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Osteoporosis Implications for the Aging Adult

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Osteoporosis in the Aging Adult

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Osteoporosis

- Low bone density is a common manifestation in postmenopausal women
- Risk factors: hormone deficiencies vitamin
- Diagnosis: diagnosed after a person breaks a bone, usually a hip or arm by a bone scan
- Treatment: bisphosphonates, hormone replacement, vitamin replacements, and other therapies

Justification

- Since fractures are usually the first sign of osteoporosis, patients may become more immobile and unable to take care of themselves
- Inactivity can lead to other adverse health outcomes and isolation, which is problematic for the aging adult
- Early prevention and treatment are best for the aging adult to keep them active and prevent disability
- Osteoporosis treatment and prevention can greatly improve a person's life. As Berry, Kiel, and Colon-Emeric write in their JAMA clinical update, "It may take more than 10 years before the benefits of cancer screening are observed. In contrast, the benefits of oral osteoporosis medications may occur at 6 to 12 months, and the benefits for effective fall prevention interventions might be immediate" (Berry et al., 2019).



Pathophysiology

- As a person ages, osteoclasts break down and reabsorb parts of bones faster than new bone can be formed
- Reactive Oxygen Species, a product of aerobic metabolism, accumulate in bones and cause oxidative stress
- Oxidative stress increases osteoclast development, therefore increasing reabsorption
- Receptor activator of nuclear factor κ B ligand (RANKL) is expressed by osteoblasts and is needed for osteoclasts to develop
- The more RANKL expressed, the more osteoclasts develop
- OPG, a protein, blocks RANKL expression
- Hormones such as estrogen and cytokines regulate the RANKL-OPG balance
- As estrogen decreases, RANKL increases, and bone breaks down
- Estrogen deficiency affects men and women
- Physical activity helps to strengthen bone mass by increasing skeletal stress
- Bones become more fragile because the trabeculae in spongy bones becomes thin, and compact bone becomes porous and has a sponge-like appearance
- Osteoporosis can be caused by glucocorticoids and immunosuppressants by inhibiting osteoblasts from doing their jobs
- Disorders including metastases, myelomas, vascular disease, hypoparathyroidism and rheumatoid arthritis can also
- Bone mass peaks around 30 years old and decreases until death
- Deficiencies in vitamins decrease the amount of minerals available for bone production

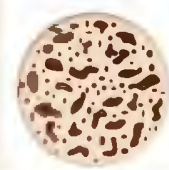
McCance et al., 2019

Signs & Symptoms

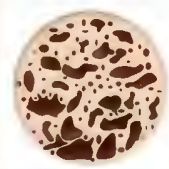
- First symptom is either bone deformity or fracture
- Fracture of long bones, such as the humerus, ribs, and femur are most common
- Bones can shrink and collapse on one another and can cause kyphosis
- Bone fractures can cause fat emboli to travel and cause a pulmonary embolism or stroke
- A dual-photon absorptiometry scan (DXA) is used to diagnose.
- A bone density score of 2.5 or more below normal is considered a diagnosis for osteoporosis

Stages of Osteoporosis

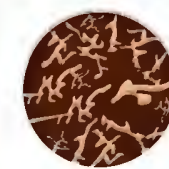
NORMAL BONE



OSTEOPOROSIS



SEVERE OSTEOPOROSIS



Osteoporosis and the Implications to Nursing Care

Falls are a major complication of a patient's hospital stay. New medications, secondary diagnoses, and unknown surroundings are all factors that increases a person's likelihood of falling. Weakened bones from osteoporosis have a higher chance of breaking and causing significant harm to a patient. If diagnosed and treated early, osteoporosis can diminish, and a person can still live an active life.

Fractures in the elderly have severe consequences. Surgery, physical therapy, and medications are used to treat the fracture, but recovery is long and difficult. Bones take longer to heal and can cause a person to become more sedimentary.

Nurses can teach their patients how to avoid common environmental triggers for falls, how to take their osteoporosis medications, and the risk factors for osteoporosis and falls. Encouraging an active lifestyle can help decrease the risk of bones becoming more brittle. Starting when adults are in their 30's to stay active and integrate strength training into their routines can help prevent osteoporosis.

Genetic counseling can be important for those with a family history of osteoporosis. Nurses in this field can help educate their patients on the importance of regular screenings and help their patients navigate a potential diagnosis.

Fracture Risk Assessment Tool for Diagnosing Osteoporosis

Country: **US (Caucasian)** Name/ID: _____ About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
Age: _____ Date of Birth: _____
Yr: _____ Mo: _____ D: _____

2. Sex: ☐ Male ☐ Female

3. Weight (kg) _____

4. Height (cm) _____

5. Previous Fracture ☒ No ☐ Yes

6. Parent Fractured Hip ☐ No ☐ Yes

7. Current Smoking ☒ No ☐ Yes

8. Glucocorticoids ☒ No ☐ Yes

9. Rheumatoid arthritis ☒ No ☐ Yes

10. Secondary osteoporosis ☒ No ☐ Yes

11. Alcohol 3 or more units/day ☒ No ☐ Yes

12. Femoral neck BMD (g/cm²)
Select BMD: _____
Clear Calculate

Implications to a Nurse Practitioner's Care

Nurse practitioners can integrate osteoporosis prevention strategies into a person's yearly physical and teach their patients on the risk factors and symptoms of osteoporosis.

Nurse practitioners should be aware of the current screening and treatment guidelines. Research has shown that repeat DXA scans are not useful in the treatment of osteoporosis (VanGompel et al., 2017). But, a DXA scan is important for diagnosing osteoporosis and osteopenia. Diagnosis should also include a person's risk factors, comorbidities, family history, and age (Qaseem et al., 2017).

The Fracture Risk Assessment (FRAX) tool, a questionnaire for determining the probability of a fracture within 10 years is another diagnostic for all older adults (Kanis, 2008).

Treatment should be comprised of vitamin supplementation and denosumab. Denosumab has shown a greater improvement of bone mineral density compared to bisphosphonates after 1-2 years of therapy (Jundi et al., 2019).

Medication therapy should span at least 5 years with regular checkups. Therapy should also include smoking and alcohol cessation, strength training, vitamins, and maintaining an active lifestyle.

Significance of Pathophysiology

Osteoporosis can affect any bone in the body and can go undiagnosed until a person falls. Screening prior to fractures can help prevent life-altering injuries. A hip fracture can greatly reduce a person's quality of life, and even institutionalize them.

Osteoporosis decreases bone mineral density and cause bones to weaken and shrink. When a bone breaks, it can even create fat emboli that can travel and cause strokes, heart attacks, or a pulmonary embolism.

Fractures are hard to treat fully in older adults because their rate of bone formation is significantly slower than in younger adults. Mobility decreases, pain increases, and an adult becomes more sedentary which leads to more health problems.

"It may take more than 10 years before the benefits of cancer screening are observed. In contrast, the benefits of oral osteoporosis medications may occur at 6 to 12 months, and the benefits for effective fall prevention interventions might be immediate" (Berry et al., 2019). Compared to other debilitating diseases in older adults, osteoporosis is quite manageable, and therapy is effective within 2 years.

The clinical recommendations in 2017 showed that "approximately 50% of Americans older than 50 years are at risk for osteoporotic fracture) and the economic impact of osteoporosis on the health care system is estimated to be \$25.3 billion per year by 2025" (Quseem et al., 2017). Early screening and medications are crucial for proper treatment.

Conclusion

Osteoporosis is a common diagnosis for elder adults. If caught early, it can protect a person from life-threatening falls.

The pathophysiology of osteoporosis includes decreased osteoblast function and increased osteoclast function. Osteoclasts and upregulated by oxidative stress and decreased estrogen. RANKL expression also increases osteoclast production.

Screening includes the FRAX tool, DXA scans, and a thorough family history. Usually, a diagnosis is not determined until after a person has fractured their hip, wrist, or forearm.

Treatment is usually multimodal and includes vitamin supplementation, denosumab, and physical therapy. Providers should encourage people with

osteoporosis to increase their dietary intake of vitamin D and calcium, increase strengthening exercises, and to be aware of their fall risks.

Nurses can educate their patients on the importance of avoiding environmental hazards, encourage an active lifestyle, and explain the patient's medical treatment to them.



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