨髓生化無源，骨骼就會萎軟無力，最終可導致骨痿。“肝腎同源”，肝藏血，主筋。腎精需要肝血的滋養才得以補充。同時，筋腱也需肝血的滋養才能屈伸自如。當肝血不足，腎精和筋骨失去濡養，久而久之，便會出現髓枯筋攣，痿廢不用。脾為後天之本，氣血生化之源，主四肢肌肉。當脾胃運化功能下降，氣血生化無源，腎精得不到補充，最後可以導致骨痿的發生。脾胃功能下降，出現肌肉萎弱無力，面對外力衝擊時，也不能緩解損害、保護器官骨骼。所以骨質疏鬆症的患者如果有脾虛的情況，就會增加骨折發生的風險。疼痛是骨質疏鬆症的其中一個表現，若以刺痛為主、痛處固定、夜間疼痛重於白天、病程較長，這些都是瘀血所致的疼痛表現。氣血運行不暢，會形成瘀血；而瘀血內停，會令氣血更難以運行，形成循環。總括以上，骨痿的病機為：腎虛是發病的根本，脾虛是發病的促進因素，血瘀是病理機制及病理產物。<sup>2</sup> 針對以上病機，治則以補腎壯骨，健脾活血為主。常用的藥物包括：杜仲、骨碎補、補骨脂、牛膝、細辛、川草烏、黨參、白朮、川芎、當歸等。<sup>2</sup>

治療骨痿除了使用湯藥外，內地中醫醫院也會應用膏方。膏方的特點包括服用方便及味道較好。在上述藥物中，細辛和川草烏需長時間煎煮以避免毒副作用。對於長期用藥的慢性病患而言，膏方相對方便服用。另外，製作膏方時會加入適量的蜂蜜或冰糖成膏調味，味道比湯藥好。在急性發作期，醫師根據患者的情況調整方藥，使用湯藥靈活性大，直中病所。當病情漸趨穩定，方藥沒太大變化，要求病人服藥一段時間以鞏固療效，膏方就適合這種情況。

目前本港臨床多使用湯藥或顆粒劑型，若能增加不同的劑型，方便患者用藥，相信能提高療效。

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# ROLE OF PHYSIOTHERAPY IN THE MANAGEMENT OF OSTEOPOROSIS

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## Introduction

Osteoporosis is not uncommon in Hong Kong, especially among high-risk individuals such as post-menopausal women. Osteoporosis is often asymptomatic until fracture happens as a complication. Risk factors include the female sex, ageing, history of fragility fracture, low body weight, genetic predisposition, premature or early menopause, low calcium intake, physical inactivity, smoking, excessive alcohol intake, lack of sunlight exposure, and prolonged immobilization.<sup>1</sup> Early simple screening helps to identify high risk individuals and thus timely preventive management by medication and exercise can be offered.

## Evidence on favourable effects of exercise in the management of osteoporosis

Exercise has been shown to be one of the effective means for the management of osteoporosis. Julius Wolff, a German surgeon, found out that bone adapts to loads. Tension, compression and torsions would be created during exercise. Trabeculae and external cortical portion of bone undergo adaptive changes, and thus bone remodels to become stronger.<sup>2</sup> Turner et al also showed compression force, muscle contraction and gravitational impacts occurred during exercise. Fluid movement within extracellular matrix of bone exerts effect on osteocytes and bone lining cells, and triggers release of nitric oxide and prostaglandin, leading to division and differentiation of osteo-progenitor cells and production of new bone by osteoblasts.<sup>3</sup> Researchers also showed that exercise helps to reduce bone resorption.<sup>4</sup> Exercise not only helps short-term but also long-term outcome on bone density. Kemmler et al showed that 16 years of supervised exercise (60 minutes of aerobic dance, resistance training with machine and 2 home training sessions with resistance training and walking weekly) significantly lowered bone mineral density (BMD) loss in lumbar spine and hip in 137 women with osteoporosis when compared with control group.<sup>5</sup>

## What types of exercise help?

A comprehensive exercise programme including physical exercise with impacts, static and dynamic muscle works through resistance training, whole body vibration, as well as balance and proprioception training should be incorporated for the best outcome.

### 1. Impact exercise e.g. Tai Chi.

Zou et al did a systematic review on Tai Chi on attenuating BMD loss from 20 randomized controlled trials.<sup>6</sup> Significant benefit was found in Tai Chi group with less lumbar and femoral neck BMD loss. During body movement in Tai Chi, continuous engagement of core and waist muscles creates sheer force at the lumbar spine. Weight shifting from one leg to the other results in foot-floor impact. These effects attenuate BMD loss. Other examples of impact exercise include marching and jogging.

### 2. Static and dynamic muscle works with resistance training e.g. weight-lifting.

These types of exercise were found to be effective in preventing osteoporosis as muscle contraction facilitates bone production equilibrium. Howe et al performed a systematic review from 43 randomized controlled trials. Exercise group presented with small but statistically significant reduction of BMD loss in spine and trochanter when compared with control group.<sup>4</sup>

### 3. Whole body vibration.

Whole body vibration is becoming a popular exercise for individuals with osteoporosis (Figure 1). In a systematic review, Fratini et al found a positive effect of whole body vibration on BMD over hip and spine in post-menopausal women.<sup>7</sup> During training with a vibration platform, serum levels of growth hormone and testosterone increase that facilitates continuous muscle contraction and bone metabolism. Current studies suggest that side-altering platform is more effective, frequency of less than 25Hz is more favorable and over 1000 minutes of treatment is more promising. However, more future research is needed to examine the best protocol.



**Figure 1 Whole body vibration**

### 4. Balance and proprioception training.

Miko et al performed a randomized controlled trial on balance training for women with osteoporosis and showed improved performance-based balance and reduced fall by 12 months.<sup>8</sup> Simple balance exercise like single-leg standing can be practiced at home.

## Exercise Recommendations

According to the American College of Sports and Medicine<sup>9</sup>, the following exercise prescription is recommended to help preserve bone health:

1. Mode: weight-bearing endurance physical activities e.g. stair climbing and jogging; activities that involve jumping; and resistance exercise such as weight-lifting
2. Intensity: moderate to high, in terms of bone-loading forces
3. Frequency: weight-bearing endurance activities 3–5 times weekly; resistance exercise 2–3 times weekly
4. Duration: 30–60 minutes with a combination of different types of exercise

## Special considerations during exercise

To maximize effectiveness and minimize risks, exercise should be done with caution

1. Warm up before exercise
2. Put on proper gear e.g. sports wear
3. Avoid high-impact exercise for individuals with severe osteoporosis. Prior medical advice should be obtained from doctors or physiotherapists
4. Avoid activities that increase fall risks
5. Beware of body biomechanics
6. Nutritional support

# ROLE OF PHYSIOTHERAPY IN THE MANAGEMENT OF OSTEOPOROSIS

## Conclusion

Exercise is useful in the prevention of osteoporosis. Simple screening tools are available for early detection to allow early referral to medical professionals. DEXA scan is the gold standard in the diagnosis of osteoporosis. Simple assessment tools such as ultrasound scan which are non-invasive and radiation-free are also available. High risk individuals can benefit from exercise program under supervision of physiotherapists and drug treatment by medical professionals.

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# NURSING CARE FOR PATIENTS WITH OSTEOPOROTIC FRACTURE

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Osteoporosis is a progressive systemic skeletal disease characterized by low bone mass and micro-architectural deterioration of bone tissue. As bone density decreases, bones become porous and fragile, increasing risk of fracture. The most common fractures associated with osteoporosis happen at the hip, spine and wrist. Globally, 1 in 3 women over age 50 and 1 in 5 men aged over 50 are at risk of an osteoporotic fracture.<sup>1</sup>

Osteoporosis can affect both sexes, especially in advanced age. Hence, it is more likely to occur in post-menopausal women. Additionally, people with unhealthy lifestyle such as smoking, low dietary calcium and/or vitamin D intake, alcoholism, underweight and physical inactivity, can be at greater risk for developing osteoporosis.<sup>2,3</sup>

To prevent and treat osteoporosis, management goals are to slow down or even stop progression of osteoporotic bone changes, reduce bone pain, and prevent fractures.<sup>4,5</sup> A case scenario below illustrates nursing care management for patients suffering from osteoporotic fracture.

## Case Study: An Elderly Lady with Osteoporotic Fracture

Mrs. Chan, a 70-year-old widow, lives alone in a small flat of a public estate. She was hospitalized for a week due to a fall accident at home because of severe low back pain. She was recommended for spine X-ray and Bone Mineral Density (BMD) screening by the medical officer in charge. Spine X-ray revealed compression fracture involving T12 – L2 vertebra. Moreover, spine BMD showed T-score at -2.5. Mrs. Chan was diagnosed to have osteoporosis complicated by vertebral fracture and was put on oral Naprosyn and Calcitonin nasal spray for pain control.

You are a community nurse paying the first home visit to Mrs. Chan after her discharge from the hospital. In her small flat, there are boxes, rugs and several small electric appliances such as fans and lamps cluttering on the floor. Mrs. Chan reports that her back pain has improved, but is still limiting her mobility such that she uses a walking stick for ambulation.

## What is the nursing care plan for Mrs. Chan?

The nursing care plan for Mrs. Chan is to focus on pain control, safe mobilization and fall prevention, and modification on risk factors of osteoporosis.<sup>4,5</sup>

## Care Focus 1: Pain Control in Osteoporotic Fracture

Compression fracture of the spine leads to low back pain and limits abilities in carrying out activities of daily living. Pain control can be managed by appropriate use of analgesic (e.g. Naprosyn tablet in the case scenario). Calcitonin nasal spray aforementioned is a hormonal inhibitor of bone resorption that improves bone strength and has a beneficial analgesic effect in postmenopausal women with painful vertebral compression. Patients should be adequately educated on the indication, action and side effects of these medications. Common side effects of Naprosyn include gastric irritation and gastrointestinal bleeding whereas calcitonin nasal spray might cause nasal bleeding and headache.

Patients are reminded to avoid prolonged sitting and standing which will place stress on the spine. Other pain management modalities including transcutaneous nerve stimulation, use of back braces or back support belts, and simple stretching and relaxation exercise, can be adopted under supervision of physiotherapist.

## Care Focus 2: Safe Mobilization and Fall Prevention

Patient suffering from severe low back pain has impaired mobility and posed high risk of fall. To maintain environmental safety, home assessment is essential in identifying factors that may contribute to fall accidents. Community nurse needs to educate patients on adverse outcome of fall and injuries in an unsafe environment. Good housekeeping such as maintaining an uncluttered environment with dry floor and adequate lighting can reduce fall hazard. In the bathroom, installation of grab bars and/or placement of non-slippery rubber mat around the bath area and toilet are wise measures for fall prevention.

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A regular, well-designed weight-bearing exercise program can strengthen bones and muscles, as well as increasing balance, coordination, and flexibility.<sup>6</sup> Patients with osteoporosis are advised to consult physiotherapist on muscle training and walking aid to improve stability on mobilization. If necessary, pain medication may be taken before patients start to exercise. Patients are instructed to use walking aid and avoid climbing up and down stairs until muscle strength and endurance has improved. Moreover, patients should be reminded to wear well-fitted footwear with non-slippery soles and roll up overlong trousers to promote safe mobilization.

Patients with osteoporosis usually have fair bone tensile strength. They are advised to avoid lifting heavy objects and to bend their knees when lifting objects to prevent waist injury and fall. Besides, if there is history of frequent fall, preventive measures such as use of hip protector is recommended to lower the impact on fractures in fall accidents.

### Care Focus 3: Modification on Risks Factors Related to Osteoporosis

Health education for osteoporosis care includes information regarding the condition, treatment and medication regimen. Nurses can discuss with each patient to develop individualized strategies to prevent injury and bone deformity. In addition, risk factors for osteoporosis can be identified and emphasized in patient education. Most modifiable risk factors are largely related to unhealthy diet pattern and/or sedentary lifestyle, which have detrimental effect on BMD. Patients are advised to quit cigarette smoking, restrict on alcohol and caffeine consumption, and maintain optimal body build. It is also important to recommend intake of enough calcium and vitamin D. Nurses can provide a food list with high ingredient of calcium/vitamin D as reference. Apart from dietary intake, sunshine is a natural source of vitamin D. Casual exposure to the sun for around 10 to 15 minutes without sunscreen twice a week is enough for vitamin D absorption for most people. Patients are encouraged to abandon inactive lifestyle and participate in regular exercise program according to their own preference for bone strengthening. Lastly, regular BMD monitoring under medical advice is recommended for patients who are receiving osteoporotic treatment.<sup>5</sup>

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