1. OSTEOPOROSIS: DIAGNOSIS AND MANAGEMENT
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2. I, NAOMI ALBERTSON, M.D., NOR MY FAMILY MEMBER(S), HAVE ANY RELEVANT FINANCIAL RELATIONSHIPS TO BE DISCUSSED, DIRECTLY OR INDIRECTLY, REFERRED TO OR ILLUSTRATED WITH OR WITHOUT RECOGNITION WITHIN THE PRESENTATION.

I AM ISCD CERTIFIED AND USE THIS TITLE IN CARING FOR PATIENTS WITH LOW BONE DENSITY AND OSTEOPOROSIS.

I OWN A COMPANY, DR. NI’S, LLC, WHICH MANUFACTURES A SUPPLEMENT CALLED OSTEO C2 USED TO ASSIST NORMAL BONE/MUSCLE FUNCTION IN ADULTS WITH POOR BONE QUALITY

3. Objectives
   - 1) Identify who to screen and who to treat – risk evaluation
   - 2) Non-medication treatments
   - 3) Medication treatment options
   - 4) what’s on the horizon?

4. What’s the big deal?
   - 52 million people have low bone density or osteoporosis.
   - ½ of all patients with osteoporosis will not meet WHO criteria for dx with BMD alone.
   - By 2020, half of all Americans over age 50 are expected to have low bone density or osteoporosis.
   - 25 % of hip fractures are associated with death within 1 year of the injury (due to complications)
   - $14 BILLION/year spent in the U.S. (CHF = $8 BILLION)
Fractures hurt and limit independence!
1 out of 4 osteoporotic hip fractures result in long-term nursing home care, 1/2 of these patients are unable to walk again without assistance
2/3 of all vertebral fractures are not clinically recognized
Presence of vertebral fractures increases the risk of future vertebral and NON-vertebral fractures INDEPENDENT of BMD

Men & Osteoporosis
2 million American men have osteoporosis
3 million more are at risk
1/3 of male hip fractures are related to osteoporosis
1/3 of these men will not survive 1 year after fracture

A very quick refresher...
Normal bone is formed by 2 types of cells: osteoblasts (build) and osteoclasts (chew). The process of building and remodeling bone occurs all of the time.

Normal homeostasis

Normal Bone
Normal Bone development requires:
Vitamin D (1,25 OH)
Calcium
Magnesium
Normal hormonal levels (thyroid and parathyroid)
Normal kidney function
No severe chronic disease

“Doc, should I take D2 or D3?”

So what’s the right definition???
WHO defines osteoporosis as a T score of -2.5 or below and SEVERE osteoporosis by a T score of -3.0 or below.
WHO defines early “abnormal bone health” by a Z score below -1.5
Many professional organizations define osteoporosis by a clinical event, fragility fracture.
Others define osteoporosis as a combination of clinical fractures, risk factors and T scores below -1.0

What if there were another way to measure bone quality…

12 **How can we identify the right patients to treat?**


- “Bone mineral density can identify people who are at increased risk of developing a fracture, but it cannot with any certainty identify individuals who will develop a future fracture.”

13 **USPSTF Recommendation – 2010**

- The U.S. Preventive Services Task Force recommends testing of all women age 65 and older and younger women whose fracture risk is equal to or greater than that of a 65-year-old white woman who has no additional risk factors.

14 **ACOG Recommendation - 2012**

- Dual-energy X-ray absorptiometry (DXA) of the lumbar spine and hip should begin at age 65 for all women.
- Postmenopausal women younger than 65 should only be screened with DXA if they have significant risk factors for osteoporosis and/or bone fracture.
- FRAX, a fracture risk assessment tool, can help to further predict a person’s risk of bone fracture in the next 10 years.
- In the absence of new risk factors, DXA screening should not be performed more frequently than every two years. FRAX should be used on an annual basis to monitor the effect of age on fracture risk.

15 **ACP (American College of Physicians)**
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ACP (American College of Physicians)

The appropriate age at which to begin risk assessment is unknown. However, by age 65 years, at least 6 percent of men have DEXA-determined osteoporosis, so risk factor assessment before this age is reasonable.

What are the risk factors?

- Age.
- Gender. Women over the age of 50
- Ethnicity. Caucasian and Asian
- Bone structure and body weight. Petite and thin individuals have a greater risk of developing osteoporosis.

Risk Factors (continued)

- Family history.
- Prior history of broken bones.
- Cigarette smoking.
- Alcohol.
- Certain Diseases.
- Certain medicines.

Symptoms and Warning Signs

- Persistent, unexplained back pain
- Shorter than you used to be (>2 inches)
- Spinal deformities

Symptoms and Warning Signs

- Recurrent fractures
- Fracture from minimal trauma
- Experiencing chronic medical problems

Medical WHO Definition

- Osteopenia is defined as a T score of -1.0 to -2.5
- Osteoporosis is defined as a T score BELOW – 2.5
Medical WHO Definition

- Osteopenia is defined as a T score of -1.0 to -2.5
- Osteoporosis is defined as a T score BELOW -2.5
- BOTH MAY REQUIRE TREATMENT

Why are we basing a diagnosis on a test that doesn’t predict fracture?

FRAX calculation
Predictor of fracture in the next 10 years

HIGH RISK:
1) Major Osteoporotic fracture >20%
2) Hip Fracture risk >3%

What treatments are available?

Treatments

1 NON-PHARMACOLOGIC

2. Diet and supplements: Calcium, Vitamin D, Magnesium
   - Exercise: 15-30 minutes of weight bearing exercise every day!!
   - Fall risk evaluation and home exercise plans
   - Limiting medications associated with bone loss
   - Cut out smoking, cut out alcohol consumption
   - Don’t fall down!!
   - Hip protectors – seldom used

3 PHARMACOLOGIC (MEDICATIONS)

4. Medicines:
   - Bisphosphonates
   - Estrogen agonists/antagonists (also called selective estrogen receptor modulators or SERMS)
   - Calcitonin – new black box!
   - Parathyroid-like hormone
   - Estrogen therapy hormone therapy
   - RANK ligand (RANKL) inhibitor.

Calcium
The current recommended intake of calcium is Calcium Citrate 1200mg daily. NOT MORE due to the potential for kidney stones and possibly cardiac plaques to develop.
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Recommend dietary form if able, otherwise supplement remainder.

Vitamin D
- Vitamin D3 is the most bioavailable form.
- Vitamin D is a fat soluble vitamin and therefore should be taken with food/fat. Additionally, it is best taken in divided doses twice daily and you MUST avoid acid blocking medicines.
- Goal is to normalize levels, NOT exceed them.
- Current recommendations for adequate intake are variable:
  - Children 600-800IU daily
  - Adults 1000 -1200 daily >age 51 (women), >70 (men)
  - Sometimes high dose use of 50,000IU weekly for 12 weeks is used to boost levels (may be Vitamin D2 or D3)
  - Occasionally calcitriol is needed (1,25 vitamin D) as a Rx

Magnesium
- Magnesium helps build normal bone structure.
- The recommended daily allowance of magnesium > age 50 is
  - 320 mg/day for women
  - 420 mg/day for men
- *** Most people in this age group get far less than this daily amount.

Exercise

strontium Ranelate vs. Citrate?
- What Is Strontium?
- Strontium is a trace element found in seawater and soil. The main dietary source of strontium is seafood (there is a small amount in milk, wheat bran, meat, poultry, and root vegetables).
- Strontium is chemically similar to calcium. It appears to play a role in the formation of new bone while slowing the breakdown of old bone, and thus may influence bone density. There is some evidence that women with osteoporosis may not absorb
Strontium is chemically similar to calcium. It appears to play a role in the formation of new bone while slowing the breakdown of old bone, and thus may influence bone density. There is some evidence that women with osteoporosis may not absorb strontium as they should. By most it is considered a weak anti-resorptive medicine.

In several European countries and Australia, a patented form of strontium, called strontium ranelate (Proteos), is available as a prescription medication used for the treatment and prevention of osteoporosis. Proteos is not approved in the U.S.; however, strontium citrate is widely available as a nutritional supplement.

Medications for reducing fractures

Several medications are available for the prevention and/or treatment of osteoporosis, including:
- Bisphosphonates*
- estrogen agonists/antagonists (also called selective estrogen receptor modulators or SERMS)*
- Calcitonin – BLACK BOX WARNING
- parathyroid hormone*
- estrogen therapy
- hormone therapy
- RANK ligand (RANKL) inhibitor *

Bisphosphonates

- Fosamax, Boniva, Reclast, Actonel, etc.
- 2 forms – oral pills and IV injections/infusions
- All target the reabsorption of bone and all improve bone density AND decrease the risk of fracture (may increase bone density 7% and reduce fracture risk up to 45%)
- All have the same side effects: esophagitis, atypical hip fractures, avascular necrosis of the jaw (IV forms do not have as much esophagitis), bone aching
- Not advised to be used LONGER than 5 years, in those with severe GI issues OR in people with kidney failure

All help to decrease serum calcium
- BONIVA has NOT been shown to reduce hip fracture rates in PO form
- NO contraindication for use with acute fracture – does NOT slow fracture healing
Mainstay of treatment for those with primary cancer that has potential for metastasis to bone to reduce time to first fracture (zoledronic acid dosed 4mg q 3-4 weeks)

OK to use after 1-2 year holiday for an additional 5 years, however, no data about additional gains of bone density or fracture reduction

SERMS

Raloxifien, tamoxifen

Mechanism of action: synthetic molecules that bind to the estrogen receptor and act as agonists on the bone and liver and as antagonists on breast and genito-urinary tract

Benefits: up to 3% increase in bone mineral density and reduces risk of vertebral fractures by up to 40% (MORE study) but has NO effect on non-vertebral fracture reduction. Impact on cardiovascular health is controversial

Risks: cardiovascular – increased risk of thrombotic and thromboembolic events.

Rank Ligand inhibitor (Prolia, Xgeva, Denosumab)

Considered to be an alternative first line medication

Mechanism of action: rankligand inhibitor on premature osteoclast – when bound turns off and inhibits osteoclast activity.

Subcutaneous injection every 6 months (more frequent as Xgeva)

Minimal side effects (no GI effects)

Safe in patients with kidney disease but MUST monitor serum ionized calcium

Safe to be used for ongoing treatment beyond 5 years,

Maximum bone density improvement 7%, fracture risk reduction 45%

Monitoring — Patients with chronic kidney disease (creatinine clearance <30 mL/min, including patients receiving dialysis) and/or other conditions that predispose to hypocalcemia (eg, malabsorption syndromes) are at higher risk for
hypocalcemia following denosumab administration than patients without these conditions. Calcium should be measured in such patients approximately 10 days after denosumab administration. In addition, if a patient with a condition that predisposes to hypocalcemia becomes ill and cannot take oral calcium after having received denosumab, there is a risk of hypocalcemia.

37 ☐ Forteo (teraparatide)
- The only medication that builds bone (up to 22% in 2 years)
- Self-administered injection daily for 2 years
- FDA approval for 2 years of use due to lab rats development of osteosarcoma. NO HUMAN CASES.

☐

38 ☐ Coming soon...
1 ☐ Diagnosis:
- OsteoProbe® – see next slides
- Available? Currently seeking FDA device approval

2 ☐ Treatment:
- Romosozumab – monoclonal antibody that binds sclerostin receptor and stops the inhibition of bone growth. Phase II clinical trials showed better bone growth over Forteo and bisphosphonates.
- “no major side effects”
- Several years from availability

39 ☐
40 ☐
41 ☐
42 ☐
43 ☐

44 ☐ Osteoporosis – case 1
- 67 year old caucasian female in office s/p recent fall and left femur fracture. Fall due to loose cord on floor.
Medical history:
- RA, treated in past for over 1 year on prednisone >5mgs daily, now on humira doing well
- Drinks 2 glasses wine nightly
- No prior DXA or risk factor assessment completed
- No supplements, good diet
- Exercised prior to fall by swimming 3-4 days/week
- No cancer history

DXA shows lumbar spine T-2.4, hip T-2.2
FRAX calculation: 18%, 2.2%
Labs: no anemia, normal chem panel, normal kidney function, PTH and TSH are normal

Does she need treatment with anything other than supplements and exercise?

YES!!!!
Bisphosphonate, denosumab or teraparatide?
Why not just diet and exercise with repeat DXA in 2 years?
What is argument for/against use of teraparatide?

Started on alendronate 70mg weekly
Repeat DXA in 1 year after initiating treatment, anticipate 2% gain annually
Educate re: diet/exercise/fall risk, etc.

Questions?
National Osteoporosis Foundation
AAOS
CDC.gov
AAFP.org
https://riskcalculator.fore.org/default.aspx