Tips and Tricks for Better Bone Health

Radhika Narla, MD

Outline

- What is Osteoporosis?
- What causes Osteoporosis?
  - Risk Factors for Bone Loss
    - Especially in Cancer survivors
  - Risk factors for Falls
- What are some of the initial tests done to look for if someone has Osteoporosis?
- Focus on what someone can do to prevent bone loss or falls
  - Calcium intake
  - Vitamin D
  - Exercise to help maintain leg strength, balance and posture.

What is Osteoporosis?

A skeletal disorder characterized by compromised bone strength predisposing to an increased risk of fracture

Normal bone

Osteoporotic bone: one can see thinning of connecting bone and big spaces in the bone structure making the bone more fragile

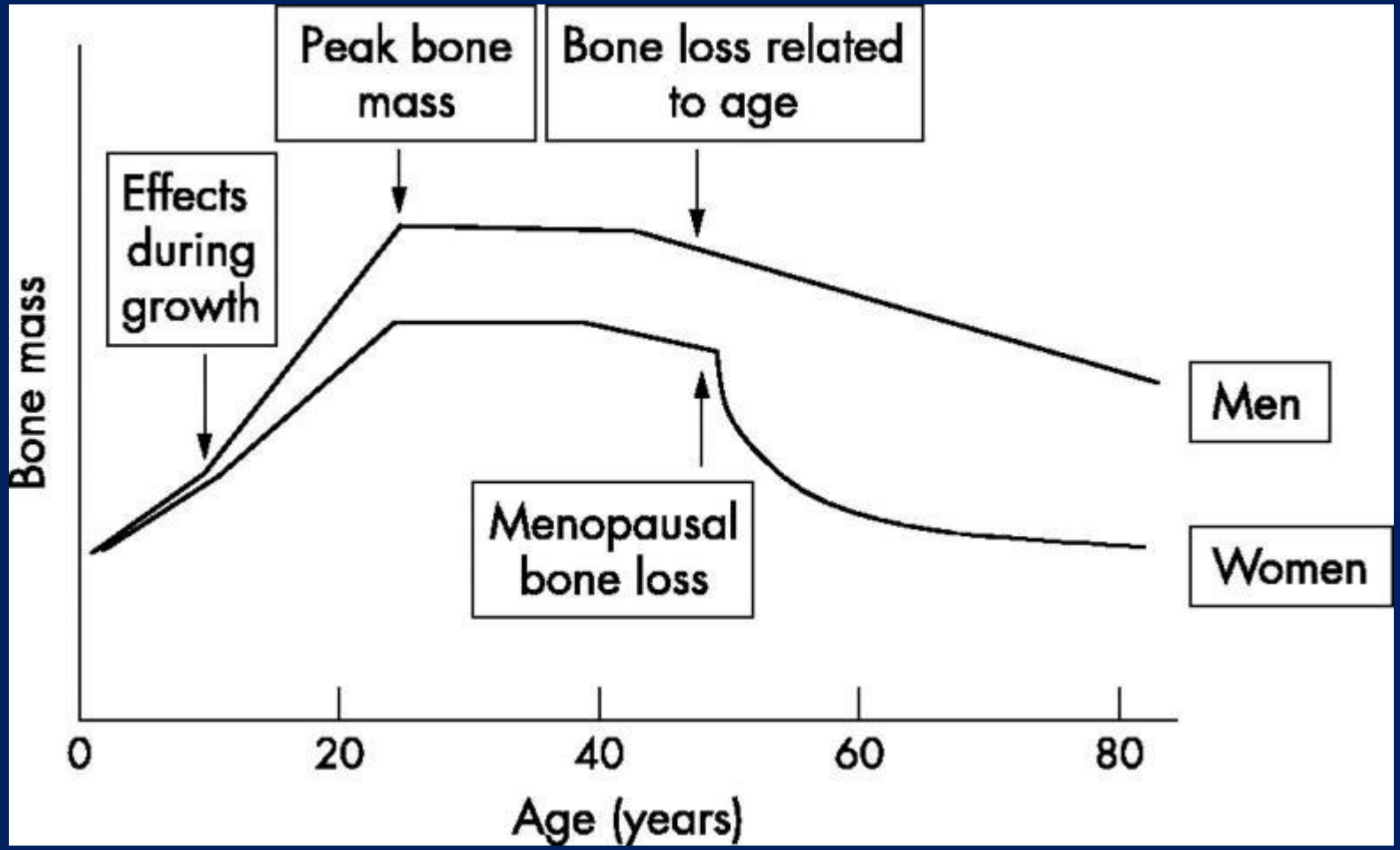
Bone Density + Bone Quality = Bone Strength

DEXA grams/cm2

Structure/Architecture/Turnover/Mineralization/ Damage Accumulation

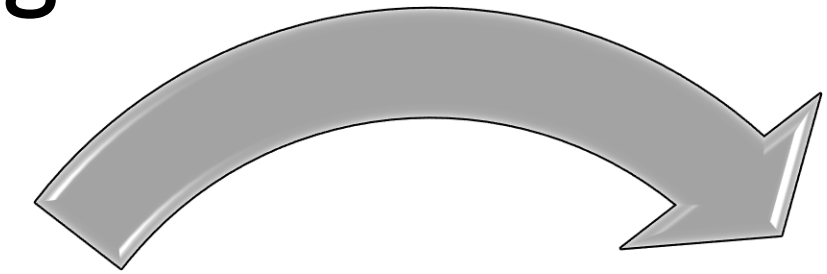
JAMA 2001;285:785

General Pattern of Bone Development and Bone Loss



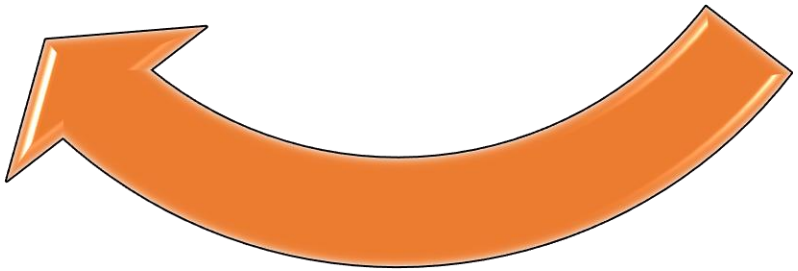
International Osteoporosis Foundation

Bone Remodeling



Osteoblasts build bone

Osteoclasts Resorb or break down bone



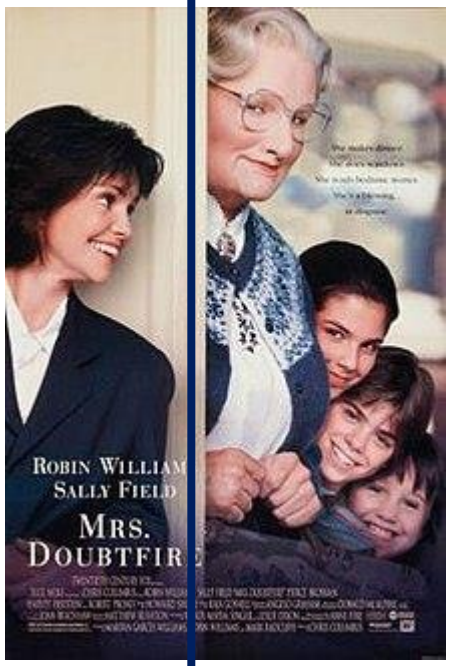
As we age or due to other factors, this cycle can tilt in favor of bone loss, causing our bones to become increasingly porous and fragile.

Osteoporosis Numbers…

- 2 million osteoporotic fractures/year
- 1 of every 2 Caucasian women & 1 of every 5 men will have an osteoporotic fracture
- Hip fractures
  - 8-36% risk of 1 year mortality→ this is higher in men
  - 20% risk of nursing home placement/Long term Care
- Direct healthcare costs about $19-30 billion per year

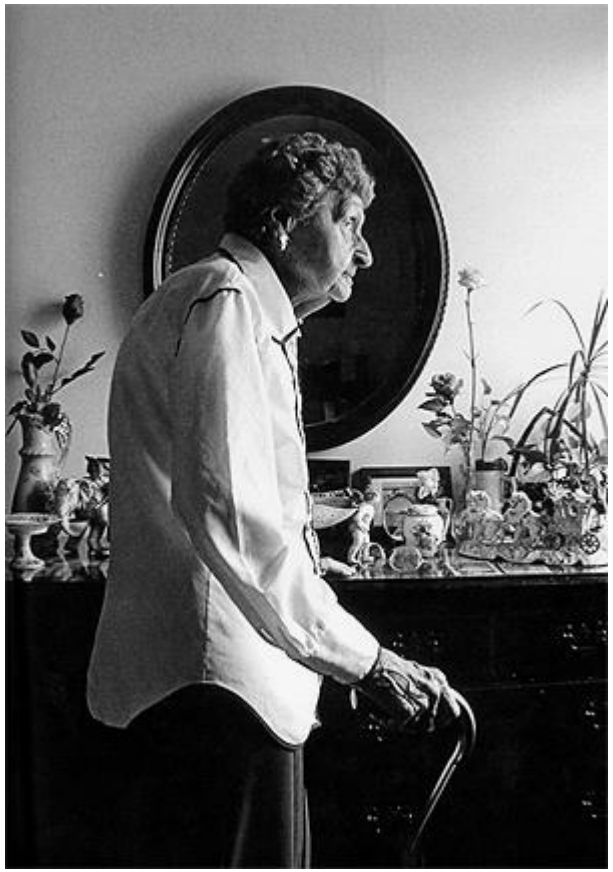
Wright NC et al. Osteoporos Int. 2016;
Cosman F et al. Osteoporos Int. 2014;25:2359-2381.

Famous faces with Osteopenia or Osteoporosis



Men can have Osteoporosis too!

Hyperkyphosis patient

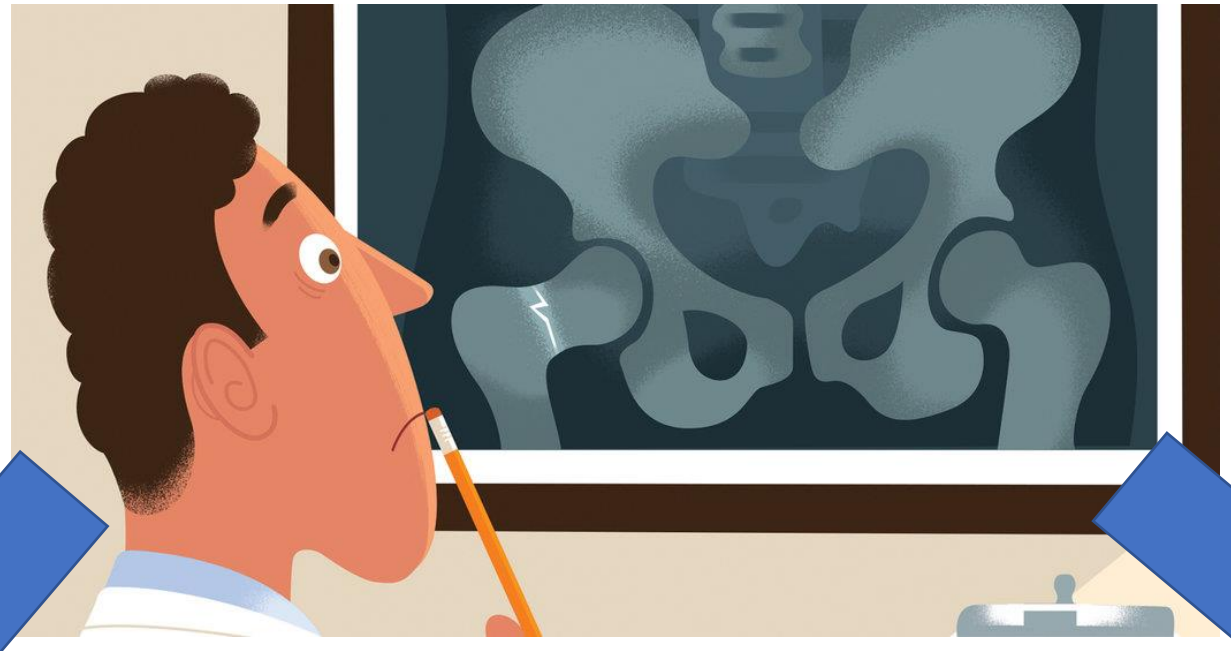


Excessive curvature of the thoracic spine, commonly known as the "dowager's hump."

Primary Reasons of Hyperkyphosis

- Vertebral fractures
- Degenerative discs
- Genetics

Two Components to Osteoporosis



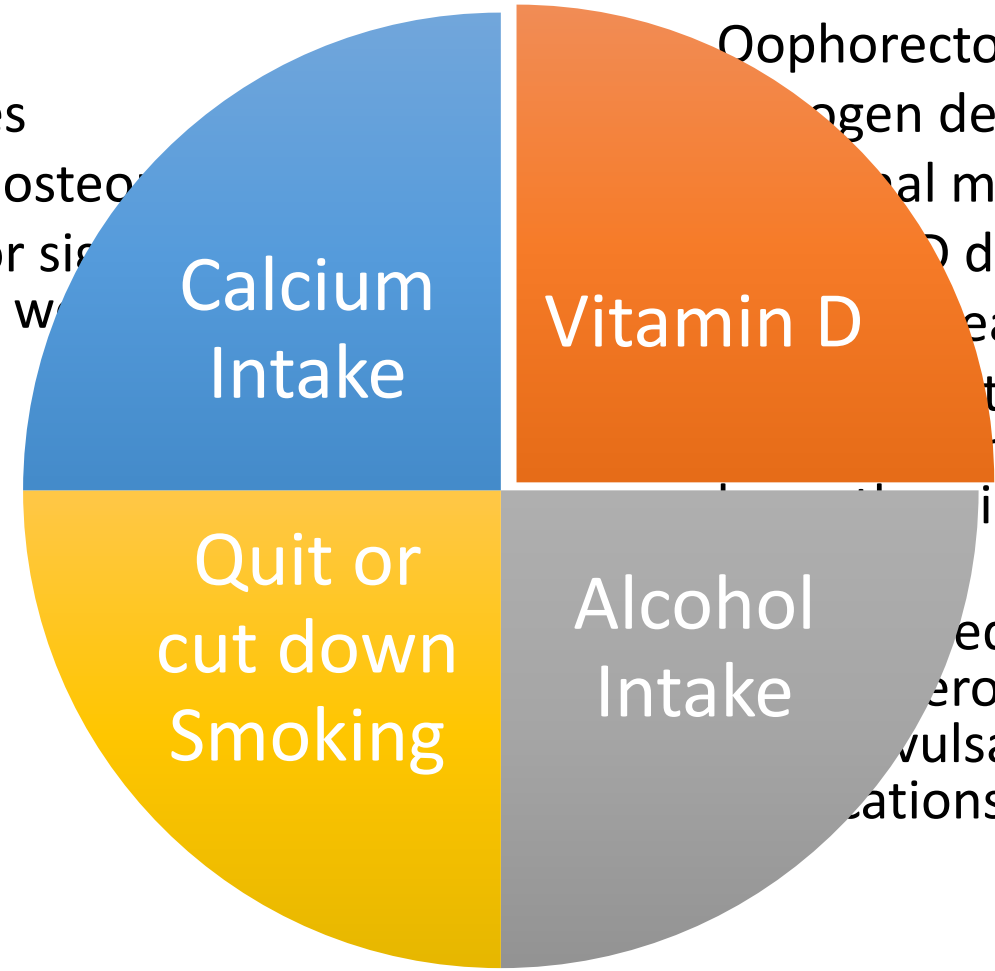
Risk Factors for Bone Loss

Risk Factors for Falls

Risk Factors for Bone Loss

- Genetic factors
  - Female
  - Certain Ethnicities
  - Family history of osteo
  - Low body mass or si
    decrease in body w
    of 25

Factors you can change



- Health status factors
  - Oophorectomy
  - ogen deficiency
  - al malabsorption
  - D deficiency
  - ea
  - tabolic disorders (e.g., hyroidism, idism, diabetes, Cushing's
  - edications (e.g., prolonged eroid therapy, antacids, vulsants, lithium, seizure cations)

Bone Related Effects from Cancer

Chemotherapy

Agents used to help fight cancer cause an increase in bone loss or resorption

Corticosteroids – big component of chemotherapy drug regimen cause bone loss

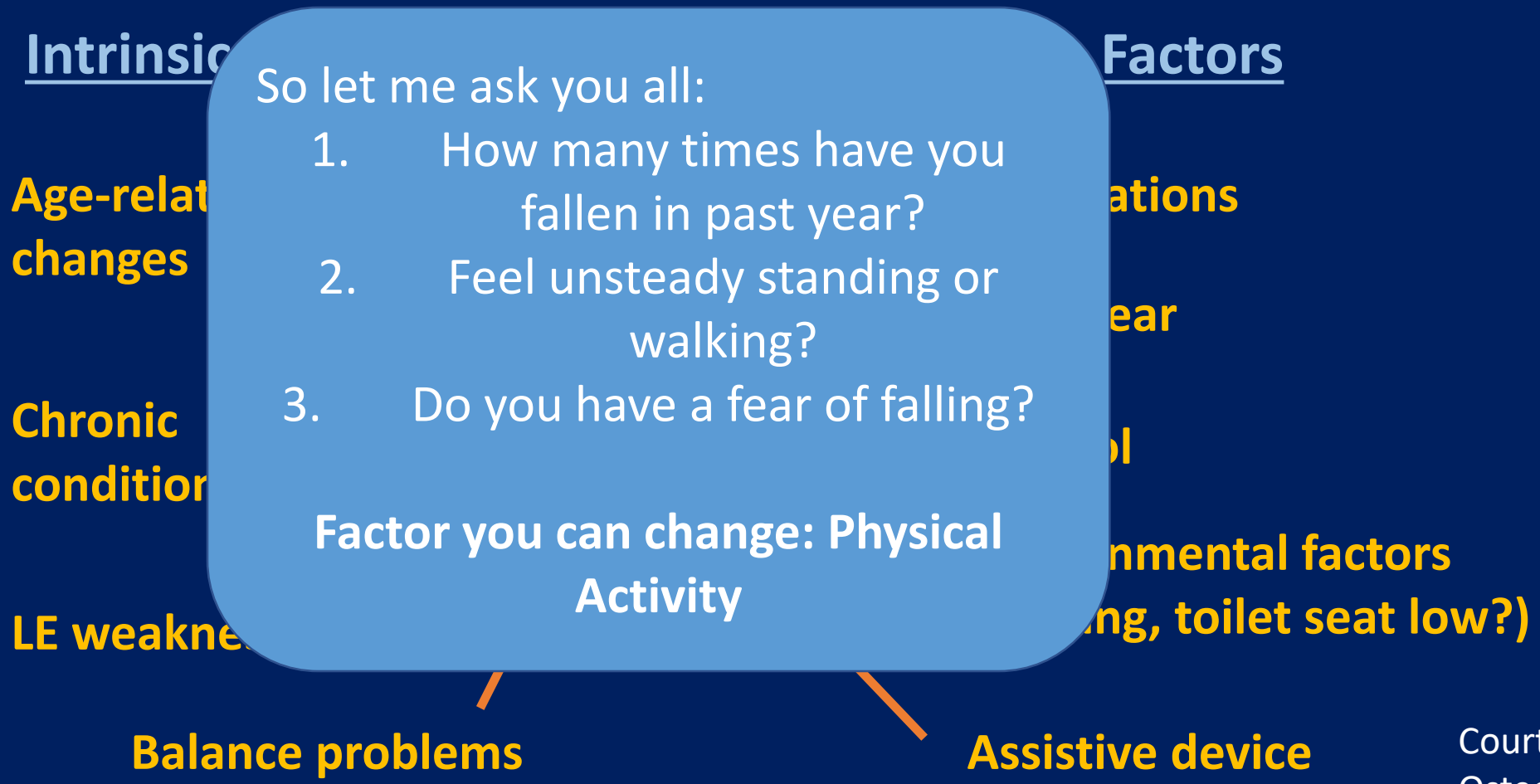
Weight loss, nutrition effects

Endocrine Therapy

Aromatase inhibitors (AI) inhibit aromatase enzyme leading to a decrease in plasma estradiol.

In men with Prostrate Ca, Androgen deprivation therapy (block testosterone) results in a profound decrease in the levels of testosterone.

Risk Factors for Falls



Courtery of Osteoporosis Clinic

How do you diagnose Osteoporosis?

- The T-score compares an individual's BMD with the mean value for young adults and expresses the difference as a standard deviation score
- There are pitfalls to DEXA but we don't have other great tools

Category	T-score
Normal	-1.0 and above
Low bone mass (osteopenia)	Between -1.0 to -2.5
Osteoporosis	-2.5 and below

FRAX

- **FRAX is not intended to be used in patients who are already on pharmacologic treatment**
- **The model is based on femoral neck BMD only—not spine or hip BMD**
- **Limited to 4 racial backgrounds in US**
- **It is not obvious that all risk factors carry equal weight in predicting risk**

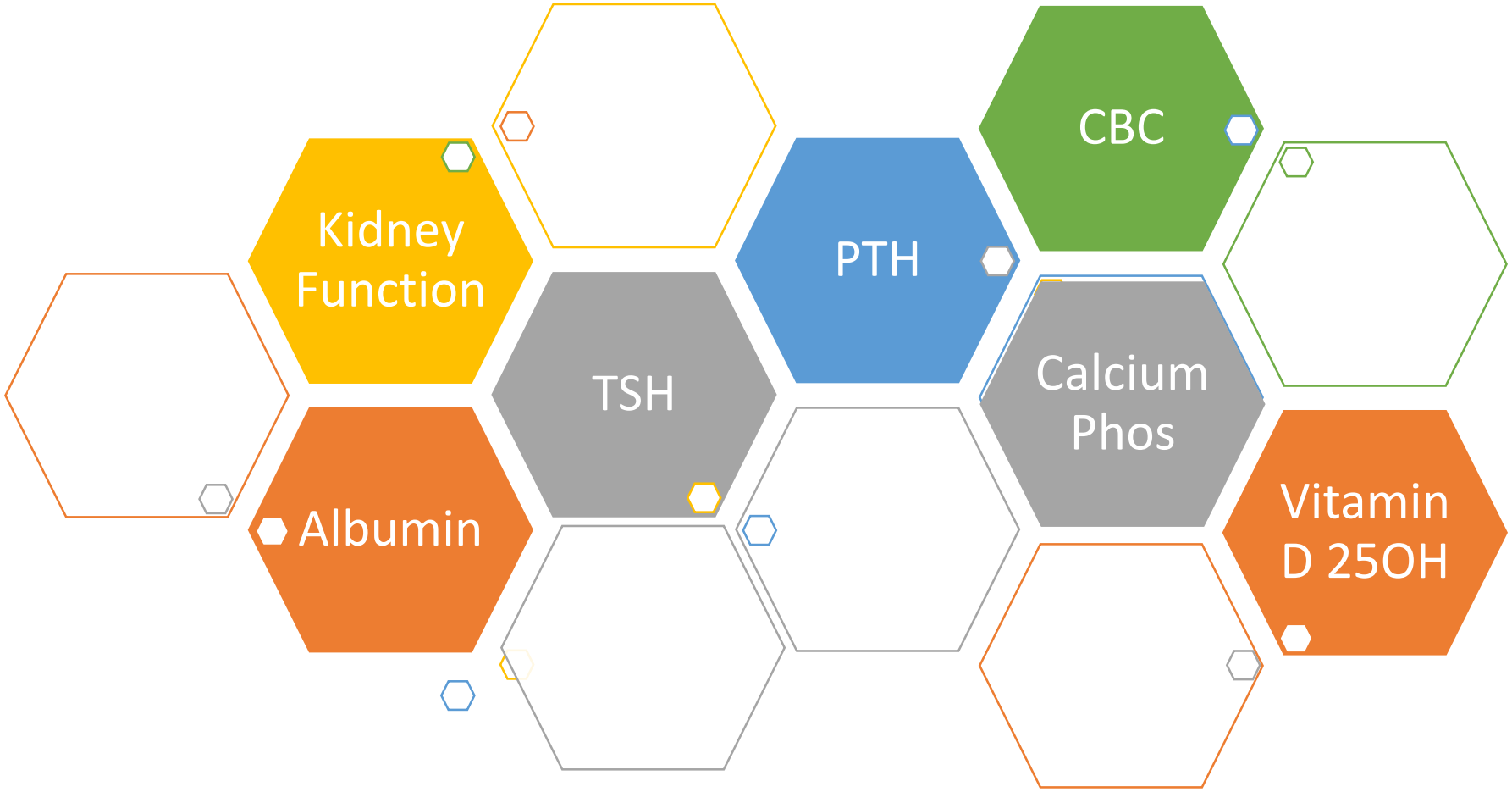
Who should get a Bone Density Test?
No Guideline Consensus

Who Should Have a Bone Density Test?

- In women age 65 and older and men age 70 and older
- In postmenopausal women and men above age 50–69, based on secondary risk factor profile
- In postmenopausal women and men age 50 and older who have had an adult age fracture to determine degree of osteoporosis

National Osteoporosis Foundation. Clinician's Guide to Prevention and Treatment of Osteoporosis.
Endocrine Society

Many Lab Tests that follow



Key Take Home Message: You have to sometimes go beyond the standard bone density test and labs when assessing risk of fractures.

SUCCESS

is the SUM of

SMALL

efforts,

REPEATED

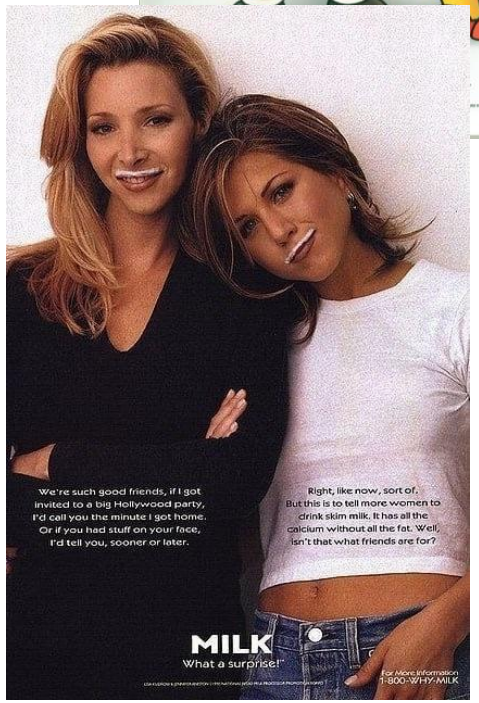
DAY IN AND DAY OUT.

R. COLLIER

Calcium: Key Points

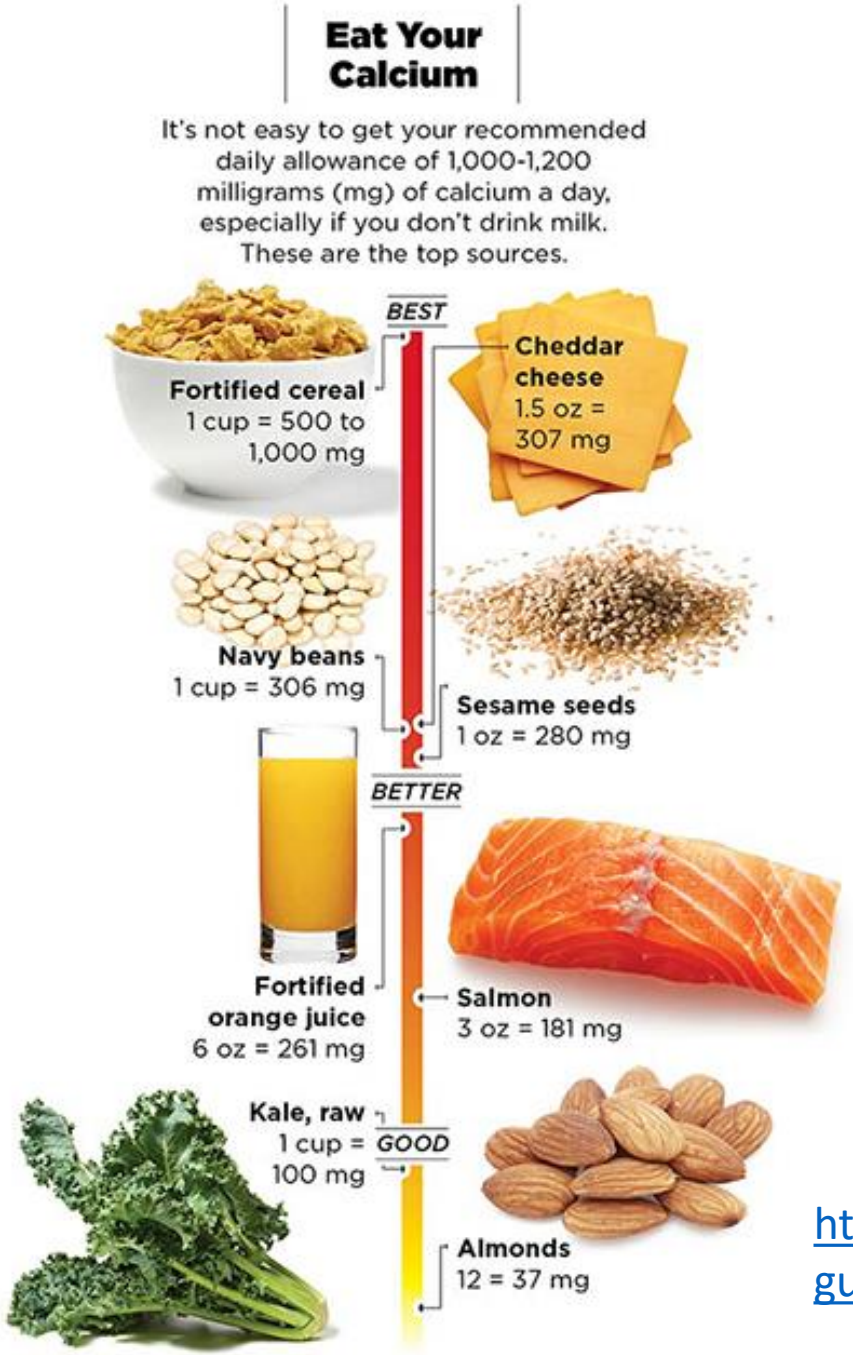
- Nerves and muscles need calcium to function.
- The bones do need calcium to repair damage and maintain strength.
- But excess calcium will not help the skeleton.
- Bones take what they need, and the rest must

be removed by the kidney, or it will build up in the wrong places (blood vessels, kidneys themselves).



Calcium…

- Most of the clinical guidelines suggest **calcium intake of 1,000 mg/day**.
- It would be best to get this from dietary sources: Yogurt, Cheese & Milk



Protein	**Tofu (with Calcium), Garbanzo Beans, Soy Beans, green, boiled**
Veggies	Bok Choy, Kale, Broccoli

https://www.nof.org/patients/treatment/calciumvitamin-d/a-guide-to-calcium-rich-foods/

Nutrition Labels

Take the 20% Ca and ADD ‘0’ for total Calcium in mg
20 + 0 = 200mg

Nutrition Facts

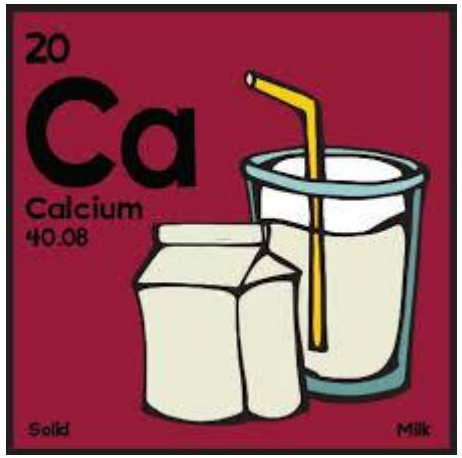
Serving Size 2/3 cup (55g)
Servings Per Container About 8

Amount Per Serving

Calories 230	Calories from Fat 72
	% Daily Value*
Total Fat 8g	**12%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**12%**
Dietary Fiber 4g	**16%**
Sugars 1g	
Protein 3g	
Vitamin A	10%
Vitamin C	8%
Calcium	20%
Iron	45%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g



Calcium Supplements

Two main types of calcium supplements

Remember: Please Read the labels – not FDA regulated

Calcium citrate

i.e., Citracal

Easier on stomach,

Take with or without food

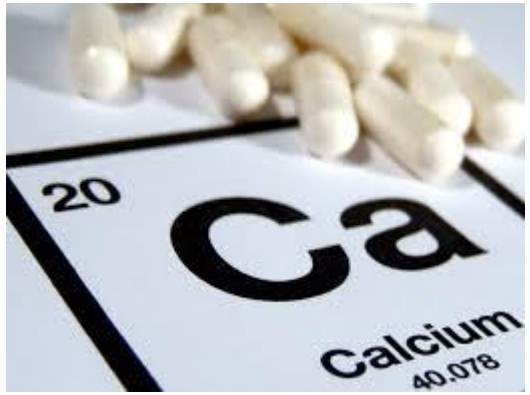
Calcium carbonate

i.e., Caltrate

Less expensive,

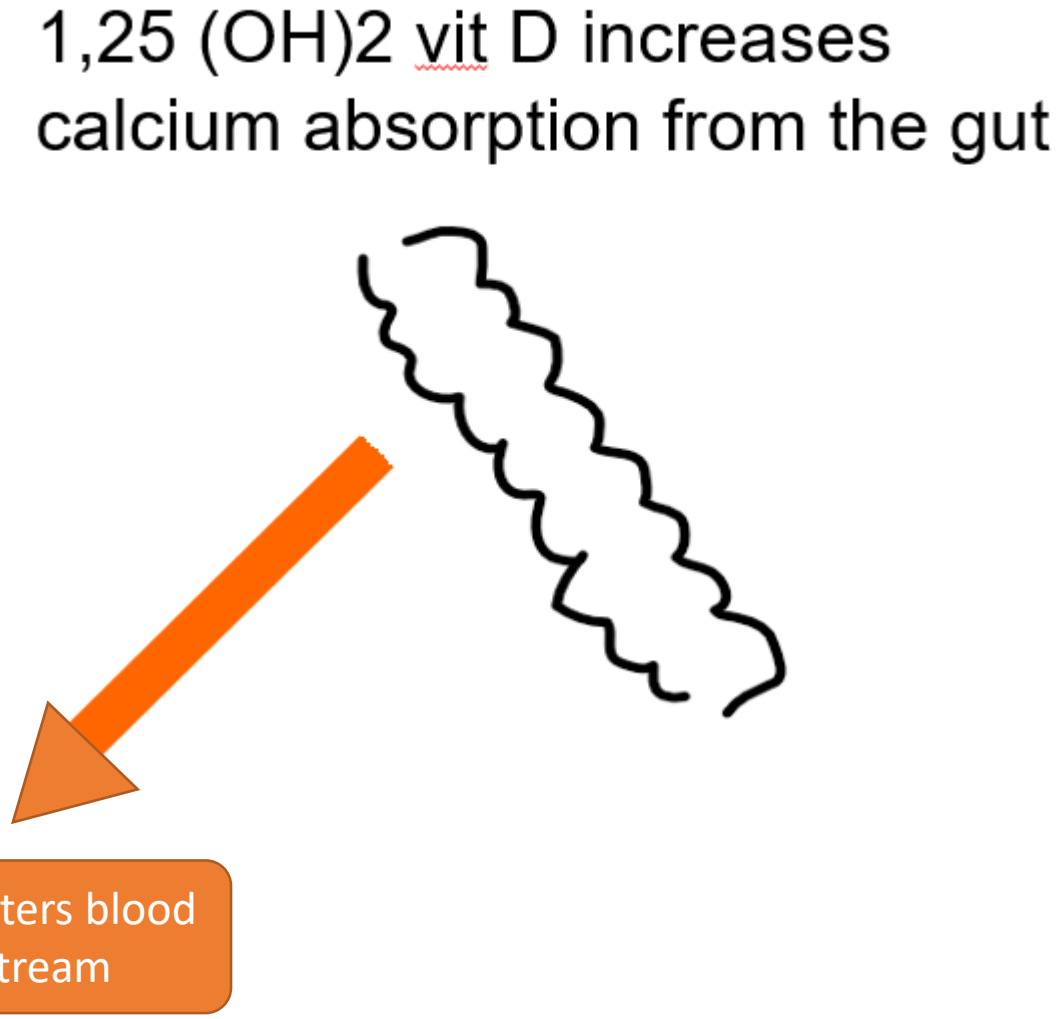
Take with food

Can cause constipation



Vitamin D

- Cholecalciferol (name for active vit D or 1,25 (OH)2 vit D)
- Vitamin D increases calcium absorption from the gut, and regulates Parathyroid hormone or PTH production (hormone that is important for calcium regulation)



Active Vitamin D Pathway

UV

25 - hydroxylase

1 Alpha - hydroxylase

7-Dehydrocholesterol → Cholecalciferol (D3) + Calcidiol (25 Cholecalciferol) + 1,25 (OH2) Cholecalciferol (Calcitriol) Active Vit D

Ergocalciferol (D2) +

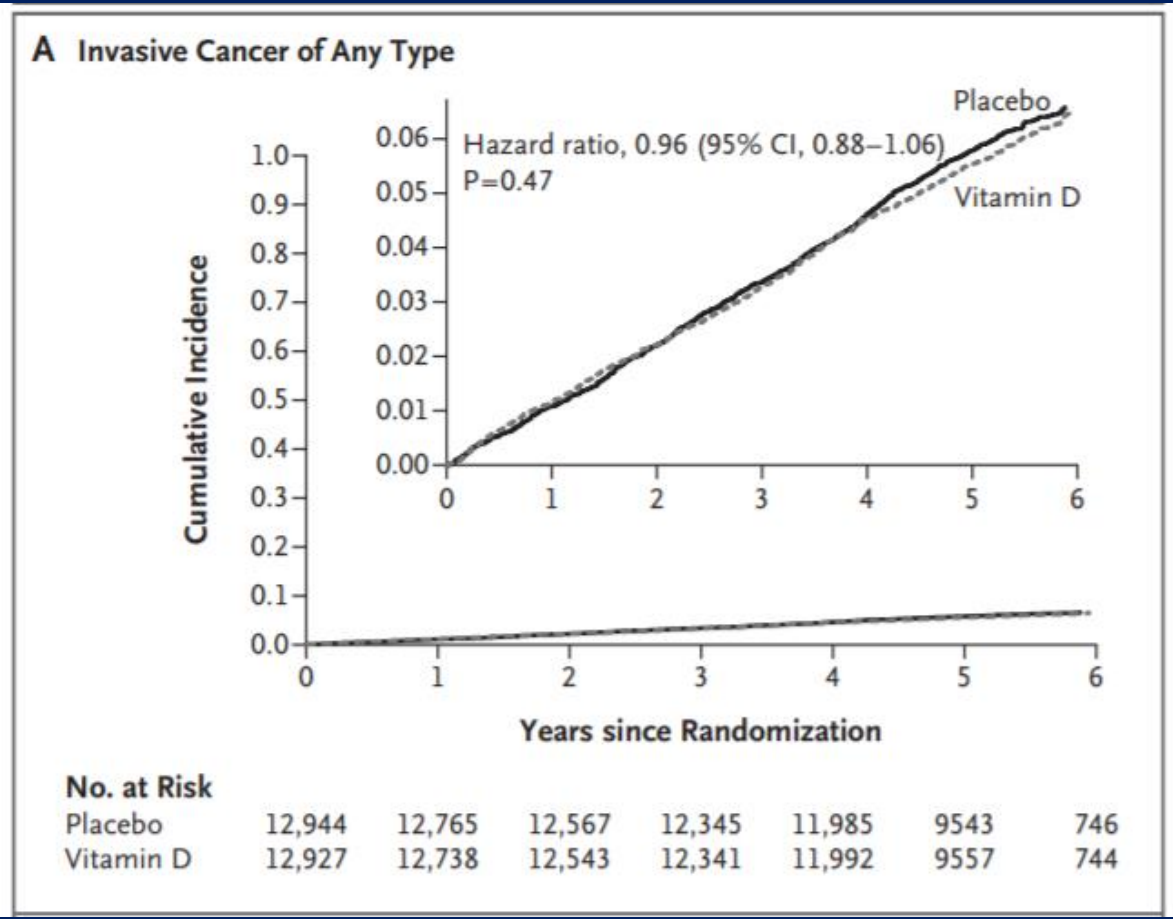
The NEW ENGLAND JOURNAL of MEDICINE

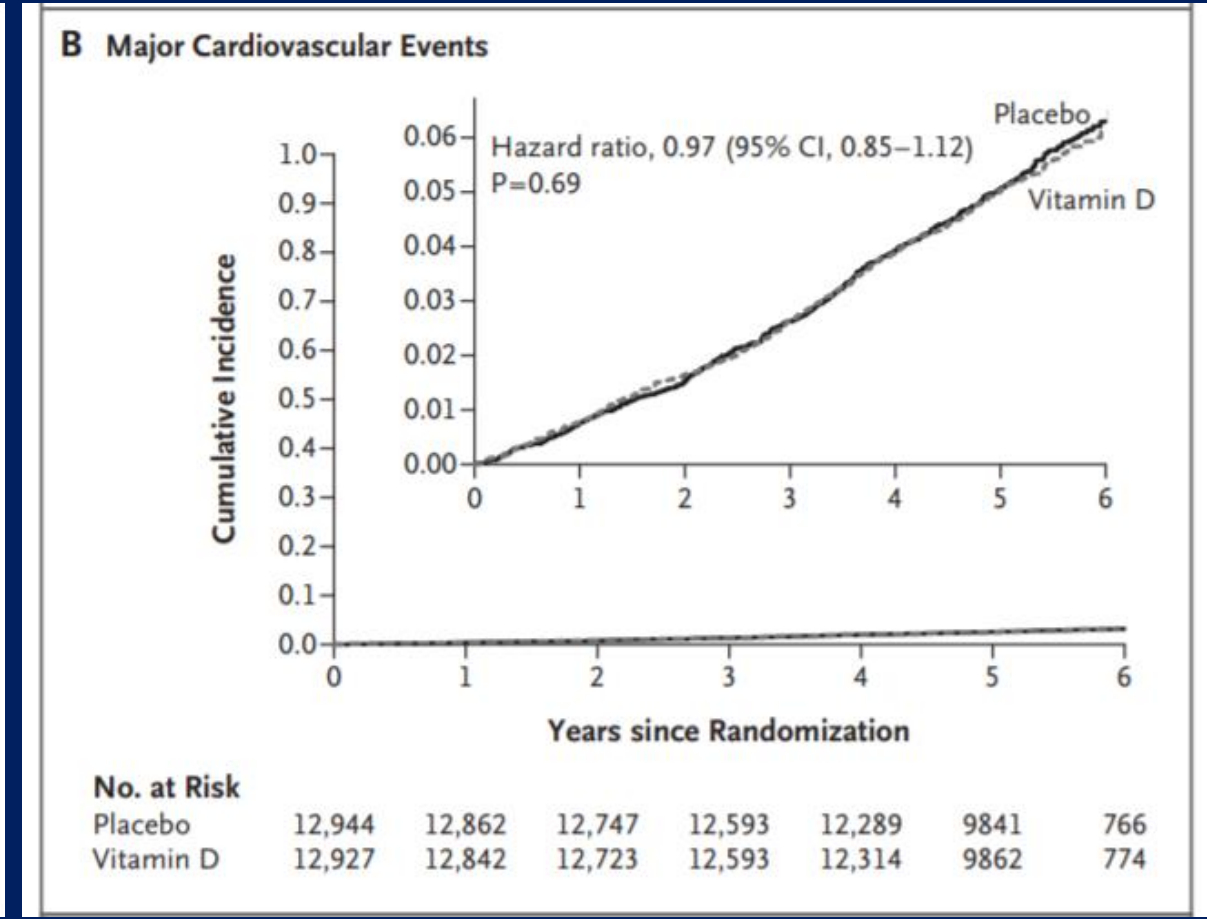
ORIGINAL ARTICLE

Vitamin D Supplements and Prevention of Cancer and Cardiovascular Disease

JoAnn E. Manson, M.D., Dr.P.H., Nancy R. Cook, Sc.D., I-Min Lee, M.B., B.S., Sc.D., William Christen, Sc.D., Shari S. Bassuk, Sc.D., Samia Mora, M.D., M.H.S., Heike Gibson, Ph.D., David Gordon, M.A.T., Trisha Copeland, M.S., R.D., Denise D'Agostino, B.S., Georgina Friedenberg, M.P.H., Claire Ridge, M.P.H., Vadim Bubes, Ph.D., Edward L. Giovannucci, M.D., Sc.D., Walter C. Willett, M.D., Dr.P.H., and Julie E. Buring, Sc.D., for the VITAL Research Group*

Supplementation with Vitamin D did not result in a lower incidence of Invasive cancer or CV events than placebo.





Manson et al Nov 2018 NEJM

Key Take Home Points about Vitamin D

- It’s a Hormone – there is a range it should be at.
- Vitamin D is still controversial but data is accumulating to support Institute of Medicine recommendation of 800 IU/day to achieve levels of 20 – 50 ng/mL.
- Takes at least 3 months for new steady-state in your lab levels
- Pearl: If you take too much and levels are high, there are side effects. Eg – too much calcium in your urine.

Exercise and Bone Health

- Mechanical Strain is beneficial for the skeleton (again not to make you exceed fracture threshold)
- Mechanical Strain reduces sclerostin and allows osteoblast formation (bone forming cells) to let bone formation happen in sites of stress
- So relatively higher Bone density is observed among physically active individuals (there are exceptions).

Exercises

- **Strength training:**
  - use of free weights
  - resistance bands or your own body weight to strengthen all major muscle groups, especially spinal muscles important for posture.
- **Weight-bearing aerobic activities**
  - aerobic exercise on your feet, with your bones supporting your weight.
  - walking, dancing, low-impact aerobics
- **Stability and balance exercises**
  - tai chi can improve your stability and balance.
  - Stand on one leg

Exercises

Play video 1

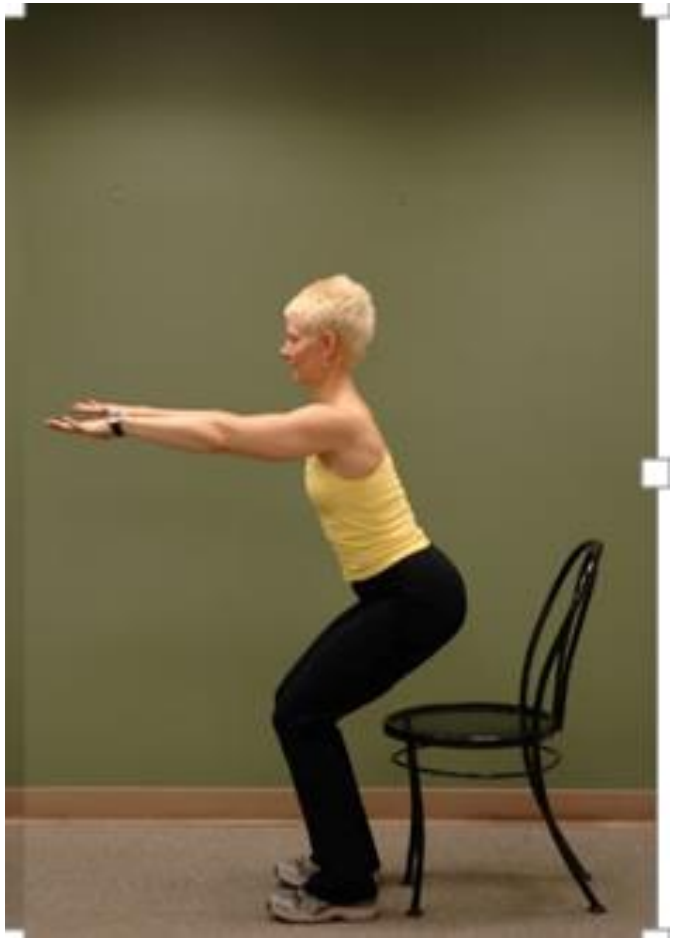
https://osteoporosis.ca/health-care-professionals/clinical-practice-guidelines/exercise-recommendations/video-series-on-exercise-and-osteoporosis/

Exercises

- Play Video 2
- https://osteoporosis.ca/health-care-professionals/clinical-practice-guidelines/exercise-recommendations/video-series-on-exercise-and-osteoporosis/

Leg Strength

Modified Squat



Stand close to the chair – feet hip distance apart

Keep a straight back, hinge at hip

Squat back and hover over chair

Hold as long as you can, work up to 30 seconds

Balance Exercise & Tips

Courtesy of Meg Wojtowicz, Osteo Clinic

Safety

- **Stop** Exercising and Contact your Dr if during exercise you feel
  - Chest pain
  - Dizziness
  - Shortness of Breath
- **Hold** onto support while performing all Balance Exercises

Goal

Improve and Maintain

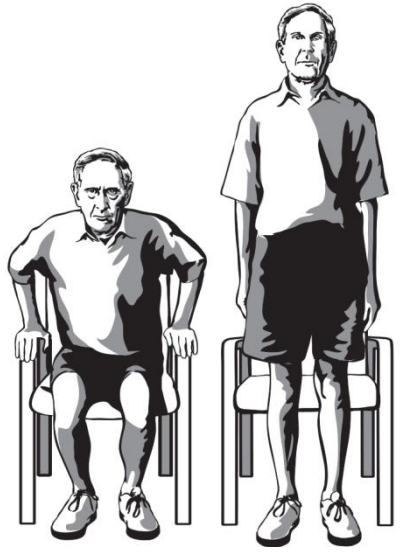
- Balance
- Strength
- General Fitness

Tandem Stance:

Hold Support for balance
Place one foot in line with other foot, touching heel to toe;
Hold position for 30 sec x 3 each side

Sit to Stand:

Using hands as needed
Stand up and sit down from chair
Repeat sets of 10 up to 3x10 reps



Thank You! Questions?