Bones

• The role of bones:
  o Provide structure
  o Protect vital organs
  o Anchor muscles
  o Store calcium and other minerals

• When the body needs calcium, it breaks down and rebuilds bone

• This is called remodeling – supplies the body with calcium and keeps bones strong
Bone Health

- Bones are continuously changing – made of living, growing tissue
  - New bone is made and old bone is broken down
- Younger = your body makes new bone faster than it breaks down old bone which increases your bone mass
- Around 30-35 years of age our bone mass peaks
- Bone continues to remodel but you lose slightly more bone mass than you gain
- The higher your peak bone mass, the less likely you are to develop osteoporosis as you age.
Osteoporosis

• Osteoporosis means “porous bone”

• It is a disease that weakens bones and increases your risk for sudden and unexpected bone fractures

• Osteoporosis often develops without symptoms and is usually discovered once a painful fracture occurs – usually the hip, wrist or spine

• The National Osteoporosis Foundation reports that 54 million people in the US have osteoporosis

• After age 50, 1 in 2 women and 1 in 4 men will have an osteoporosis-related fracture in their lifetime
Osteoporosis

• The inside of a healthy bone looks like a sponge

• A hard outer shell of dense bone wraps the spongy inside bone

• With osteoporosis the “holes” in the “sponge” grow larger and more numerous which weakens the inside of the bone.

• Symptoms (usually no symptoms):
  • Loss of height (getting shorter by an inch or more)
  • Change in posture (bending forward or stooping)
  • Shortness of breath (compressed disks)
  • Bone fractures
  • Pain in the lower back
Factors that Affect Bone Health

• The amount of calcium in your diet
  o A diet low in calcium contributes to diminished bone density, early bone loss, and an increased risk of fractures

• Physical Activity
  o Being physically inactive leads to higher risk of osteoporosis compared to those who are more-active

• Tobacco and Alcohol use:
  o Research suggests that tobacco contributes to weak bones
  o Regularly having more than 1 alcoholic drink/day for women or 2 alcoholic drinks/day for men may increase osteoporosis risk

• Women are at greater risk for osteoporosis than men due to having less bone tissue than men do
Factors that Affect Bone Health

• Size
  o Having a BMI of 19 or less or a small body frame increases risk because you may have less bone mass to draw from as you age

• Age
  o Bones become thinner and weaker as you age

• Family history
  o Having a parent or sibling who has osteoporosis puts you at greater risk

• Hormone levels
  o Too much thyroid hormone can lead to bone loss
  o For women, bone loss increases significantly at menopause due to dropping estrogen levels
  o For men, low testosterone levels can also cause loss of bone mass
Factors that Affect Bone Health

• Eating disorders and other conditions
  o Severely restricting food intake and being underweight weakens bone in both men and women
  o Weight-loss surgery and conditions like celiac disease can affect your body’s ability to absorb calcium

• Certain medications
  o Long-term use of corticosteroid medications (dexamethasone, prednisone, cortisone, prednisolone) is damaging to bone
  o Aromatase inhibitors to treat breast cancer also increases the risk of osteoporosis along with selective serotonin reuptake inhibitors, methotrexate, some anti-seizure medications (Dilantin and phenobarbital) and proton pump inhibitors
Cancer Survivors – Bone Health

• Survivors are at higher risk for bone loss and osteoporosis than the general public – often due to cancer therapies

• Breast and prostate cancer treatments may cause low estrogen or androgen levels – two hormones important for strong bones

• It is estimated that 75% of multiple myeloma patients have osteopenia or osteoporosis

• Bone disease (osteoporosis) is a recognized complication of Hematopoietic Cell Transplantation – prevalence is as high as 50% as early as 1 year after transplantation.

• The duodenum is the primary absorption site for calcium – any surgical interventions bypassing or removing can increase bone loss and bone density should be monitored.
Bone Health Testing / Screening

• Bone Mineral Density (BMD) tests also known as dual-energy X-ray absorptiometry (DEXA or DXA) scans

• These X-rays that use very small amounts of radiation to determine how solid the bones of the spine, hip or wrist are

• Regular X-rays only show osteoporosis when the disease is very far progressed

• All women over the age of 65 should have a bone density test – may be done earlier if you have risk factors

• Men over age 70 should also consider getting a bone density test or younger if you have risk factors
Osteopenia vs. Osteoporosis

• Osteopenia is the thinning of bone and characterized by low bone density.

• Results from a Bone Mineral Density test define bone health:

<table>
<thead>
<tr>
<th>Bone Density</th>
<th>T-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal bone density</td>
<td>+1.0 to -1.0</td>
</tr>
<tr>
<td>Low bone density</td>
<td>-1.0 to -2.5</td>
</tr>
<tr>
<td>At high risk for osteoporosis</td>
<td>-2.5 or higher</td>
</tr>
</tbody>
</table>
How to Keep Your Bones Healthy

• Include **calcium** and **vitamin D** in your diet

• Include physical activity in your daily routine
  - Weight bearing exercises = walking, jogging and climbing stairs
  - Resistance and balance exercises

• Avoid substance abuse
  - Don’t smoke
  - Women should avoid drinking more than 1 alcoholic beverage each day
  - Men should avoid drinking more than 2 alcoholic beverages each day
How Much Calcium Do You Need?

Recommended Dietary Allowance (RDA)

- Adults 19-50 years: 1,000mg/day
- Men 51-70 years: 1,000mg/day
- Women 51 and older: 1,200mg/day
- Men 71 and older: 1,200mg/day
# Calcium - Food Sources

<table>
<thead>
<tr>
<th>Calcium per Serving</th>
<th>Food Source</th>
</tr>
</thead>
</table>
| **300 mg / serving** | 1 cup milk
|                     | 1 cup fat-free/low-fat yogurt
|                     | 1 cup calcium-fortified soy or rice milk
|                     | 1 cup calcium-fortified orange juice
|                     | 1.5 oz. low-fat cheese (cheddar, mozzarella, or Swiss) |
| **200 mg / serving** | 3 oz. canned salmon (with soft bones) |
|                     | 3 oz. sardines (with soft bones) |
|                     | 1 cup calcium-fortified cereal |
| **150 mg / serving** | 1 cup cottage cheese |
|                     | ½ cup tofu (made with calcium) |
|                     | 1 slice calcium-fortified bread |
| **100 mg / serving** | ½ cup frozen yogurt |
|                     | ¼ cup almonds |
|                     | ½ cup cooked greens (kale, collards, spinach, turnip greens) |
| **50 mg / serving**  | 1 medium orange |
|                     | ½ cup cooked broccoli |
Calcium Supplements

- Two most common forms of calcium used in calcium supplements:
  - Calcium Carbonate – take with food
  - Calcium Citrate – take with or without food
- Calcium supplements are better absorbed in smaller doses (500mg) at a time
- Available in a variety of forms like tablets, chews, liquids, etc.
- Not regulated by the FDA
- More IS NOT always better – excessive calcium doesn’t provide extra bone protection
- Always tell your healthcare provider what supplements you are taking – calcium supplements can interact with certain medications.
What is Vitamin D?

• A nutrient we eat and a hormone our bodies make
• A fat-soluble vitamin
• Helps your body absorb calcium and phosphorus
  o Best known for bone health
• Vitamin D exists in two forms:
  o D₂ (ergocalciferol) – produced in plants
  o D₃ (cholecalciferol) – produced in animals
• Vitamin D production in the skin is the primary natural source of vitamin D
How Much Vitamin D Do You Need?

Institute of Medicine recommendations:

- 0-12 months: 400 IU (or 10 mcg)
- 1-70 years: 600 IU (or 15 mcg)
- 70+ years: 800 IU (or 20 mcg)
- 4000 IU (or 100 mcg) upper limit

Endocrine Society's Clinical guidelines:

- 0-12 months: 400 IU - 1000 IU (or 10-25 mcg)
- 1-18 years: 600 IU – 1000 IU (or 15-25 mcg)
- 19-70 years: 600 IU – 2000 IU (or 15-50 mcg)
- 70+ years: 800 IU – 2000 IU (20-50 mcg)
Vitamin D - Food Sources

- **Oily Fish:**
  - Salmon (11.1 mcg or 444 IU)
  - Trout (16.2 mcg or 648 IU)
  - Sardines (4.1 mcg or 164 IU)
  - Canned Tuna (3.9 mcg or 156 IU)

- **Mushrooms – exposed to UV light**
  - (7.9 mcg or 316 IU)

- **Fortified foods:**
  - Milk (2.9 mcg or 116 IU)
  - Orange Juice (3.4 mcg or 136 IU)
  - Yogurt (2 mcg or 80 IU)
Other Nutrients

• Protein makes up 50% of bone volume
  o High protein diets were once thought to leach calcium from bones but now are thought to play an important role in building bone
  o Epidemiologic studies show great protein intake to be beneficial to bone health

• Research is still lacking regarding the role other nutrients play in bone health
  o Other nutrients include selenium, magnesium, and vitamin K

• Magnesium – involved in laying down of bone
  o RDA is 310-420 mg/day: pumpkin seeds, almonds, spinach, cashews, peanuts, black beans and edamame
Vitamin K2

- Vitamin K also has two forms: K1 and K2

- **Vitamin K2 deficiency** is more prevalent and potentially linked to heart and bone health (serum levels aren’t reliable for testing)

- **Bone Health** = activates osteocalcin > can draw calcium into the bones

- **Heart Health** = Vitamin K2-activated matrix gla protein is responsible for removing excess calcium that can accumulate in soft tissues like arteries and veins
# Vitamin K2 Sources

<table>
<thead>
<tr>
<th></th>
<th>Vitamin K1</th>
<th>Vitamin K2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role</strong></td>
<td>Coagulation</td>
<td>Proper calcium utilization</td>
</tr>
<tr>
<td><strong>Food Sources</strong></td>
<td>Leafy greens</td>
<td>Liver</td>
</tr>
<tr>
<td></td>
<td>Green vegetables</td>
<td>Meat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Egg Yolks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-fat Dairy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Natto (only vegetarian option)</td>
</tr>
<tr>
<td><strong>DRI</strong></td>
<td>90-120 mcg/day</td>
<td>Not yet determined</td>
</tr>
<tr>
<td><strong>Deficiency</strong></td>
<td>Rare</td>
<td>Prevalent</td>
</tr>
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</table>
Physical Activity

- Aim to get 150 minutes of moderate intensity physical activity per week (30 minutes, 5 days per week)
  - Walking, jogging, resistance training, yoga/balance
- Start small; it all counts!
- Space it out throughout the day
- Add walking or standing breaks to limit time sitting
- Limit “screen time” to ≤ 2 hours
Limit Alcohol Consumption

- For cancer – it is best **not** to drink alcohol
- Previous research showed that modest amounts of alcohol may have a protective effect against heart disease
- Alcohol in any form is a potent carcinogen
- For those concerned about cancer do not drink
- It is linked to 6 different cancers

* If you do choose to drink alcohol – limit your consumption to 1 drink for women & 2 for men per day
Smoking Cessation

• Talk to your doctor about smoking cessation programs

• Northside Smoking Cessation Program
  o Call: 404-780-7653
  o Email: smokingcessation@northside.com
  o Website: https://www.northside.com/community-wellness/built-to-quit

BUILT TO QUIT
Resources to help you stop smoking and using tobacco
Osteoporosis Treatment

• Treatment may also include the recommendations for prevention

• There are several classes of medications available to treat osteoporosis and your healthcare provider will determine the best fit if needed
  
  o Hormone & hormone-related therapy (Fortical, Miacalcin, Evista)
  
  o Bisphosphonates (Boniva, Reclast, Fosamax)
  
  o Biologics (Prolia)
  
  o Anabolic agents (Evenity, Forteo, Tymlos)
Questions?
References


• National Osteoporosis Foundation. https://www.nof.org/patient-support/