UNDERSTANDING OSTEOPOROSIS

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Understanding Osteoporosis

- **What is Osteoporosis**
- **Osteoporosis myths**
- **Osteoporosis facts**

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Bone Basics

Some people think of bones as hard and lifeless, but they are actually living, growing tissue.

Your bones are made up of three major components that make them flexible and strong:

Collagen, a protein that gives bones a flexible framework

Calcium-phosphate mineral complexes that make bones hard and strong

Living bone cells that remove and replace weakened sections of bone

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OSTEOPOROSIS

Did you know… that throughout your life, you constantly lose old bone while you make new bone?

Children and teenagers form bone faster than they lose bone.

As you age, you can lose more bone than you form.

In midlife, bone loss usually speeds up in both men and women.

For most women, bone loss increases after menopause, when estrogen levels drop sharply. In fact, in the five to seven years after menopause, women can lose up to 20 percent or more of their bone density.

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Understanding Osteoporosis

- Osteoporosis symptoms and warning signs
- Who is at risk?
- Diagnosing Osteoporosis

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Understanding Osteoporosis

- **Treatment options**
  - **Medication**
  - **Treatments**
- **Steps you can take to prevent Osteoporosis**

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What is an orthopaedic surgeon?

- **The expert in treating the musculoskeletal system**

- **The expert in maintaining musculoskeletal health**

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What do orthopaedic surgeons do?

- Diagnose
- Treat
  - Medication
  - Physical Therapy
  - Exercise
  - Brace
  - Surgery
- Prevent Injury and/or Disease Progression

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Osteoporosis

Osteoporosis, or porous bone, is a progressive disease that robs its victims of bone mass.

Age related decrease in bone mass secondary to uncoupling of osteoclast - osteoblast activity

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Osteoporosis

Normal Bone

Osteoporotic Bone

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Osteoporosis is Serious !

Broken bones due to osteoporosis are most likely to occur in the hip, spine and wrist, but other bones can break too.

Broken bones can cause severe pain that may not go away.

Osteoporosis also causes some people to lose height.

When osteoporosis causes the bones of the spine, called vertebrae, to break or collapse, it affects your posture and causes you to become stooped or hunched.

Osteoporosis - limits mobility - feelings of isolation or depression.
Source : NOF

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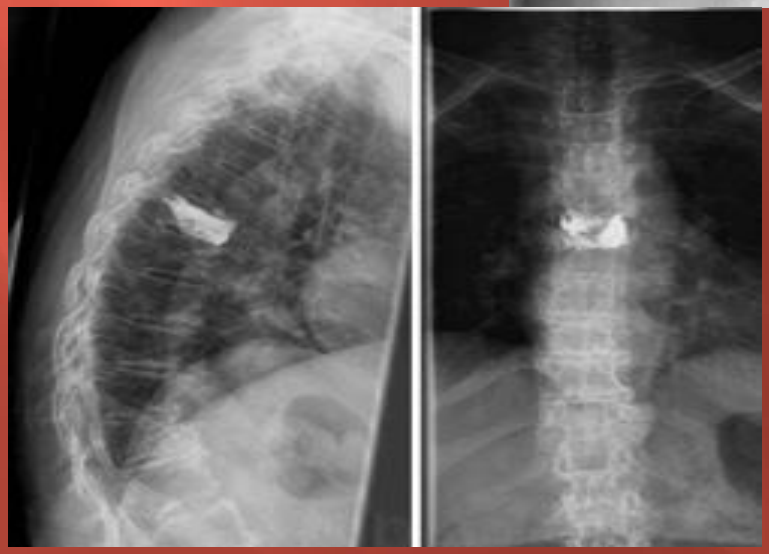
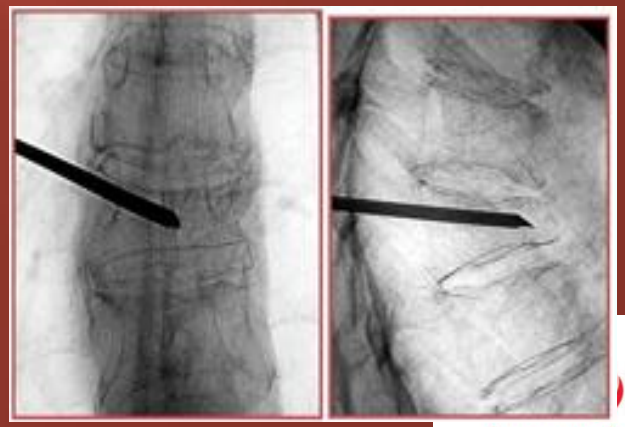
Osteoporosis and spine fracture





Osteoporosis

Lose too much bone, make too little bone or both.

Bones become weak and may break from a minor fall or, in serious cases, even from simple actions, like sneezing or bumping into furniture.

If you look at healthy bone under a microscope, you will see that parts of it look like a honeycomb.

If you have osteoporosis, the holes and spaces in the honeycomb are much bigger than they are in healthy bone.

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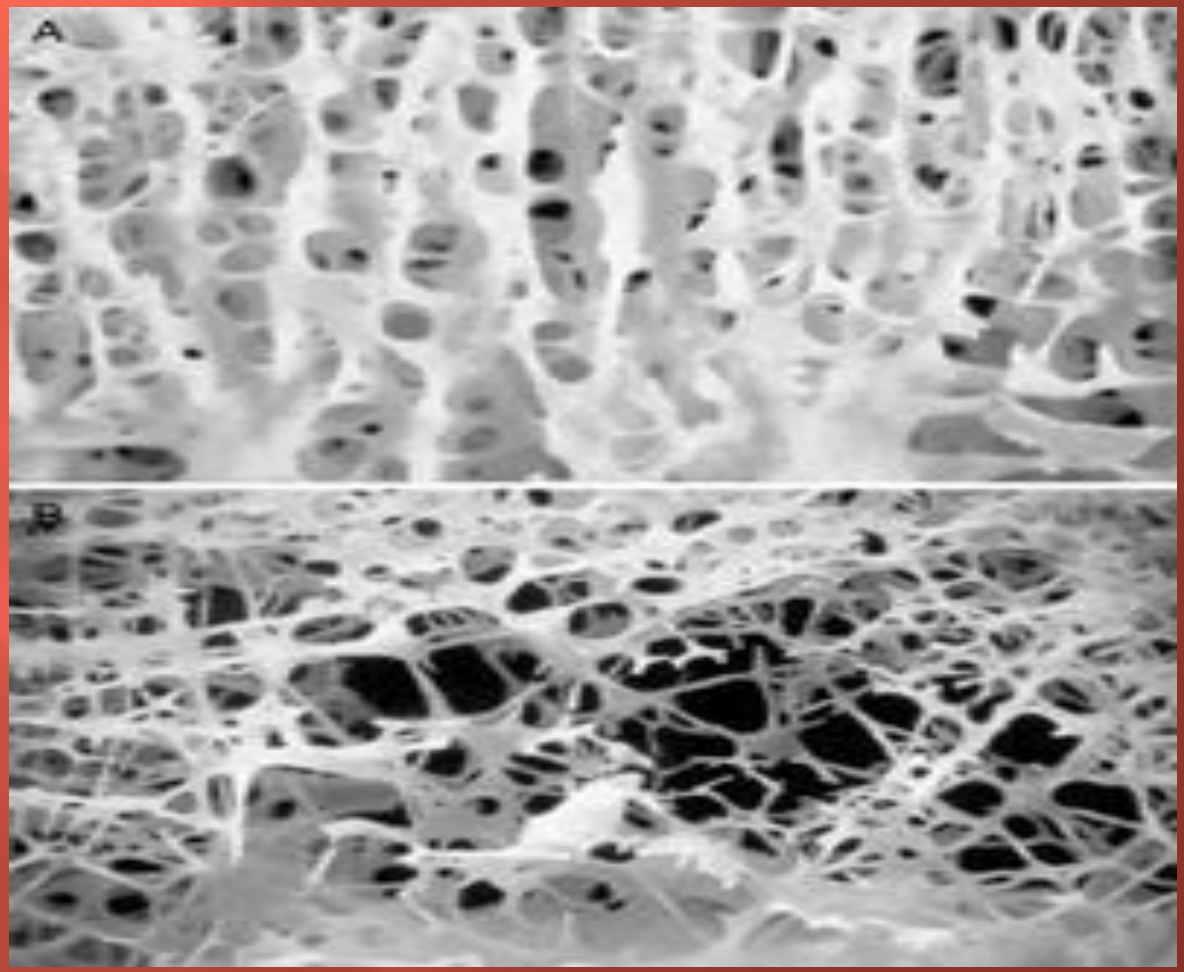

Myth #1: "Osteoporosis is not serious enough for me to worry about"

- It is a progressive disease and irreversibly weakens bones
- Minor trauma can cause debilitating fracture
- Chronic pain and disability are the potential outcomes
- Hip fractures can cause death

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Myth #2: Osteoporosis Myths

"I'm a healthy person. I eat right and exercise so I am not at risk."

Myth #3: Osteoporosis Myths

"I'm too young to worry about osteoporosis."

Myth #4: Osteoporosis Myths

"It's too late for me to do anything about Osteoporosis."

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- It is never too early to prevent Osteoporosis
- Osteoporosis can strike at any age
- Bone is a living, growing tissue that constantly rebuilds

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Prevalence

- **More than 10 million Americans suffer from Osteoporosis**
- **80% are women**
- **1 in 2 women and 1 in 4 men over 50 years old will be diagnosed**

Source: National Osteoporosis Foundation

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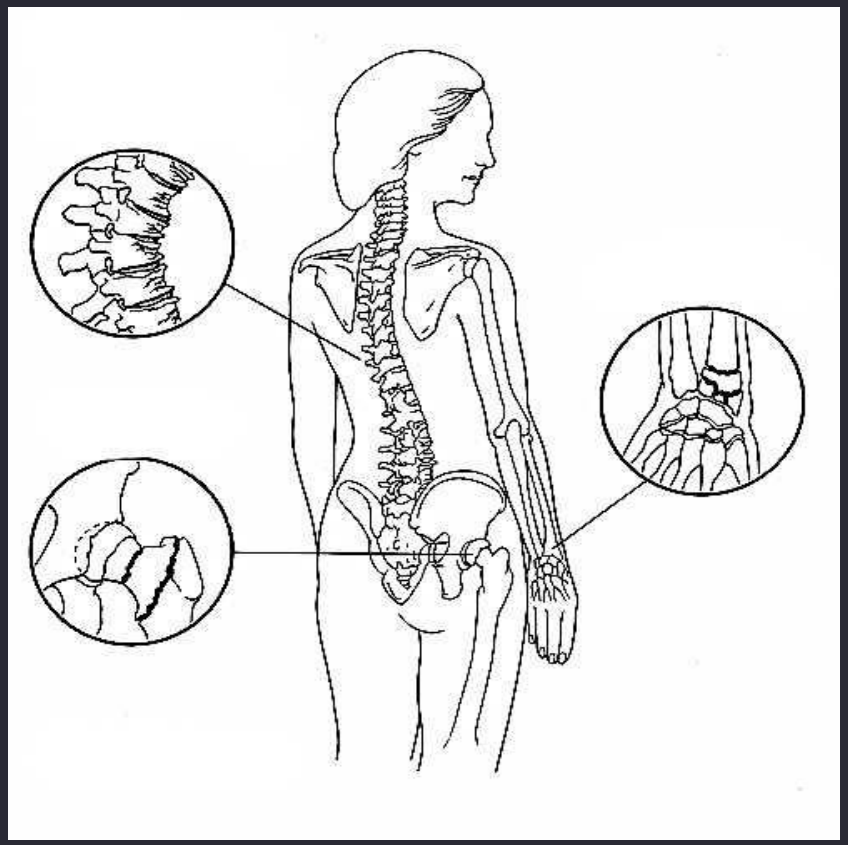
2 Million Fractures Annually

Vertebral Fractures: 550,000+



Wrist Fractures: 400,000+

Hip Fractures: 300,000+

Other Fractures: 810,000+

Source: National Osteoporosis Foundation, 2000

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Burden of Disease

- **Most patients with hip fractures are hospitalized for about one week.**
- **One in four adults who lived independently before their hip fracture has to stay in a nursing home for at least a year after their injury.**
- **One in five hip fracture patients dies within a year of injury.**

Source: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention

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Symptoms and Warning Signs

- **Persistent, unexplained back pain**
- **Shorter than you used to be**
- **Can no longer stand up straight**
- **Spinal deformities**

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Symptoms and Warning Signs

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

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Risk Factors

- Female
- Thin or small frame
- Older age
- Family history
- Smoking

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Risk Factors

- **Advanced age**
- **History of fragility fracture**
- **Family history - primary relative with Osteoporosis or fragility fracture**

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Risk Factors

- **Post Menopausal**
  - **Hormonal imbalances can result in rapid bone loss**
  - **Women can lose up to 20% of their bone mass in 5-7 years**

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Risk Factors

- Amenorrhea, anorexia, and bulimia
- Diet low in calcium
- Certain medications
- Low testosterone in men

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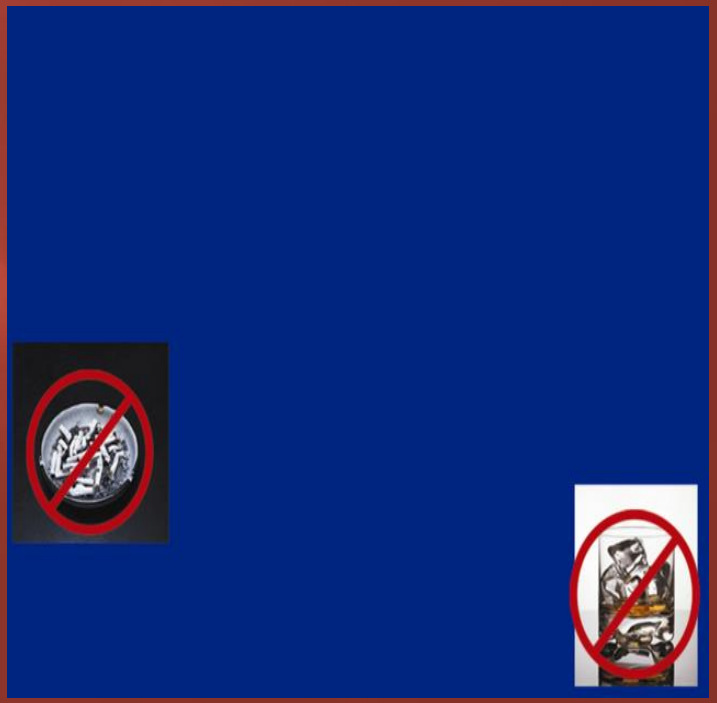
Risk Factors

Inactive lifestyle



Cigarette smoking

Excessive alcohol consumption

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Men & Osteoporosis

Underdiagnosed

Unrecognized

Underreported

Inadequately researched

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Conditions that can cause bone loss

- **AIDS/HIV**
- **Depression**
- **Diabetes**
- **Digestive disorders like celiac disease, Crohn's disease & ulcerative colitis**
- **Hyperparathyroidism**
- **Leukemia**
- **Low estrogen and testosterone levels**
- **Lymphoma**
- **Multiple Myeloma**
- **Multiple sclerosis (MS)**
- **Organ transplants**

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- Parkinson’s Disease
- Prostate cancer
- Rheumatoid arthritis
- Scoliosis
- Sickle cell disease
- Stroke
- Weight loss and weight loss surgery

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Low Hormone Levels and Osteoporosis

Testosterone and estrogen are hormones that help you maintain strong bones.

Some men lose testosterone as they age.

Others may develop low testosterone levels after receiving androgen deprivation therapy (ADT) to treat prostate cancer.

Estrogen is also present in small amounts in men.

Low levels of either of these hormones can contribute to bone loss and osteoporosis in men.

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What puts Man at risk ?

As men age, bone density decreases, especially age 70.

If you have a family history of osteoporosis or broken bones, you may be at risk.

If you are age 50 or older and have broken any bones or lost an inch or more in height, you may already have osteoporosis and not know it.

If you take certain medicines or have certain medical conditions that can cause bone loss, you may develop osteoporosis.

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Prevention of Osteoporosis in Man

- Treatment options for osteoporosis in men currently are limited
- Prevention is the rule.
- Boys should be encouraged to engage in weight-bearing sports exercise to maximize peak bone mass before puberty.
- In adulthood, men require calcium 1,000 mg/day to 1,500 mg/day and vitaminD400 IU/day to 800 IU/ day.
- Oral supplementation is necessary because only 60% of older adults receive these levels from their diets,and intestinal calcium and vitamin D metabolism are impaired with age.

- Mechanical stimuli for bone formation should be provided via weight-bearing exercise to reduce the risk of hip fracture.
- Exercise should continue throughout life because the bone benefits decrease when exercise is stopped.
- Alcohol and tobacco use should be avoided.

Medicines that can cause bone loss

- • Aluminum-containing antacids
- • Antiseizure medicines (only some) such as Dilantin® or Phenobarbital
- • Cancer chemotherapeutic drugs
- • Cyclosporin A and FK506 (Tacrolimus) (used after organ transplantation)
- • Gonadotropin releasing hormone (GnRH) such as Lupron® and Zoladex® (androgen deprivation therapy)
- • Heparin

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- Methotrexate
- Proton pump inhibitors (PPIs) such as Nexium®, Prevacid® and Prilosec®
- Selective serotonin reuptake inhibitors (SSRIs) such as Lexapro®, Prozac® and Zoloft®
- Steroids (glucocorticoids) such as cortisone and prednisone
- Thiazolidinediones such as Actos® and Avandia®
- Thyroid hormones in excess

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Diagnosis

- Medical history
- Physical exam
- X-rays
- Bone densitometry
- Specialized lab tests

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Bone Densitometry

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Bone Densitometry

- Anyone with a fragility fracture
- All women age 65 and older
- Postmenopausal women younger than 65 with risk factors
- Men over 50 with risk factors

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NOF recommendation for DXA

Woman age 65 or older

Man age 70 or older

Break a bone after age 50

Woman of menopausal age with risk factors

Postmenopausal woman under age 65 with risk factors

Man age 50-69 with risk factors

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DEXA – BONE DENSITY

Guide to Understanding T-scores			
Category	T-scores		
	Range	Examples	
Normal Bone Density	-1 and above	+0.5	
		0	
		-1.0	
Low Bone Density (Osteopenia)	Between -1 and -2.5	-1.1	
		-1.5	
		-2.4	
Osteoporosis	-2.5 and below	-2.5	
		-3.0	
		-4.0	

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Other test

25-hydroxyvitamin D test

- **Spine x-ray or vertebral fracture assessment (VFA) to look for broken bones in your spine**
- **FRAX® test to estimate your risk of breaking a bone in the next 10 years**
- **Blood calcium level and 24-hour urine calcium measurement**
- **Thyroid function tests to check for hyperthyroidism**
- **Parathyroid hormone levels to see if you may be at risk of hyperparathyroidism**
- **Testosterone levels to see if your levels are too low**
- **Biochemical markers of bone turnover tests to make estimates about how quickly you are losing bone**

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Diagnosis

Before Your Appointment

- Prepare to describe your symptoms
- Gather medical history
- Make list of medications
- Write down concerns and questions and bring them

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During Your Appointment

1. Expect what from treatment?
2. Treatment effect on daily activities?
3. How to prevent further disability?

When to consider treatment

Below are treatment guidelines for postmenopausal women and men age 50 or older:

Most people with T-scores of -1.0 and above (normal bone density) do not need to take an osteoporosis medicine.

Some people with T-scores between -1.0 and -2.5 (low bone density or osteopenia) should consider taking an osteoporosis medicine when they have certain risk factors.

All people with T-scores of -2.5 and below (osteoporosis) should consider taking an osteoporosis medicine.

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Medication

- Bisphosphonates
- Estrogen Replacement Therapy
- Medications made from natural hormones
- SERMs (Selective Estrogen Receptor Modulators)

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Treatment

- Appropriate treatment of fragility fractures
- Surgery if necessary

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Prevention

Calcium and Vitamin D Intake

- Adults: 1000-1200 mg of Calcium per day
- 400-800 IU vitamin D per day
- Consult your physician for dosage

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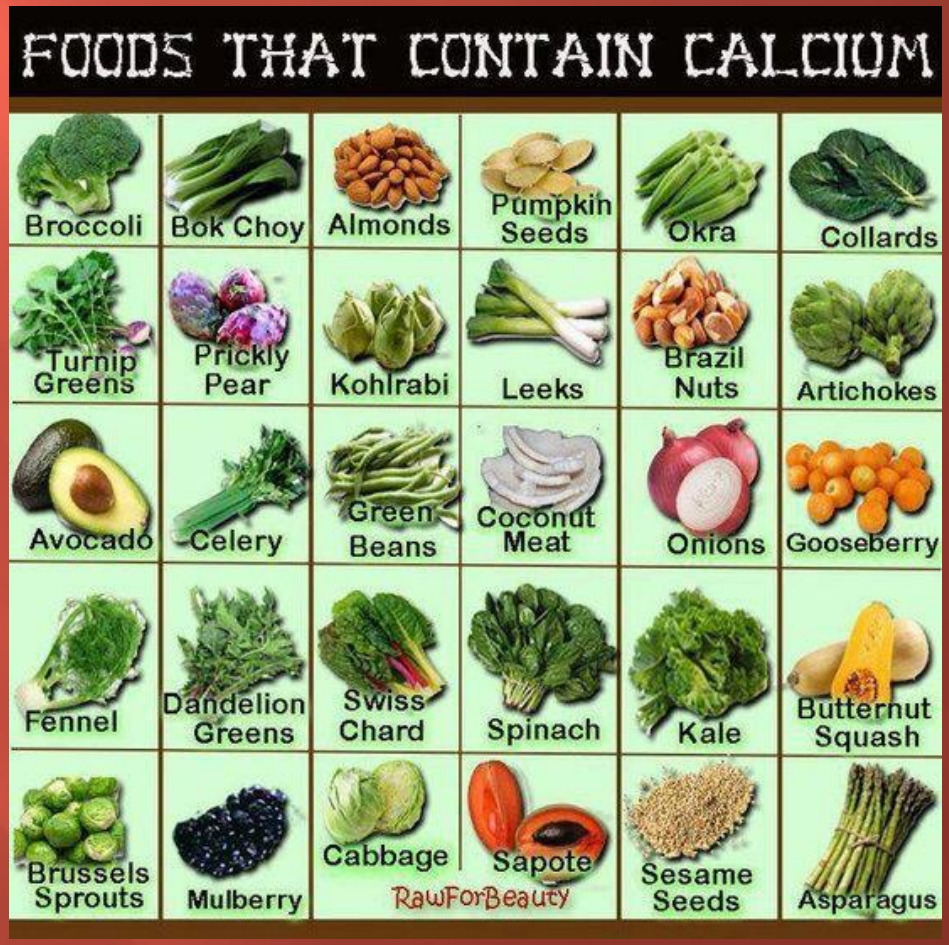
Prevention



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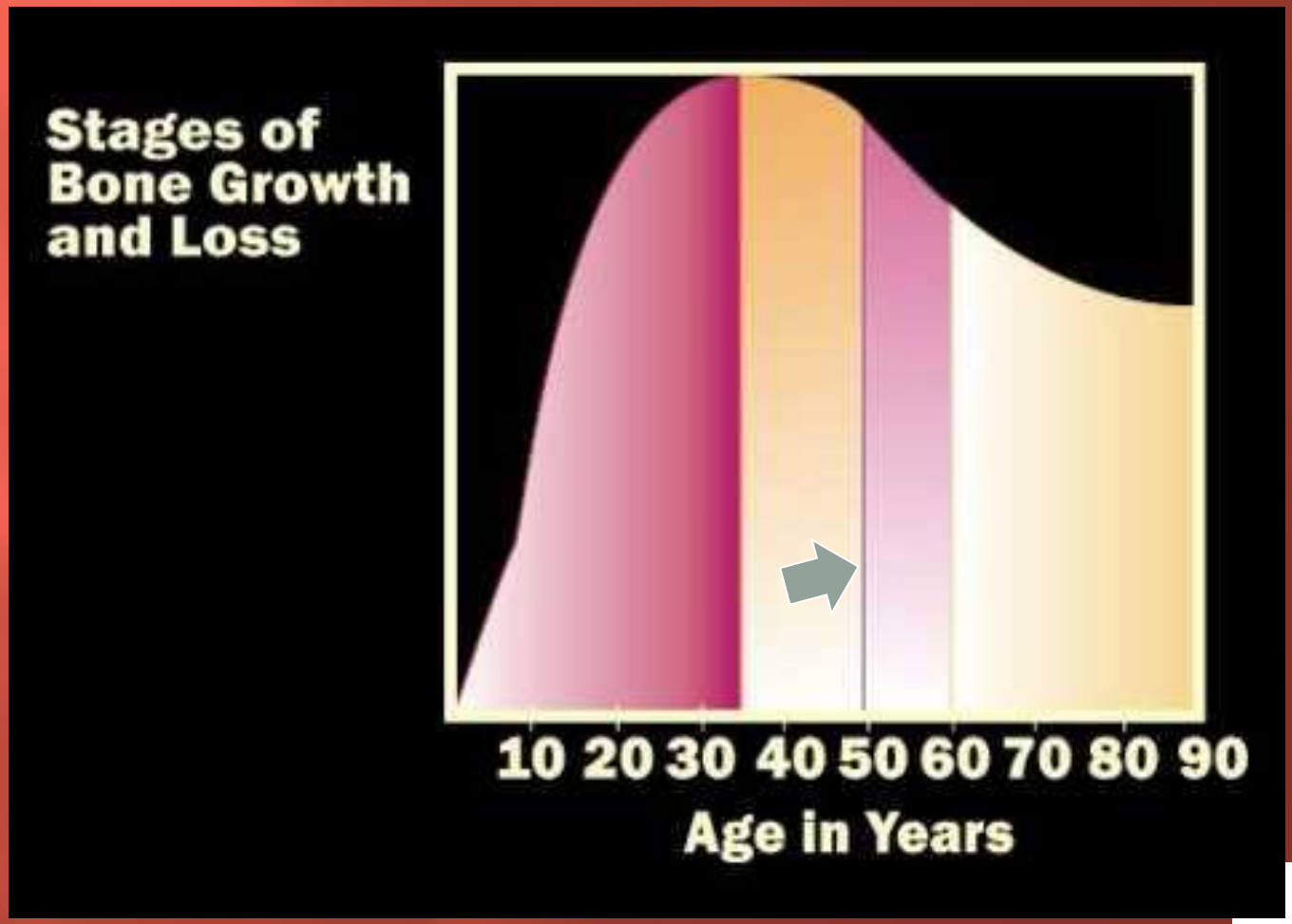
Prevention: 10-20 Year Olds



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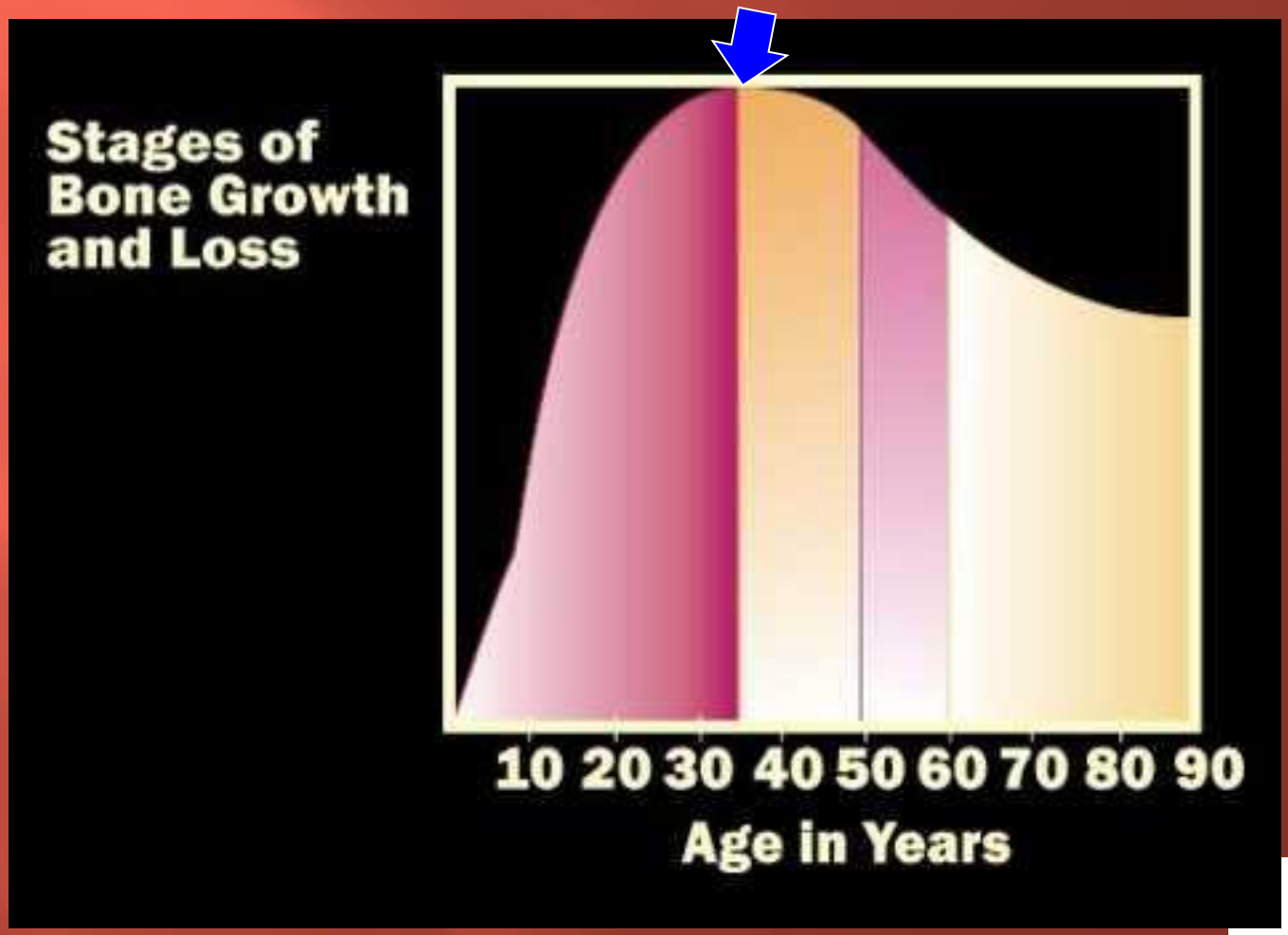
Prevention: 20-35 Year Olds



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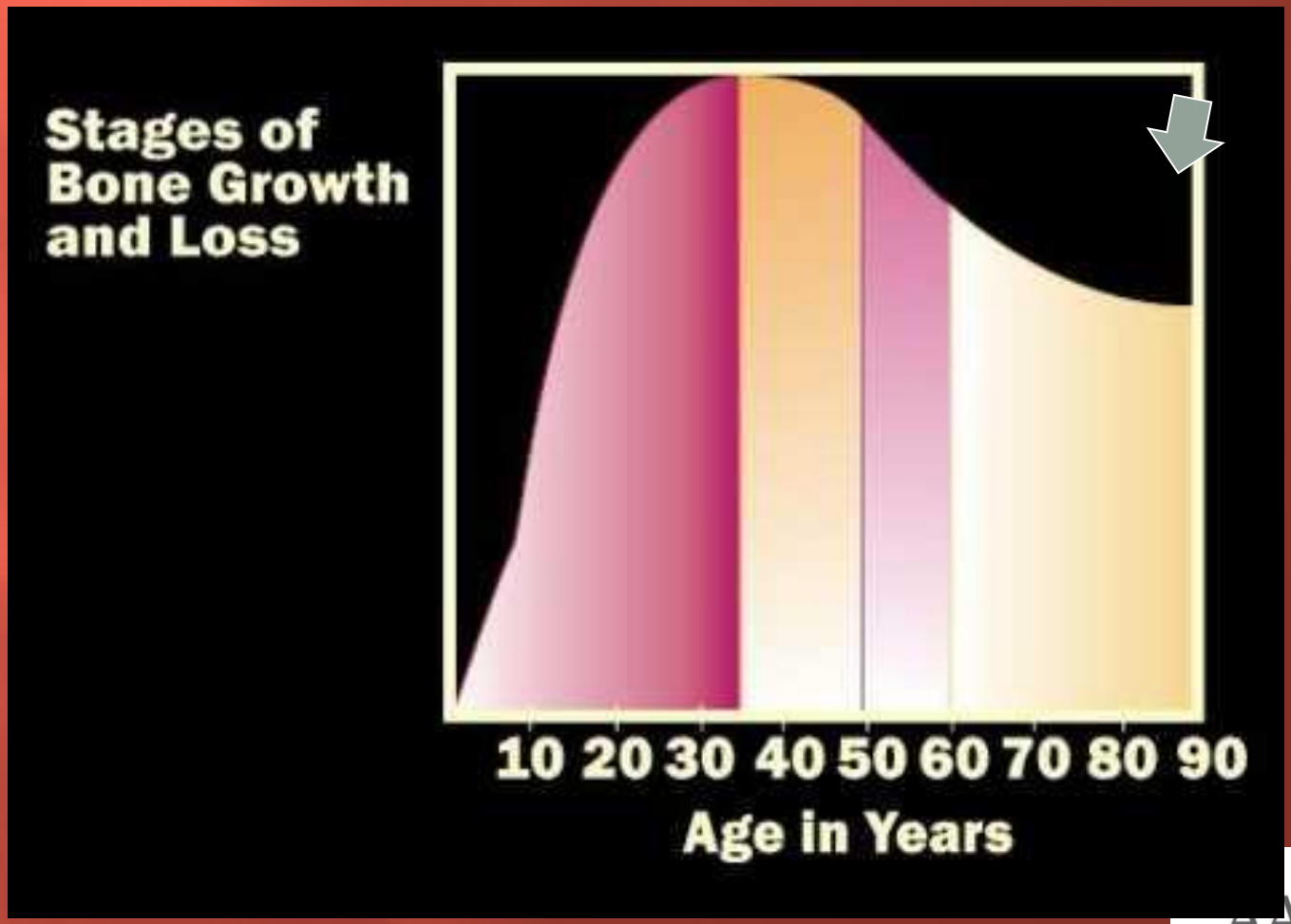
Prevention: 35-50 Year Olds



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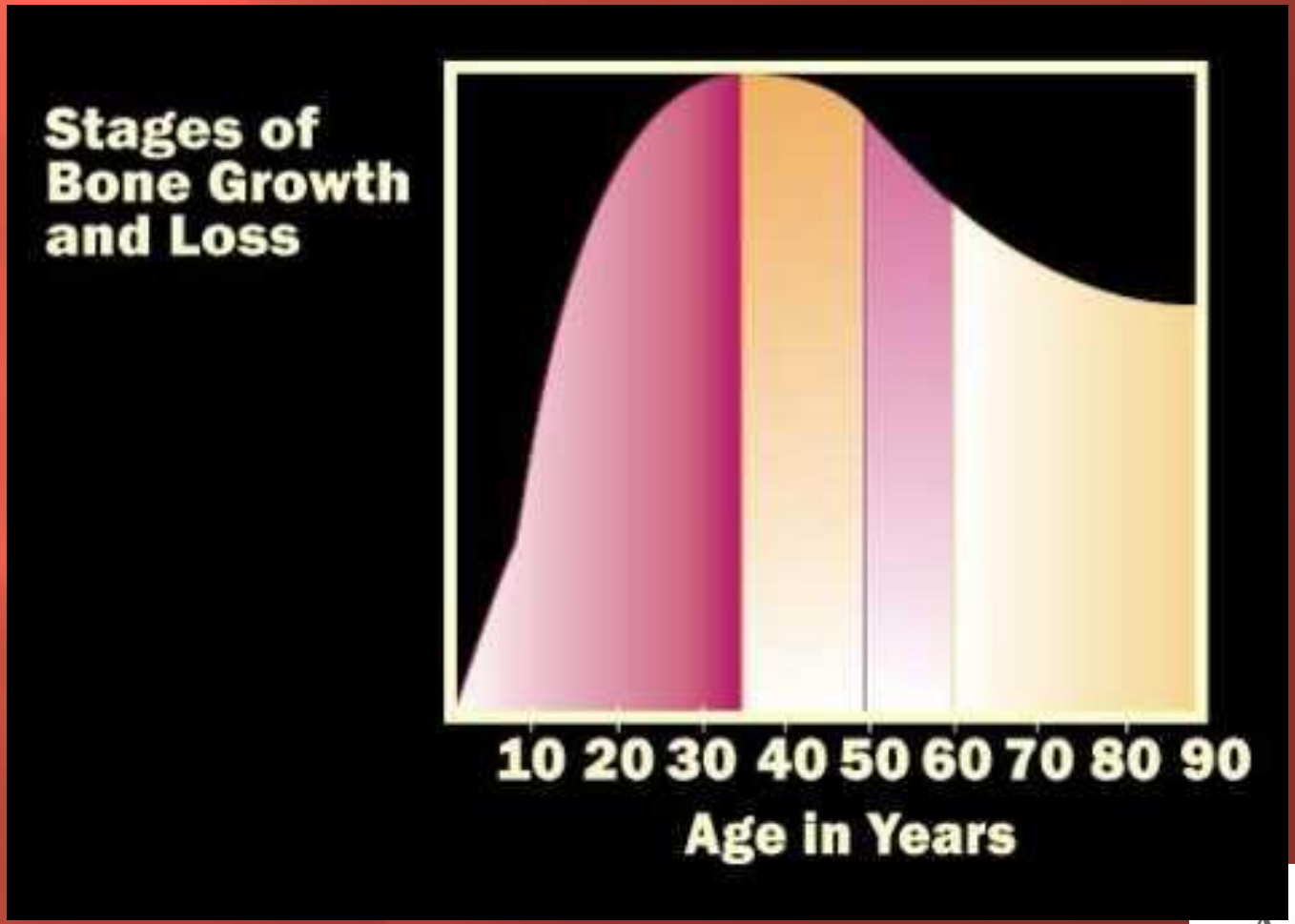
Prevention: Over 50



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Osteoporosis

While you cannot change your genetics or heredity, skeletal frame, gender, race or age, you can control other risk factors

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Are you at risk ?

A woman's risk of breaking a hip due to osteoporosis is equal to her risk of breast, ovarian and uterine cancer combined.

And a man age 50 or older is more likely to break a bone due to osteoporosis than he is to get prostate cancer.

Uncontrollable Risk Factors

Being over age 50.
Being female.
Menopause.
Family history of osteoporosis.
Low body weight/being small and thin.
Broken bones or height loss.

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Risk ?

Controllable Risk Factors

Not getting enough Ca and Vit D

Not eating enough fruits and vegetables

Getting too much protein, sodium and caffeine

Having an inactive lifestyle

Smoking.

Drinking too much alcohol

Losing weight

Medications and diseases that can cause osteoporosis.

VITAMIN D

Vitamin D is required for calcium metabolism

In Caucasian persons, 15 minutes of exposure to bright sunlight on the hands and face per day produces enough vitamin D3 (cholecalciferol) to satisfy the minimum requirement (10 mg) of this hormone.

Dark-skinned persons may require longer exposure.

The major source of vitamin D is the diet, which provides vitamin D2 (ergocalciferol).

Some individuals may lack sufficient exposure to sunlight as well as dietary exposure to foods naturally containing vit D

Most milk in the United States is supplemented with vit D2.

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How much calcium you need will vary depending on your age and other factors.

The National Academy of Sciences makes the following recommendations regarding daily intake of calcium:

Males and females 9 to 18 years: 1,300 mg per day
Women and men 19 to 50 years: 1,000 mg per day
Pregnant or nursing women up to age 18: 1,300 mg per day
Pregnant or nursing women 19 to 50 years: 1,000 mg per day
Women and men over 50: 1,200 mg per day

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VITAMIN D

Vitamin D helps your body absorb calcium.

The recommendation for Vitamin D is 200-600 IU (international units) daily.

Supplemented dairy products are an excellent source of Vitamin D. (A cup of milk contains 100 IU of Vitamin D. A multivitamin contains 400 IU of Vitamin D.)

Vitamin supplements can be taken if your diet does not contain enough of this nutrient.

Again, consult with your doctor before taking a vitamin supplement. Too much Vitamin D can be toxic.

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Calcium, phosphorus, zinc, and magnesium are necessary minerals that must come from our diets.

Vitamins D, K, and A are needed for normal bone metabolism.

Without these nutrients, our bones can become weak and more likely to break.

Calcium and Vitamin D are well known for the important role they play in building strong bones.

The skeleton is our body's major storage bank for calcium, and Vitamin D helps our bodies effectively absorb calcium from our diets.

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Physical Activity and Bone Health

Being active and following a regular exercise program are important to maintaining healthy bones.

Weight-bearing exercise is especially important for maintaining bone strength and preventing osteoporosis.

Weight-bearing physical activity can slow bone loss in older people.

Maintaining muscle mass also preserves and strengthens surrounding bone and helps prevent falls.

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Weight-bearing describes any activity you do on your feet that works your bones and muscles against gravity.

Regular weight-bearing exercises — such as brisk walking, jogging, or team sports — turns on your body's bone-forming cells and helps bones become stronger.

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PHYSICAL EXERCISE

- Important for building and maintaining bone density: **weight-bearing and muscle-strengthening exercises.**

- Weight-bearing Exercises
- These exercises include activities that make you move against gravity while staying upright.

- Weight-bearing exercises can be high-impact or low-impact.

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- **High-impact weight-bearing exercises help build bones and keep them strong.**
- **If you have broken a bone due to osteoporosis or are at risk of breaking a bone, you may need to avoid high-impact exercises.**
- **Examples of high-impact weight-bearing exercises are: Dancing, Doing high-impact aerobics, Hiking, Jogging/running, Jumping Rope, Stair climbing, Tennis**

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LOW-IMPACT WEIGHT-BEARING

- **Low-impact weight-bearing exercises can also help keep bones strong and are a safe alternative if you cannot do high-impact exercises.**
- **Examples of low-impact weight-bearing exercises are:**
  - **Using elliptical training machines**
  - **Doing low-impact aerobics**
  - **Using stair-step machines**
  - **Fast walking on a treadmill or outside**

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MUSCLE-STRENGTHENING EXERCISES

- These exercises include activities where you move your body, a weight or some other resistance against gravity. They are also known as resistance exercises and include:

- Lifting weights
- Using elastic exercise bands
- Using weight machines
- Lifting your own body weight

- Functional movements, such as **standing and rising up on your toes**

- **Yoga and Pilates** can also improve strength, balance and flexibility. However, certain positions may not be safe for people with osteoporosis or those at increased risk of broken bones.

- For example, exercises that have you bend forward may increase the chance of breaking a bone in the spine. A physical therapist should be able to help you learn which exercises are safe and appropriate for you.

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NON-IMPACT EXERCISES

- Non-impact exercises can help you to improve balance, posture and how well you move in everyday activities.
- These exercises can also help to increase muscle strength and decrease the risk of falls and broken bones.
- Some of these exercises include:
- Balance exercises that strengthen your legs and test your balance can decrease your risk of falls.
- Posture exercises that improve your posture and reduce rounded or “sloping” shoulders can help you decrease the chance of breaking a bone, especially in the spine.

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NON-IMPACT EXERCISES

- Functional exercises that improve how well you move can help you with everyday activities and decrease your chance of falling and breaking a bone.
- For example, if you have trouble getting up from a chair or climbing stairs, you should do these activities as exercises.
- A physical therapist can teach you balance, posture and functional exercises.

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- **Weight-bearing exercises**
- **30 minutes on most days of the week. Do a 30-minute session or multiple sessions spread out throughout the day. The benefits to your bones are the same.**

- **Muscle-strengthening exercises**
- **Two to three days per week. If you don't have much time for strengthening/resistance training, do small amounts at a time. You can do just one body part each day. For example do arms one day, legs the next and trunk the next. You can also spread these exercises out during your normal day.**

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- **Balance, posture and functional exercises**

- **Every day or as often as needed. You may want to focus on one area more than the others. If you have fallen or lose your balance, spend time doing balance exercises.**

- **If you are getting rounded shoulders, work more on posture exercises. If you have trouble climbing stairs or getting up from the couch, do more functional exercises.**

- **You can also perform these exercises at one time or spread them during your day.**

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- In terms of prevention, patients should be instructed in the proper techniques of posture and body mechanics.
- They should avoid lifting heavy objects and should learn proper bending motions.
- The use of a cane often provides the patient with better balance and reduces the possibility of falls.
- Patients should also be instructed in pectoral stretching, deep breathing, and back extension exercises.
- Swimming and bicycling are excellent means of maintaining aerobic fitness and do not place undue stresses on the vertebral column.

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- Management of chronic pain secondary to microfractures and kyphotic or scoliotic changes in the spine requires a program of back extension exercises and specific physical therapy tailored to the patient's needs.

Early treatment for osteoporosis is the most effective way to reduce bone loss and prevent fractures.

However, treatment programs after a fracture also are of value and may help to prevent future fractures.

Current treatment methods can reduce bone loss, but there are no proven methods of restoring lost bone.

Building bones through adequate calcium intake and exercise when you are young is an investment that will pay off years later with a reduced risk of hip and other fractures.

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ARE DAIRY FOODS PROTECTING US FROM OSTEOPOROSIS ?

- Multicountry analysis of hip fracture incidence and dairy product consumption found that milk consumption has a high statistical association with higher rates of hip fractures.
- 3 or 4 servings of milk a day (higher fracture rate) vs. little or no milk
- Does not mean that dairy causes osteoporosis but not protect us from osteoporosis
- Studies show fruits and vegetables are protective against osteoporosis
- Osteoporosis has a complex etiology that involves other factors such as dietary acid-alkaline balance, trace minerals, phytochemicals in plants, exercise, exposure to sunlight and more.

- EAT TO LIVE – JOEL FUHRMAN, MD

EAT TO LIVE – JOEL FUHRMAN, MD

- Dr Campbell: " Ironically, osteoporosis tends to occur in countries where calcium intake is highest and most of it comes from protein-rich dairy product.
- Chinese date – people need less Ca than we think and get adequate amounts from vegetable source and plant food.
- New York times - No osteoporosis in China w Ca intake 241-943 mg/day. US intake 841-1435 mg/day mostly from dairy source
- Negative Calcium balance concept – more calcium is excreted in the urine than is absorbed through digestion – overtime results in bone loss – primary cause of osteoporosis
- Positive Ca balance means more Ca is absorbed than excreted

- Epidemiologic studies - Osteoporosis is linked to nutritional factors that causes excessive Ca loss in the urine rather than low Ca intake
- Plant foods high in protein are not acid forming
- Animal protein ingestion results in heavy acid load in the blood
- Fruits and vegetable can help buffer the acid load from all the animal protein and reduce calcium loss
- Calcium released from bones to help neutralize the acid

Dietary factors that induce Ca loss in the Urine

- Animal protein
- Salt
- Caffeine
- Refined sugar
- Alcohol
- Nicotine
- Aluminum containing antacids
- Drugs – antibiotics, steroids, thyroid hormone
- Vitamin A supplements

EAT TO LIVE – JOEL FUHRMAN, MD

- Published data clearly links increased urinary excretion of calcium with animal proteins intake (acid – forming in blood) but not with vegetable – protein intake (not acid – forming)
- Acid forming food in blood sets off reactions whereby Ca is released from the bones to help neutralize the acid- Ca loss
- Dairy fat – exposure to Dioxin highly toxic.
- Cheese & butter – acid inducer – bone loss
- Fruits and Vegetables are rich in potassium, magnesium, calcium – alkaline and do not induce urinary calcium loss
- Green vegetable are rich in Vitamin K – crucial for bone health
- Calcium Diet - 90 % whole plant food and 10 % Dairy products

- Have denser bone

The Best Foods for Bones : Fruits and Vegetables
CALCIUM IN 100 CALORIES OF :

☐ BOK CHOY	775
☐ TURNIP GREENS	685
☐ COLLARD GREEN	539
☐ TOFU	287
☐ KALE	257
☐ ROMAINE LETTUCE	194
☐ MILK	189
☐ SESAME SEEDS	170
☐ BROCCOLI	114
☐ CUCUMBER	107
☐ CARROTS	81
☐ CAULIFLOWER	70
☐ SOYBEANS	59
☐ FLAXSEEDS	48

- ☐ PREVENT OSTEOPOROSIS & STRONG BONES – EXERCISE AND STOP THE CAUSES OF HIGH URINARY Ca EXCRETION
- ☐ SOURCE : EAT TO LIVE – JOEL FUHRMAN, MD

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Resources

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6300 North River Road
Rosemont, IL 60018
www.orthoinfo.org

National Osteoporosis
Foundation
(202) 736-1656
www.nof.org

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