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Optimal Bone Health: Preventing Osteoporosis and Bone Loss as you Age

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HOSPITAL
FOR
SPECIAL
SURGERY

WHERE THE
WORLD COMES
TO GET BACK
IN THE GAME

 **NewYork-Presbyterian**

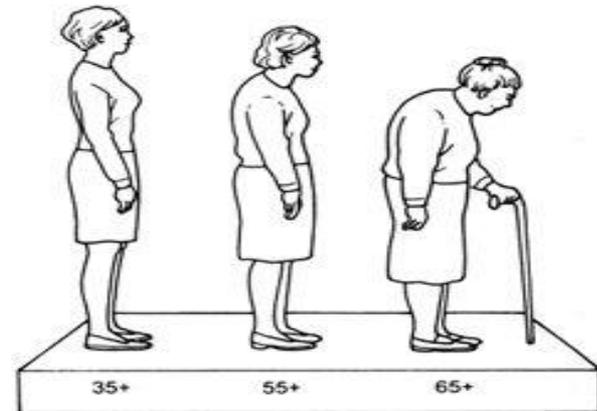
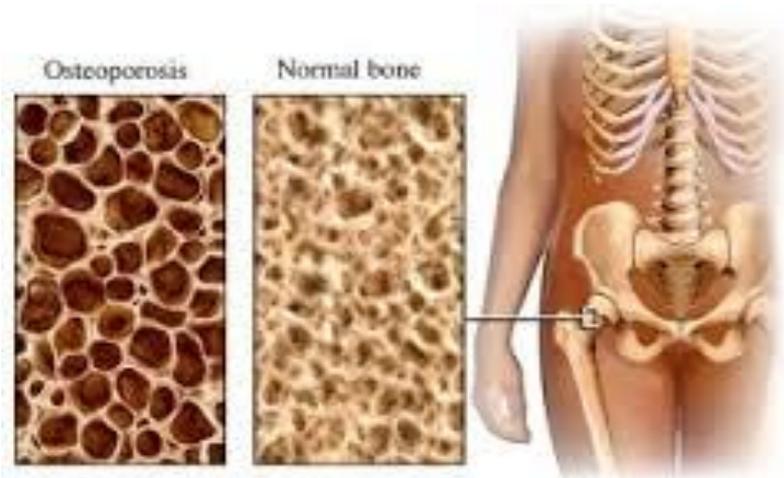


Weill Cornell Medicine

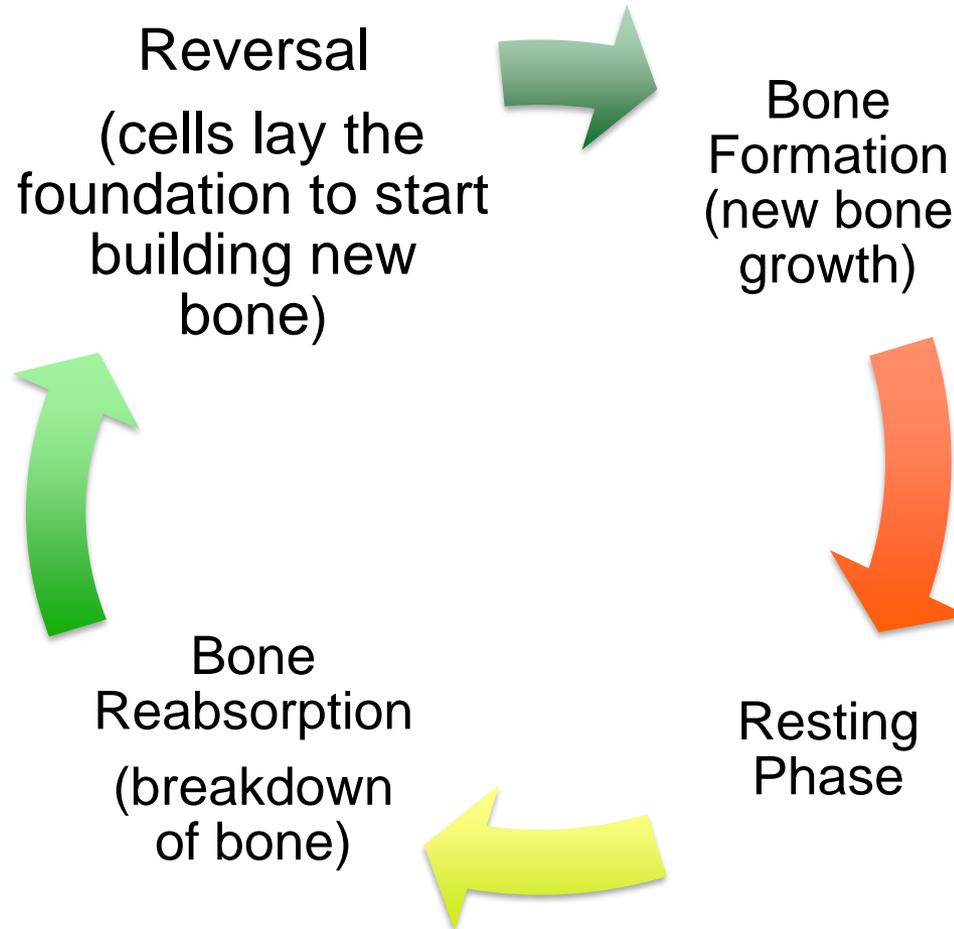
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What is Osteoporosis

- Osteoporosis is a silent skeletal disease
- Low bone mass/density
- Microarchitecture loss within the bone
- Increase in bone fragility and fracture



What is Bone Health?



Osteoporosis

Reversal (cells lay the foundation to start building new bone)

Bone Formation (new bone growth)

Osteoporosis happens when you;

- Make too little bone (FORMATION)
- Lose too much bone (RESORPTION)
- Or a combination of both

INCREASED RESORPTION
TOO MUCH BREAKDOWN OF BONE

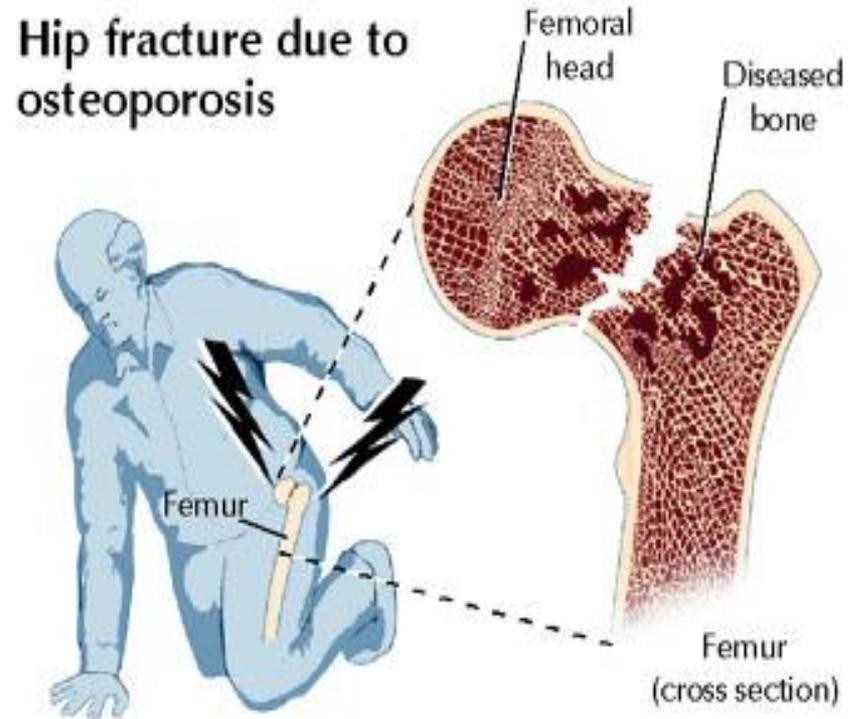
Resting Phase

What Do We Know?

- 1 out of 2 women
- 1 out of 4 men

Over the age of 50 will sustain an Osteoporotic related Fracture in their lifetime

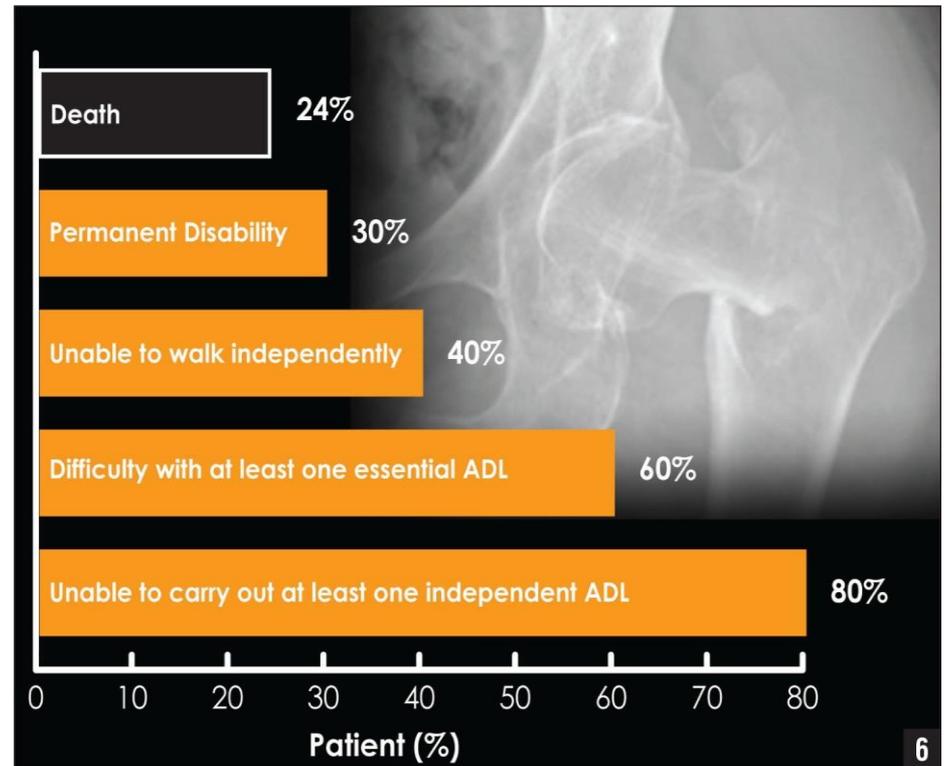
- Low energy trauma fractures are associated with poor bone quality



What Do We Know?

People who sustain low energy fractures are at higher risk of;

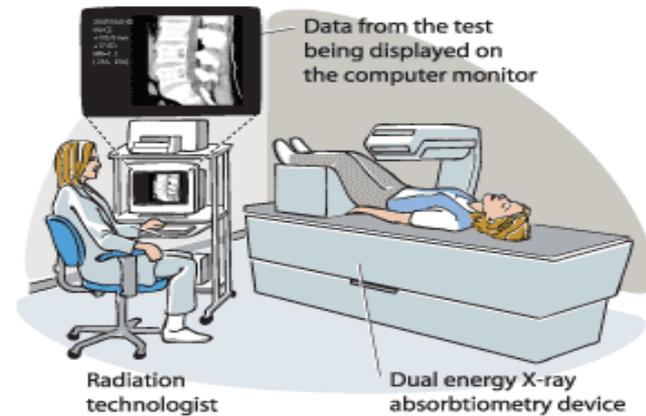
- Sustaining additional fractures
- Disability
- Death



What Can We Do?

Evaluation of bone quality

- Bone Density (DXA)
- Trabecular Bone Scores (TBS)
- Quantitative Cat Scans (QCT)
- FRAX Score
- Vertebral Fracture Assessment (VFA)
- Laboratory Bone Markers





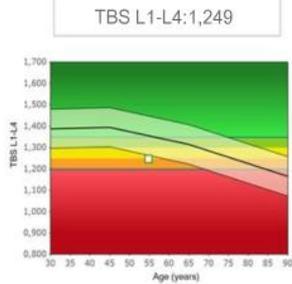
Medical Imaging Center

957 Ocean Boulevard - 97212 - Portland

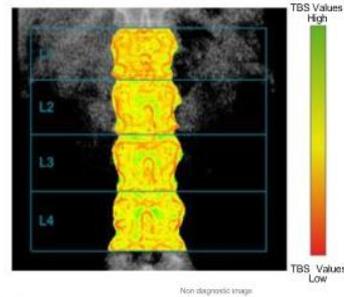
Patient:	Test1, Test1	Patient ID:	
Date of birth:	01/01/1960 54.7 years	Acquisition date:	29/09/2014
Height / Weight:	165.1 cm / 60.0 kg	Prescribing doctor:	
Gender / Ethnicity:	Female / White		

SPINE TBS REPORT

TBS reference graph
Reference population: USA



TBS Mapping



Additional results

Region	TBS	BMD	BMD T-Score
L1	1,055	1,207	---
L2	1,257	1,261	---
L3	1,321	1,284	0.0
L4	1,362	1,297	0.0
L1-L4	1,249	1,265	---
L1-L3	1,211	1,252	0.0
L1-L2	1,156	1,235	0.0
L2-L4	1,313	1,282	0.0
L2-L3	1,289	1,273	0.0
L3-L4	1,341	1,291	0.3

Comments

The TBS is derived from the texture of the DEXA image and has been shown to be related to bone microarchitecture and fracture risk. This data provides information independent of BMD value. It is used as a complement to the data obtained from the DEXA analysis and the clinical examination. The TBS score can assist the health care professional in assessment of fracture risk and in monitoring the effect of treatments on patients across time. Overall fracture risk will depend on many additional factors that should be considered before making diagnostic or therapeutic recommendations. The software does not diagnose disease or recommend treatment regimens. Only the health care professional can make these judgments. DXA file: 'sagev001.nec' TBS analysis done on 29/09/2014, version 2.1.1.10. This DXA system has not been calibrated with a specific TBS phantom. The TBS score has been computed with a generic calibration. These results can be used at the sole discretion of the physician.



Patient:	Sample, Report	Facility ID:	
Birth Date:	10/06/1942 59.6 years	Physician:	Dr. Crusher
Height / Weight:	64.5 in. 133.3 lbs.	Measured:	05/14/2002 11:38:30 AM (6.10)
Sex / Ethnic:	Female White	Analyzed:	05/24/2002 8:33:33 AM (6.50)

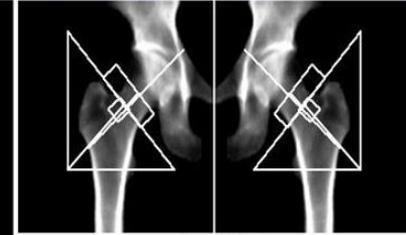
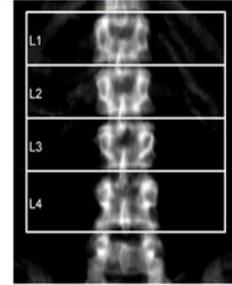
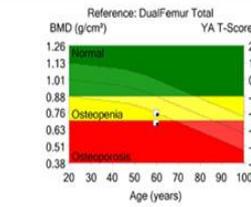
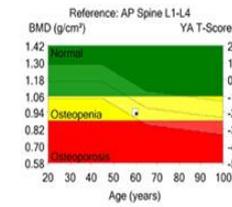


Image not for diagnosis

Image not for diagnosis
Hip Axis Length Comparison (mm)
Left = 2.9 Right = 3.8
-30 -20 -10 Mean 10 20 30
(Right = 109.5 mm) (Mean = 105.7 mm) (Left = 108.6 mm)



Region	BMD ¹ (g/cm ³)	Young-Adult T-Score ^{2,7}	Age-Matched Z-Score ³	WHO Classification ¹¹
AP Spine L1-L4	0.946	-1.947	-0.6	Osteopenia
DualFemur Total				
Total Left	0.749	-2.067	-1.1	Osteopenia
Total Right	0.680	-2.609	-1.6	Osteoporosis
Total Mean	0.714	-2.338	-1.3	Osteopenia
Total Diff.	0.068	2.067	-	-

1 - Statistically 68% of repeat scans fall within 1SD (± 0.010 g/cm³ for AP Spine L1-L4; ± 0.010 g/cm³ for DualFemur Total Mean)
2 - USA/NHANES, AP Spine Reference Population, Ages 20-40; USA/NHANES, Femur Reference Population, Ages 20-40
3 - AP Spine Matched for Age, Weight (females 25-100 kg), Ethnic; DualFemur Matched for Age, Weight (females 25-100 kg), Ethnic
7 - DualFemur Total T-Score difference is 0.5. Asymmetry is None.
11 - WHO - Definition of Osteoporosis and Osteopenia for White Women: Normal = T-Score at or above -1.0 SD; Osteopenia = T-Score between -1.0 and -2.5 SD; Osteoporosis = T-Score at or below -2.5 SD

Printed: 08/12/2002 9:21:29 PM (7:00); Filename: zeltc_gw3y0xab.dtc; AP Spine; 13.9%Fat+4.9%; Scan Mode: Standard; Right Femur; 12.5%Fat+21.2%; Neck Angle (deg): 53; Scan Mode: Precise; Left Femur; 13.1%Fat+19.2%; Neck Angle (deg): 53; Scan Mode: Precise

GE Medical Systems
LUNAR

Prodigy
DF+00001



Calculation Tool

Please answer the questions below

Country: **US (Caucasian)**

- Asia
- Europe
- Middle East & Africa
- North America
- Latin America
- Oceania

Canada

US

[About the risk factors](#)

-  US (Caucasian)
- US (Black)
- US (Hispanic)
- US (Asian)

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth

Age: Date of Birth: Y: M: 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

Weight Conversion

Pounds  kg

Height Conversion

Inches  cm

03709131

Individuals with fracture risk assessed since 1st June 2011

What Can We Do?

Non Modifiable Risk Factors

- Race
- Small bone structure
- Hereditary tendencies
- Family History
 - Osteoporosis
 - Hip fracture
- Diabetes
- Hyperthyroidism
- Rheumatoid Arthritis
- Lupus
- Renal Failure
- Celiac Disease
- Inflammatory bowel disease, Crohns
- Collagen Disorders

What Can We Do?

Modifiable Risk Factors

- Fall Prevention
- Tobacco and caffeine use
- Regular alcohol consumption (over 3 drinks/day)
- Bedridden-weight bearing restrictions on long bones
- Inactive Lifestyle
- Low Estrogen
- Low Testosterone/Androgen Insufficiency

Nutrition

- Eating disorders
- Low Body Weight
- Obesity
- Insufficient intake of calories
- Low Calcium
- Vitamin D deficiency

Medications

- Corticosteroids
- Proton Pump Inhibitors
- Anticonvulsants
- Antidepressants
- Aromatase Inhibitors
- Thyroid hormones in excess
- Other Medications

Age and Fracture

- Falls more common as we advance in age
- Many osteoporosis related fractures due to falls
- Over 90% hip fractures due to falls
- Adults-Falls per year
 - 33% > age 65
 - 40% > age 75



Fall Prevention

- Visual and hearing screening and treatment
- Optimize medications
- Avoid throw away rugs
- Reduce clutter, cords out of area
- Handrails
- Bathroom lights



What Can We Do?

Fall Prevention

- “Age related loss of skeletal muscle mass and function”
- Loss of muscle or may be in conjunction with increased fat mass
- Low muscle mass and low muscle strength



Bone Loading Exercises

- Goal 15-60 minutes 2-3 times per week
- *Weight Bearing Exercises*
 - Standing and moving against gravity
 - High & Low Impact Aerobics
 - Walking, Jogging
 - Thai Chi & Yoga, Pilates are great for balance, strength and fall prevention



Resistance Exercises

- Muscle Strengthening Exercises-hip and back (spine)
 - Move your body, a weight or some other resistance against gravity
 - Light weights, resistance bands
- Non-Impact Exercises
 - Balance, Posture, Functional Exercises



Nutritional Considerations

Calcium (Vitamin D)

Dairy

- Milk; skim, low fat
- Yogurt, Greek
- Cheese, Cottage cheese, Kephir
- Ice Cream

Green vegetables

- Broccoli, Kale, Collard Greens, Swiss Chard, Bok Choy

Seafood

- Sardines, Salmon

Other

- Almonds, Fortified Juices, Cereals, Breads, Soy products
- Dried Figs
- Fortified juice, cereal, soy milk



Calcium Intake

Recommended Daily Calcium Intake

Men		Women	
19-70 years	1,000 mg	19-50 years	1,000 mg
71 years and older	1,200 mg	51 years and older	1,200 mg

Source: National Osteoporosis Foundation

Calcium

- Chewable, liquid and tablets
- Calcium Citrate
- Calcium Carbonate
- Smaller dosage
- Side effects include constipation, kidney stones
- Interactions with other medications



Learn to read labels

Supplement Facts		
Serving Size 1 Tablet		
Amount Per Serving		% DV
Vitamin D-3 (as cholecalciferol)	200 IU	50%
Calcium (as calcium citrate) (from 1500 mg calcium citrate)	315 mg	32%

Other ingredients: Stearic acid, cellulose, silica.

Supplement Facts		
Serving Size 2 tablets Servings Per Container 100		
	Amount Per 2 Tablets	%Daily Value
Vitamin D (as ergocalciferol)	400 IU	100%
Vitamin K (as phytonadione)	10 mcg	13%
Thiamin (Vitamin B-1) (as thiamine HCl)	3 mg	200%
Riboflavin (Vitamin B-2)	3.4 mg	200%
Niacin (Vitamin B-3) (as niacinamide)	40 mg	200%
Vitamin B-6 (as pyridoxine HCl)	4 mg	200%
Folate (as folic acid)	400 mcg	100%
Vitamin B-12 (as cyanocobalamin)	25 mcg	417%
Biotin	300 mcg	100%
Pantothenic acid (as d-calcium pantothenate)	20 mg	200%
Calcium (as calcium carbonate, dicalcium phosphate)	200 mg	20%
Phosphorus (as dicalcium phosphate)	50 mg	5%
Iodine (from kelp)	150 mcg	100%
Magnesium (as magnesium oxide)	100 mg	25%
Selenium (as sodium selenate)	20 mcg	29%
Manganese (as manganese gluconate)	2 mg	100%
Chromium (as chromium amino acid chelate)	150 mcg	125%
Molybdenum (as molybdenum amino acid chelate)	75 mcg	100%
Boron (as amino acid complex)	750 mcg	†
Lycopene	1 mg	†
Vanadium (as vanadium amino acid chelate)	10 mcg	†

†Daily Value not established.

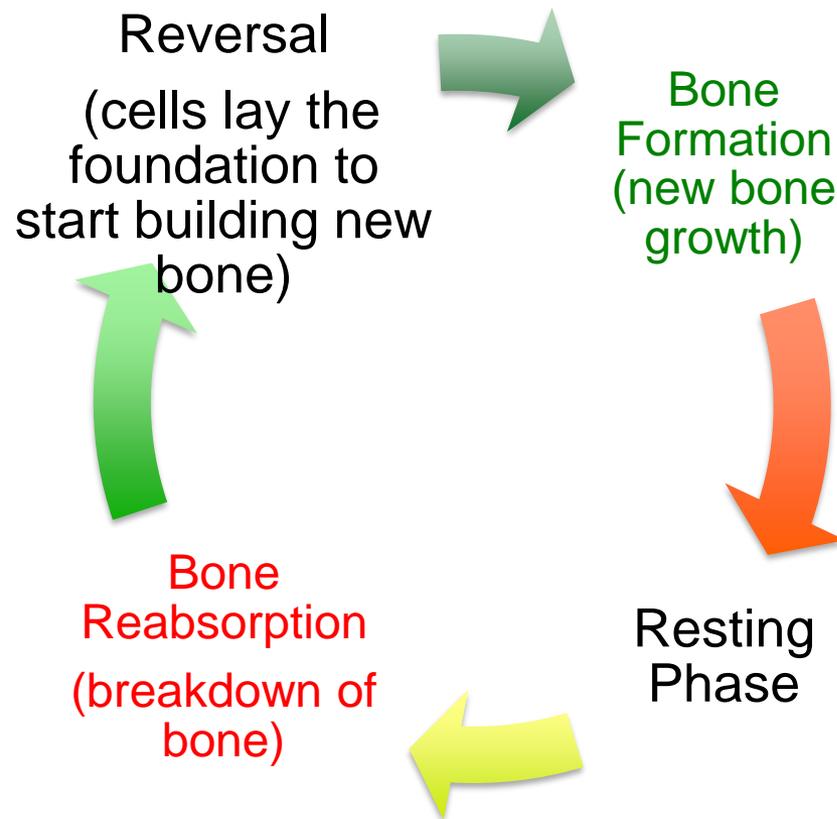
Vitamin D Intake

	Under Age 50	Age 50 & Older
Women & Men	400-800iu Daily	800-1,000iu Daily

- Cholecalciferol (D₃)
- Ergocalciferol (D₂)



Medical Treatment and the Bone Growth Cycle



Medications for Bone

- Bone remodeling agents decreases bone resorption or bone turnover
- Bisphosphonates, (Oral-Fosamax, Actonel, Boniva, IV yearly infusion-Reclast)
- RANK Ligand inhibitor, (Denosumab –Prolia) subcutaneous injection every 6 months
- Selective estrogen receptor modulators,(SERMs- Evista)
- Estrogen Therapy-prevention
- Testosterone Therapy

Anabolic Agents

- **Bone Formation/Anabolic Agent**
(Synthetic Parathyroid Hormone, PTH-rp)
- Promotes new bone growth
- Daily subcutaneous injection
(28 doses = 1 pen)
- Minimum duration of treatment 3 months
- Maximum treatment 2 years
(FDA approval)



Thank you! Questions?



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State of Health Care Quality Report 2014

Evaluate quality of care health care plans provide to Medicare beneficiaries

- Healthcare Effectiveness Data and Information Set (HEDIS)
 - Tool to measure performance of care and service
- Medicare Health Outcomes Survey (HOS) quality measures for elderly populations
 - Falls Risk Management
 - **Osteoporosis Testing in Older Adults**
 - Physical Activity in Older Adults
 - Management of Urinary Incontinence

Evidence Based Practice Medicine

2011 International Osteoporosis Foundation Position Paper

“Capture the Fracture Campaign”

Secondary Fracture Prevention Public health priority throughout the world

Growing body of evidence from many countries shows;

- “Fractured Liaison Service”
- Coordinated Multidisciplinary Approach for secondary prevention leads to
 - Fewer subsequent fractures
 - Significant cost savings for healthcare systems