Review Paper

Tele-nursing of Osteoporosis Self-Management for Women Health

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Abstract

Osteoporosis is a global health and economic burden. It is a major chronic health condition that affects women more than men and it is incurable disease. Postmenopausal women are among those at greatest risk of osteoporosis, but any one of either gender or any race can develop this disease. Effective disease management ultimately lies in the hands of the individual patient, who must take responsibility for key health behaviors related to bone health. One behavior modification strategy that has proven effective to osteoporosis is self-management. The self-management program for osteoporosis, choices for better bone health, helps to educate people about the disease and to promote behavioral strategies for maximizing bone health. Telenursing bridges the access gap to specialized osteoporosis care in remote areas. Improving coordination of investigations, access to allied health members, and future initiatives may improve morbidity and mortality related to osteoporosis in this population. Mobile health (m-Health) interventions hold promise to effect engagement in health behavior change related to calcium and vitamin D intake, balance, core and leg strength, and physical activity.

Key words: Women Health, Tele-nursing, Osteoporosis, Self-Management

Introduction:

Osteoporosis, which literally means "porous bone", is a chronic serious health problem in which the density and quality of bone are reduced. As the bones become more porous and fragile, the risk of fractures is greatly increased. The loss of bone occurs "silently" and progressively. Often there are no symptoms until the first fracture occurs so; it is called the silent disease (Janiszewska et al., 2017 and International Osteoporosis Foundation, 2019).

Bone provides construction for the body, protection for the organs, and storage for minerals, such as calcium and phosphorus, that are essential for development of the bone and its stability. Individual continues to build bone and will reach peak bone mass at about 30 years of age, after which they begin to lose bone mass steadily. While peak bone mass is extremely dependent upon genetics, many changeable factors can influence bone mass, as nutrition, exercise, and certain diseases and/or medications (NIH Osteoporosis and Related Bone Diseases ~ National Resource Center, 2017). Through life, bone is remodeled. Bone remodeling allows for maintenance of mechanical strength and repair. An imbalance in bone remodeling which resorption exceeds formation may result in the pathophysiological changes seen in osteoporosis (Raisz, 2005).

Osteoporosis is the fourth basic enemy of humans after heart failure, stroke, and cancer (Khani Jeihooni et al. 2017) and the most prevalent cause of fractures in the world. It is one of the major musculoskeletal conditions in older people, and as the population of older adults is growing, the prevalence

of osteoporosis is increasing (Keshtkar et al. 2015). It is estimated that more than 200 million people worldwide have osteoporosis (Reginster, & Burlet, N, 2006). It is characterized by reduced bone mineral density, resulting in fragile bones that fracture easily. Globally, osteoporosis causes more than 8.9 million fractures per year (Sözen, Özışık, & Başaran, 2016) .

Around the world, 1 in 3 women and 1 in 5 men aged fifty years and over are at risk of an osteoporotic fracture (Lane et al., 2006), morbidity and mortality for osteoporotic fractures was found higher in males, even though the mean age of fractures appearance was about 5-10 years later than females (Tuck & Datta, 2007). The most common fractures associated with osteoporosis occur at the hip, spine and wrist (International Osteoporosis Foundation, 2017).

In the international literature, factors such as age, female gender and/or rheumatoid arthritis mental have been evaluated as risk-factors for osteoporosis development due to having lower bone density, presenting a twice probability to experience mortality (Harrison et al., 2007 and Curtis et al., 2009).

Women tend to have smaller, lighter bones than men. This makes women more susceptible to osteoporosis as there is less mass, and menopause has a greater effect on their bones. Plus, after menopause the body produces less estrogen and progesterone. A lack of estrogen can cause bone loss in younger women too. Early menopause can cause early bone loss and disease well before the age of 65. Women lose more than 30% of their bone mass within five years after menopause (Aurora Health Care, 2019).

Thus, it is important to empower women health in osteoporosis management / prevention or early detection (Baheiraei et al., 2006).

Fractures and their complications are the relevant clinical sequelae of osteoporosis. The most common fractures are those of the vertebrae (spine), proximal femur (hip), and distal forearm (wrist). However, most fractures in older adults are due at least in part to low bone mass, even when they result from considerable trauma. A recent fracture at any major skeletal site in an adult older than 50 years of age should be considered a significant event for the diagnosis of osteoporosis and provides a sense of urgency for further assessment and treatment. The most notable exceptions are those of the fingers, toes, face, and skull, which are primarily related to trauma rather than underlying bone strength. Fractures may be followed by full recovery or by chronic pain, disability, and death (Lewiecki & Laster, 2006).

Despite the availability of cost-effective and well-tolerated treatments to reduce fracture risk, only 23 % of women age 67 or older who have an osteoporosis-related fracture receive either a bone mineral density test (BMD) or a prescription for a drug to treat osteoporosis in the 6 months after the fracture (National Committee for Quality Assurance, 2015). By 50 years of age, women from developed countries have a probability of more than 40% suffering osteoporosis fractures and 20% suffering a hip fracture (Bessette et al., 2008). The mortality rate after hip fractures in this population is approximately 20%. In addition to the hip, the other 2 sites with more fracture incidence are the spine and the wrist (Howe et al., 2011 and National Osteoporosis Foundation, 2018). Osteoporosis fractures are related to

excessive mortality, morbidity, chronic pain, reduction in the quality of life, long-term attention, social and health care costs (Papaioannou et al., 2010).

Two categories of osteoporosis have been identified: primary and secondary. Primary osteoporosis is related to age and sex hormone deficiency. Age-related osteoporosis results from the continuous deterioration of the trabeculae in bone. In addition, the decrease of estrogen production in post-menopausal women causes a significant increase in bone loss. In men, sex-hormone–binding globulin deactivates testosterone and estrogen as aging occurs, which may contribute to the decrease in BMD with time (Jeremiah et al., 2015, North American Menopause Society, 2010, Raisz, 2005, and Hunter & Sambrook, 2000).

Secondary osteoporosis is caused by several comorbid diseases and/or medications (North American Menopause Society, 2010). Diseases implicated in osteoporosis often involve mechanisms related to the imbalance of calcium, vitamin D, and sex hormones (National Institutes of Health, 2013 and Raisz, 2005). For example, Cushing's syndrome has been found to accelerate bone loss through excess glucocorticoid production (Hunter & Sambrook, 2000). Moreover, many inflammatory diseases, such as rheumatoid arthritis, may need the patient to be on long-term glucocorticoid therapy and have been associated with secondary osteoporosis. Notably, glucocorticoids are considered the most common medications linked to drug-induced osteoporosis. (Buckley et al., 2017).

Diagnostic imaging of osteoporosis has two principal aims: (a) to identify the presence of osteoporosis, and (b) to quantify bone mass with use of semi

quantitative (conventional radiography) or quantitative (densitometry) methods (Radiological Society of North America, 2019).

Clinical measurement of BMD by dual-energy X-ray absorptiometry (DXA) is currently the most widespread method to diagnose osteoporosis and evaluate the risk of fracture. DXA at the lumbar spine and femoral neck to measure BMD is nowadays a routine investigation in osteoporosis. DXA-measured BMD accounts for 60–70% of the variation in bone strength (Ammann & Rizzoli, 2003) and each standard deviation (SD) decrease of BMD is associated with a two-fold increase in fracture risk. The BMD measured is measured in g/cm2 but most commonly is expressed as the T-score, the number of SDs above or below the mean for a healthy 30-year-old adult of the same sex and ethnicity as the patient. Subsequently, osteoporosis is defined as a T-score ≤-2.5 and osteopenia as a T-score ≤-1.0 at any skeletal site (Dawson-Hughes et al., 2008 and Schuit et al., 2004).

Despite recent advances in osteoporosis's pharmacological treatment, the disease is incurable (Curtis & Safford, 2012). However, effective self-management can enhance bone health and prevent deterioration (Hootman, 2007). Self-management refers to the use of self-regulation skills to manage chronic conditions or risk factors for these conditions. The processes involved in self-management generally include tasks such as goal setting, self-monitoring, decision making, problem solving, planning for and engaging in specific behaviors, self-evaluation, and management of physical, emotional, and cognitive responses associated with health behavior change (Ryan & Sawin, 2009).

The role of nurses in caring for patients with osteoporosis or at risk for osteoporosis, regardless of setting, includes enhancing patients' knowledge about osteoporosis and promoting behavior change. Specific nursing actions include: providing patient education across the lifespan about bone health and prevention of osteoporosis and fractures, including discussing strategies to ensure bone health in adolescents as well as young adults and older patient (American College of Obstetricians and Gynecologists, 2012).

Generally, timely interventions and regular follow-up are essential in order to promote healthy behaviors. Patients with regular follow-up are more likely to change their unhealthy behaviors (Musavi fard et al., 2011). Some studies have shown that routine monitoring helps patients and families to actively participate in the healing process and be successful in controlling the disease (Nesari et al., 2009).

Nurses can use technology to access the information that helps form these guidelines and best practices. Nurses use evidence-based practice is one of the greatest tools available in the pursuit of excellence in patient care every day. The International Osteoporosis Foundation and world health organization were evidence-based practice guideline for management (Wilson & Brittney 2014).

On the other hand, modern technologies have provided the opportunity to shift treatments from hospitals and clinics to patients' homes (Musavi fard et al., 2011). American Nursing Association has considered telenursing which provides nursing services through the use of communication technologies such as telephones, computers, remote monitoring tools, and the internet as a

subset of telemedicine (Schlachta-Fairchild, Elfrink, & Deickman, 2008 and Kumar & Snooks, 2011).

Telehealth nursing focuses on patients' long-term wellness, self-management, and health. According to the American Telemedicine Association, this information technology solution provides nursing care across a distance, empowering the care providers with the ability to monitor, educate, follow-up, collect data, and provide multidisciplinary care including remote interventions, pain management, and family support in an innovative fashion (Shortliffe & Cimino, 2014).

In rural areas, many patients do not receive timely health care interventions because of the lack of specialist services. Home health agencies with telehealth capability caring for patient populations with chronic diseases can take care of patients in their home setting and therefore fill this gap. This provides convenience and a sense of security to the patient, allowing timely nursing interventions under supervised physician care (Doarn et al., 2014).

Telenursing increases patients' access to influential and effective nursing. Telephone, as an available means of communication, is increasingly used in telenursing. This method of care delivery not only reduces the costs and facilitates access to care services, but it also improves the relationship between patients and caregivers. Today, use of telenursing enables nurses to perform actions such as monitoring, training, collecting data, performing nursing interventions, controlling pain, and providing family support (Zakeri Moghadam et al., 2009).

Studies have shown that mobile health (m-Health) apps may be useful tools for patient self-management, as well as for facilitating improved communication between patients and health care providers also has the potential to improve health outcomes (Becker et al., 2014 and Whitehead & Seaton, 2016). Osteoporosis self-management behaviors involve physical activity, healthy diet, adherence to medication treatment, and prevention of falls (Baheiraei et al., 2006). Good self-management can prevent disability related to the disease, thus improving women's quality of life (Kanis et al., 2013).

The primary goal of osteoporosis management should be prevention. Optimizing skeletal development and peak bone mass to reduce the future incidence of osteoporosis. In patients who have already suffered osteoporotic fractures, reduce future falls and improve quality of life. Factors that augment bone mass (a diet rich in calcium and vitamin D, physical activity) should be encouraged, and factors that diminish bone mass (smoking, alcohol consumption) should be discouraged. These healthful practices should be maintained over a lifetime. Moreover, fall prevention should be a part of routine care for all postmenopausal women and elderly people, since falls are the precipitating factor in nearly 90% of all fractures (International Osteoporosis Foundation, 2017 and National Osteoporosis Foundation, 2018).

Nonpharmacologic therapy of osteoporosis represents the foundation for the management of osteoporosis, without which patients are unlikely to achieve the full benefit of pharmacologic therapy. Calcium and vitamin D

supplementation have been shown to increase BMD and reduce the risk of fractures in prospective trials. The National Osteoporosis Foundation recommends that all adults have a daily intake of at least 1200 mg elemental calcium with diet plus supplements, and 400–800 IU vitamin D per day for patients at risk of deficiency (Cosman et al., 2014).

Physical inactivity and decreasing the load on the skeleton result in a reduction of the BMD (Ratamess, 2008 and Zernicke et al., 2006). Involvement in high-impact sports, especially before puberty, is important to maximize the accumulation of bone mass and to obtain a greater bone mass peak independently of sex (Guadalupe-Grau et al., 2009). Strong scientific evidence exists to support that performance exercise during infantile is associated with a better maintenance of bone mass in advanced age (Karlsson & Rosengren, 2012 and Donnelly et al., 2016). In addition, regular exercise is associated with a lower risk of suffering bone fragility fractures in older people of both sexes (Guadalupe-Grau et al., 2009).

Fall prevention is a priority for patients with osteoporosis because falls are more closely associated with fracture risk than is BMD (Karinkanta et al., 2010). A thorough assessment of a patient's risks of falling and mitigation of those risk factors have strong evidence of effectiveness in fall prevention (American Geriatrics Society, 2010). A Cochrane review suggested that hip protectors decrease fracture risk (Santesso et al., 2014).

Correction of other disease states such as postural hypotension and arrhythmias may reduce the risk of fall (Sözen et al., 2017). In recent years, different types of exercise have been evaluated to improve BMD despite the

fact that not all of them have shown the same effects (Donnelly et al., 2016). It is necessary to take into account the different factors that influence and lead to bone formation. The cellular mechanisms responsible for the adaptation of bone are modeling and remodeling. These mechanisms modify the external size, contours of bone, and its internal architecture because of bone deposition or removal from the surface of bone by osteoblasts and osteoclasts, respectively through osteocytes, which detect mechanical strain and transduce the applied strain to the aforementioned cells (Seeman & Delmas, 2006 and Zernicke et al., 2006). However, as osteogenesis is influenced by the stress imposed on bone (Lee et al., 2013), a minimum effective strain to induce bone formation must be reached (Baechle & Earle, 2008). Therefore, if mechanical load exceeds this threshold, then osteoblastic activity is induced and thus bone becomes strong to provide an adequate support structure in the specific area that experienced the mechanical strain (Kohrt et al., 2004 and Guadalupe-Grau et al., 2009).

Weight bearing is one of the effective forms of exercise that lead to maintenance or improvements in BMD. Based on the NOF definition, weight-bearing exercises include activities that make one move against gravity while staying upright. These exercises can be high impact (i.e., jumping) or low impact (i.e., walking) (Guadalupe-Grau et al., 2009; Gomez-Cabello et al., 2012; Howe et al., 2011; French, 2015 and National Osteoporosis Foundation, 2019).

Aerobic exercise, especially walking, is the most common type of exercise because of its ease of accomplishment and safety (Ross & Denegar, 2001 and

Gomez-Cabello et al., 2012). Evidence suggests that walking and running have a few positive effects on BMD (Guadalupe-Grau et al., 2009). However, different results are found depending on the training variables used in the protocols. For example, more BMD benefits from walking have been shown when more intensity or distance was performed (Ross & Denegar, 2001). Also, better results are achieved when high-impact activities are included (Gomez-Cabello et al., 2012) because high impact seems to be a highly efficient exercise to promote BMD except in postmenopausal women (Guadalupe-Grau et al., 2009). For example, running and jumping had a significant effect on the BMD in 2 sites: the total hip and femur trochanter (Howe et al., 2011).

RT is the other effective type of exercise that is able to maintain or to improve BMD. The NOF considers RT as those activities where one moves the body, a weight, or some other resistance against gravity (Zehnacker & Bemis-Dougherty, 2007; Guadalupe-Grau et al., 2009; Gomez-Cabello et al., 2012; Howe et al., 2011; French, 2015 and National Osteoporosis Foundation, 2019). However, in some RT exercises, bones and muscles work against gravity, whereas feet and legs bear the body's weight, and thus, these exercises may be considered also as weight-bearing exercises (e.g., squat jumps). On the other hand, those exercises with different body positions that are not performed while staying upright (e.g., bench press) may be considered RT non–weight-bearing exercises. RT has been proven to be a potent stimulus for the formation and maintenance of bone mass (Zehnacker & Bemis-Dougherty, 2007and Gomez-Cabello et al., 2012). Positive effects

have been found especially in the femur neck, the lumbar spine and the distal radius (Howe et al., 2011and Gomez-Cabello et al., 2012). Moreover, RT improves muscular strength that may decrease risk of falls in older adults (Ross & Denegar, 2001and Granacher et al., 2012).

It seems that the most effective combination of exercises would be to perform high-impact activities, such as jumps, in addition to RT. Combination exercises programs, where different types of exercises (i.e., resistance or endurance training) were included, had a significant effect on BMD in 3 sites: the femur neck, the spine, and the femur trochanter (Guadalupe-Grau et al., 2009 and Howe et al 2011).

Patients should be counseled to quit smoking because it has been shown to decrease BMD at all skeletal sites (Yoon et al., 2012). Heavy alcohol consumption (defined as more than four drinks per day for men or more than two drinks per day for women) is a major risk factor for fracture and should be discouraged (Maurel et al., 2012).

Dietary modifications may have a role in optimizing bone health. Consuming more than 2.5 units of caffeine daily (1 unit = one cup of coffee or two cups of tea) may increase fracture risk. Diets with adequate protein intake are necessary for optimal bone health, but the proper amount or source (plant vs. animal) remains controversial. A balanced diet consisting of vitamin D, calcium, protein, vegetables, and fruits is recommended; mononutrient dietary supplementation is unlikely to be helpful (Body et al., 2011).

Meals should include from all the food groups like fruits and vegetables, carbohydrates like bread, potatoes, pasta and cereals, milk and dairy products and proteins like meat, fish, eggs, pulses, nuts and seeds. The diet should be rich in calcium and vitamin D. The following foods can be recommended for an osteoporosis patient: calcium and vitamin D fortified breakfast cereals, bakery products made from fortified flour, fortified orange juice, dairy products like milk, yoghurt, cream, cheese, green leafy vegetables such as cabbage, broccoli and ladyfingers, spinach, dried figs and apricots, tofu, calcium fortified, sesame seeds, soya beans and soya drinks with added calcium, nuts, fish like small edible bones like sardines and salmons and eggs for those who are nonvegetarians. (Agarwal et al., 2011).

Calcium: Adequate calcium intake is an important aspect of any osteoporosis prevention or treatment program for a healthy lifestyle issue. For women aged 50 and above daily recommended calcium intake is 1200 mg. Vitamin D: It is important to maintain sufficient levels of vitamin D among children and adults to prevent osteoporosis. It is primarily found in fish oils (cod liver oil), fortified milk, cereals, and breads. It is produced in the skin by exposure to sunlight during dawn. National academy of sciences recommends daily intake of vitamin D 400 IU / day in normal adults aged 50 to 70 years whose age more than 70 are recommended to take 600 IU / day (Watts et al., 2010) .

Essential fatty acids: Essential fatty acids are unsaturated fatty acid and saturated fatty acid. A food survey had found that unsaturated fatty acid protect BMD mean while saturated fatty acids accelerates bone loss

(Berriche et al., 2017). Vitamin K: It is essential nutrient for healthy bone mineralization involved in maintenance of adequate bone integrity, primarily found in probiotics and fermented soyas (Genuis & Schwalfenberg, 2007).

Studies reporting a correlation between the protein intake and bone metabolism had showed that the excess of a protein deficiency causes calcium homeostasis resulting in calcium imbalance. An increase in protein intake increases the acid load to be removed by the kidney which results in urinary calcium loss (Berriche et al., 2017).

Patients with severe osteoporosis should avoid engaging in motions such as forward flexion exercises, using heavy weights, or even performing side-bending exercises because pushing, pulling, lifting, and bending exert compressive forces on the spine that may lead to fracture (Watts et al., 2010).

After initiation of treatment, the need for follow-up bone density testing is uncertain. A decrease in BMD could suggest treatment nonadherence, inadequate calcium or vitamin D intake, an unidentified secondary cause of osteoporosis, or treatment failure (Lewiecki, 2010).

Conclusion:

Osteoporosis is the most common and worldwide public health silent disease in postmenopausal women. This disease is a systemic disease of thin bone disease where the bones had weakening of its micro-architecture tissue, low bone mass, fragile bones with a high vulnerability to fractures. The patients increase their awareness about osteoporosis risk factors and preventive measures by the different educational resources which offer evidence-based practice guidelines and patient education that are updated

routinely and feature the most relevant and up-to-date information as eHealth which uses information and communication technology for health services.

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التمريض عن بعد للإدارة الذاتية لمرض هشاشة العظام لصحة المرأة

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الملخص العربي: يعتبر ترقق وهشاشة العظام عبء عالمي على الصحة والاقتصاد. حيث إنها حالة صحية مزمنة كبيرة تؤثر على النساء أكثر من الرجال وهي مرض عضال. وتعد النساء بعد انقطاع الطمث أكثر عرضة لخطر هشاشة العظام ولكن من الممكن ظهور المرض بين النساء والرجال. تكمن الرعاية الفعالة والعلاج الفعال لهذا المرض في يد المريض نفسه، الذي يجب أن يتحمل مسؤولية السلوكيات الصحية الرئيسية المتعلقة بصحة العظام.

إحدى استراتيجيات تعديل السلوك أثبتت فاعليتها في هشاشة العظام، هي الإدارة الذاتية. يساعد برنامج الإدارة الذاتية لمرض هشاشة العظام وهو من احدى الخيارات لصحة عظام أفضل، انه يساعد على تثقيف الناس حول هذا المرض وتعزيز الاستراتيجيات السلوكية لزيادة صحة العظام إلى الحد الأقصى. كما يسد التمريض عن بعد فجوة الوصول إلى رعاية مرض هشاشة العظام في المناطق النائية. إن تحسين تنسيق الفحوصات، وتوافر اعضاء متخصصين مع المبادرات المستقبلية قد يحسن من معدلات الاعتلال والوفيات المرتبطة بهشاشة العظام في هذه الفئة من السكان. كما تبشر تدخلات الصحة المتنقلة (العناية المتنقلة) بالتأثير على المشاركة في تغيير السلوك الصحي المتعلق بتناول الكالسيوم وفيتامين (د) والتوازن وقوة القلب والساق والنشاط البدني.