# OSTEOPOROSIS Strategies for ALL Ages and ALL Stages You CAN Do Something About It!

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#### My Journey...

Who is at Risk??

Safe and Unsafe Movement

**Prevent Fractures** 

**Building Bone** 





#### A COMPREHENSIVE 12-POINT MOVEMENT & EXERCISE PROGRAM

Developed around a population of patients diagnosed with osteoporosis
 Useful for many diagnoses including scoliosis, spinal stenosis, spondylolisthesis, and other back pathologies and postural abnormalities.
 Designed with a primary objective of *safety* in movement from and for the bones
 Based on principles of anatomical alignment, kinesiological principles of movement, and biomechanics

## Don't move a thing!

Observe how you are sitting... Crossed legs and/or arms? Slouching?

- 1. Sit forward on chair feet flat on floor
- 2. Bring head into alignment with shoulders
- 3. Back straight
- 4. Spinal elongation





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Osteoporosis is a disease characterized by low bone mass and bone matrix deterioration leading to increased fragility and risk of fracture.

#### Who is effected by Osteoporosis???

#### Affects ALL populations: babies through elderly

- Knows no boundaries regarding age, gender, lifestyle or ethnicity or any other factor
- Affects over 55% of persons aged 50+ men & women (Reference National Osteoporosis Foundation 2002)

# Think of the people you sit beside at work...

"Did you know that one of the two of you will have an osteoporosis related fracture in your life time?!"



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- Total # of people estimated to have the condition in the US—44 million
- Is more prevalent than coronary heart disease (12.5 million,) heart attack (1.1 million,) or diabetes (17 million.) (Ref: Surgeon General's Report 2004)

Is more common than breast, uterine and ovarian cancer, combined

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#### OSTEOPOROSIS-RELATED FRACTURES

- Occur in 1 of 2 women; 1 of 4 men
- Happens every 20 seconds
- · Can be immediately life-altering and life-threatening
- Annual Fracture Incidence
  - Vertebral 700,000
  - Hip-300,000 - Wrist-250,000
  - Other Sites-300,000
- Cost
  - >\$46 million per day
  - By 2025 -\$25 Billion/yr NOF



#### How can we Identify those patients who are at risk for fractures in our clinics??



- Diagnosed with Osteoporosis or Osteopenia?
- > Un-Diagnosed Compression Fracture?
- Skeletal Fragility/Low Bone Mass?
- Prevent the next fracture!

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#### NON-MODIFIABLE RISK FACTORS

Female

Family History Post-Menopausal – Natural or Surgical Advanced Age Caucasian or Asian Delayed Puberty/Irregular Menstrual Cycles Early Menopause Men over age 75 Nulliparous-having had no children Small Boned Weight less than 125 lbs

#### MODIFIABLE RISK FACTORS

Smoking High Alcohol Intake Caffeine (more than 2-5 cups/day) Sedentary Lifestyle/Over-Exerciser Men-Low Testosterone High Protein Diet (Meat) Low Calcium Diet Eating Disorders – Gluten/Dairy Allergies, Celiac, Bulimia Nutrition High Sodium Diet – Packaged foods

#### DISEASES AND CONDITIONS

AIDS/HIV Ankylosing spondylitis Blood and bone marrow disorders Breast cancer Chronic obstructive pulmonary disease (COPD), including emphysema Cushing's syndrome Depression Diabetes Eating disorders, especially anorexia nervosa Female athlete triad (includes loss of menstrual periods, an eating disorder and excessive exercise) Gastrectomy Gastrointestinal bypass procedures Hyperparathyroidism Hyperthyroidism Inflammatory bowel disease, including Crohn's disease and ulcerative colitis, food allergies Kidney disease that is chronic and long lasting

Liver disease that is severe, including biliary cirrhosis Lupus Lymphoma and leukemia Malabsorption syndromes, including celiac disease Multiple myeloma Multiple sclerosis Organ transplants Parkinson's disease Polio and post-polio syndrome Poor diet, including malnutrition Premature menopause Prostate cancer Rheumatoid arthritis Scoliosis Spinal cord injuries Stroke Thalassemia Thyrotoxicosis Weight loss

#### Note

This list may not include all diseases and conditions that may cause bone loss.

#### **MEDICATIONS**

- Aluminum-containing antacids
- Antiseizure medicines (only some) such as Dilantin<sup>®</sup> or Phenobarbital
- Aromatase inhibitors such as Arimidex®, Aromasin® and Femara®
- Cancer chemotherapeutic drugs
- Cyclosporine A and FK506 (Tacrolimus)
- Gonadotropin releasing hormone (GnRH) such as Lupron® and Zoladex®
- Heparin
- Lithium
- Medroxyprogesterone acetate for contraception (Depo-Provera®)

#### Methotrexate

- Proton pump inhibitors (PPIs) such as Nexium®, Prevacid® and Prilosec®. New study just showed increased Dementia.
- Selective serotonin reuptake inhibitors (SSRIs) such as Lexapro®, Prozac® and Zoloft®
- Steroids (glucocorticoids) such as Cortisone and Prednisone (> or = 5mg. For 3 or more months)
- Tamoxifen® (premenopausal use)
- Thiazolidinediones such as Actos® and Avandia®
- Thyroid hormones in excess
- \*\* Using 4 or more prescription drugs increases fall risk (Fuller GF, 2000)
   NOTE This list may not include all medicines that may cause bane loss.

### **RISK FOR FRACTURE**

- History of Previous Fracture
- Vision Problems
- Deconditioning/Hypokinesis
- Balance Problems
- Tall Slim Build
- Hip Fracture in Immediate Family-especially of the mother
- Inability to get out of a chair unaided
- Being on one's feet less than 4 hours per day

#### **FIRST SIGNS**

- Fracture minimal trauma/fragility fracture
   (e.g., Colles Fracture, Compression Fracture, Rib Fracture. Any fracture that occurs due to a fall from standing body height is a fracture of minimal trauma)
- Hyper-Kyphosis
- Loss of body height
- Transparent skin
- Periodontal disease
- Back Pain
- Protruding Abdomen



DEXA/BMD Hip Bone Density Report

• Low dose x-ray performed of the lumbar spine, hip (shown here) or wrist.

T-score •Compared to the reference standard of a healthy thirty-year-old of the same sex and ethnicity to determine future risk of fracture.

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#### COMPRESSION FRACTURES T 12 / L1

#### Why are some bones more likely to break than others?



# BONE **STRENGTH**

- > Bone Density
- > Bone Quality
  - > Architecture
  - Mineralization
  - Micro damage accumulation

#### **INSIDE** the BONES

Osteoporotic bone vs. normal bone Disintegration of the trabecular structure and structure of the marrow



#### **Bone Formation**



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#### Bone Resorption Outpaces Formation



Expansion of marrow space by fat







## PEAK TIMES OF BONE GROWTH

\*In Utero \* In Adolescence OSTEOPOROSIS is a PEDIATRIC CONDITION that manifests in ADULTHOOD WHEN DOES PREVENTION

# Most Common Fractures Sites Vertebral Hip



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#### **HIP FRACTURE**



Most disabling/life threatening injury Half of women with hip fractures die within one year of fracture

#### **Know the Facts!**

•Risk for women is 2-3X higher than for men.

Mortality rate for men nearly 2X that of women.
Older women falling backwards or sideways are more likely to fracture hips.

•Should a hip fracture occur, half of injured never regain previous quality of life ... may require assisted living, nursing home, etc.

•At 6 months following a hip fracture, only 15% can walk across a room unaided.

#### **Vertebral Compression Fractures**



. OT w

#### Bones of anterior spine usually first to show signs

- of osteoporosis Most common fractures occurring with osteoporosis
- Occur in 30-50% of people over age 50
- Only 20% are painful...
- 70-80% are SILENT!
- Only 25-30% clinical attention
  Christiansen, Bouxsein, 2010

After one vertebral fracture, the risk for having a 2<sup>nd</sup> vertebral fracture increases 5 fold!

1 woman in 5 will sustain a 2<sup>nd</sup> vertebral fracture within 1 year

International Osteoporosis Foundation 2005
 Report of the Surgeon General on Bone Health Oct 2004

#### PATTERNS OF POSTURAL CHANGE®



PERCENSIO SPACE DECEMBER IN CONSPICTOR



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#### Thoracic Kyphosis Increases Spinal Loads (Briggs et al. 2006, 2007, Keller et al. 2003)









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#### **Common movements that increase** force on the FRONT of the spine

#### **AVOID**



Forward Bending



- Lateral Bending
- Trunk Twisting Any of the above











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#### PATTERNS OF POSTURAL CHANGE



## Posture starts at Birth...







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## Sedentary or ACTIVE



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# What does your posture tell about you?



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# When is the optimal time and what is the optimal way to build bone?

- Pre- or Peri-pubertal years optimal time for the greatest osteogenic response
- Optimal dose of exercise needed to enhance bone strength in children and adolescents is *unresolved*...
- Activities should be *dynamic*, *variable in nature*, *applied rapidly and intermittently*, and that relatively *few loading cycles* are required.

(Daly 2007), (Bailey 2008)

#### Role of Activity in Bone Health

Odd Impact







 Start in Childhood and Adolescence Nilsson ,2009 Betsey Newcomb, OT www.BoneHealth4U.com

#### S.A.F.E. Exercise: Fewer Fractures with Backward Bending Extension Exercises (Sinaki et al. 1984)



# Vertebroplasty

What would happen if you put a sponge between cement blocks?

What would happen if you placed a cement block between two sponges?

Fewer fractures with Back-Extensor-Strengthening Exercises following Vertebroplasty (Huntoon 2008)







## **S**keletally

<u>Appropriate</u>

For

Everyone



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# **ALIGNMENT**



PERCH POSTURE HIP HINGE Betsev Newcomb. OT www.BoneHealth4U.com

STANDING POSTURE

# **Standing Body** Alignment



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#### **HIP HINGE/ALIGNMENT**



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# **BODY MECHANICS**



#### VCF'S OCCUR <u>PRIMARILY</u> DURING DAILY ACTIVITIES

- 50% occur <u>"spontaneously</u>"
- 64% when getting out of bed
- 37% trivial housework
- In men, 73% <u>no known trauma</u> or <u>by low</u> <u>energy trauma</u> including <u>falls in 57%</u>
- 25-30 % of hip fx's previous VCF's
- Most occur at T 7-8 and T11-L1

Christiansen, Bouxsein, 2010. Briggs et al 2007

## Applying Body Mechanics to ADL's





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S.A.F.E.

Lunge



<u>UN-</u>S.A.F.E.

Melio Guide

#### Getting In and Out of Bed





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 Sideways method: Sitting on the edge of your bed lower yourself onto your side as you raise your legs onto the bed, then Log Roll.
 Hand and knees method to get in: From your hands and knees lower yourself to your forearms then your hips.
 Roll to your side or back from here.
 Cueing for Spinal Alignment, Core Muscle Activation, LOG ROLL



**Strengthen Support Muscles** 

#### "Fountain of Youth" Muscles

Diaphragm & Intercostals Heart Back Extensors Abdominals Pelvic Floor Gluteus Maximus Gluteus Medius



#### **UN-Load the Vertebral Bodies**



#### DECOMPRESSION

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# Isometric Back Strengthening

#### **BODY POSITION AND MOVEMENT**

#### **Can Result in Harmful or Healthy Forces**







12 b. 32 b. 42 b. Fyrit 1 2 b. 12 b. Every inch of forward head increases

by an additional 10 lbs.

Kapandji, Physiology of Joints, Vol. 3

the weight of the head on the spine

The average head weighs between 10-15 lbs.

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#### **Habitual Slouched Posture**

#### **Bone Creep Damages Anterior Vertebral Body**

(Adams and Pollintine, et al. 2009)



Fig. 5. Creep detormation and recovery curves (after smoothing) for a typical 2 h creep test. (Male, aged 80 yrs, 1.2.) The three graphs show deformation (strains) in the poterior, middle and amerior vertebral body of one of the specimen's two vertebran. Elastic ( $\epsilon_{el}$ ), creep ( $\epsilon_{er}$ ) and residual strains ( $\epsilon_{eer}$ ) are labelled for the anterior vertebran labelled for the anterior vertebran.

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Highest creep anterior

Smoothness = minor fxs

Threshold phenomenon

•Full recovery 20 times longer than load time

·BMD no significant effect



Best seated position is reclined with head supported, lumbar spine supported, and arms supported on arm rests. Feet/legs supported.

# **Work Station**





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# **Work Station**



What do you do all day?



Puzzles, Cook, Needlework, Read, Crafts, Gardening, Crossword puzzles, TV,

Video Games,

... ??

#### Ergonomics



Please think before you ask your patient to bend for an activity - Berg Balance # 8,9,10 & ADL's

Educate in S.A.F.E. movement

It is our patients expectation that we will not put them at risk to perform an activity or exercise!

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# S.A.F.E.

#### Skeletally

#### Appropriate

For



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#### ACUTE COMPRESSION FRACTURE MANAGEMENT

Adapted from work by Betsey Newcomb, OT and Denise Pontbriand, PTA

- Start early on day of fracture if possible
- UN-load the spine position in supine or as close to supine as possible, hips and knees bent and supported to relieve pull of leg muscles on the spine
- Position from least and progress to most compression supine, side-lying, prone, standing (standing more likely to precede prone)
- > Pain relief with positioning, ice, moist heat, electrical stimulation along erector spinae muscles, gentle soft tissue mobilization
- Back Extensor, Gluteus Maximus, Abdominal Isometrics

#### NO OUT-OF-BED-TO-CHAIR ORDERS

- If patient must be seated, use reclined chair. Avoid "hammock" effect with folded blanket on seat and back to provide flatter surfaces.
  - Any head, neck or lumbar support should be minimal and used only as necessary.
- Initiate weight-bearing with standing, weight shifting, gait training using rolling walker or other optimal-height-adjusted support as soon as possible.
- Consider bracing with Spinomed-Spinal Orthosis for Osteoporosis



# Nutrition





BEFORE Betsey Newcomb, OT www.BoneHealth4U.com

AFTER 7 Weeks



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1 Hour later



#### **Case Study**

≻84 Y.O.

- > 5 Vertebroplasties
- VCF cascade above and below
- Cardiac complications
- ➢ Breathing 2-4 liters O2
- ➢ Digestion/Bowel
- ≻ What would *YOU* do?

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#### Best Posture





**Progress** 





#### THINK



WHEN YOUR PATIENT FIRST COMES THROUGH THE DOOR

Shouldn't all patients at risk be handled in a manner that would avoid potential compression fractures?





# What did you learn that you will apply in your clinics?



Can you think of any of your patients that may have Osteoporosis?

Write down three things that you will do differently when you see a new patient.