Impact of Resistance Based Exercises on Cancer-Associated Bone Health Changes.

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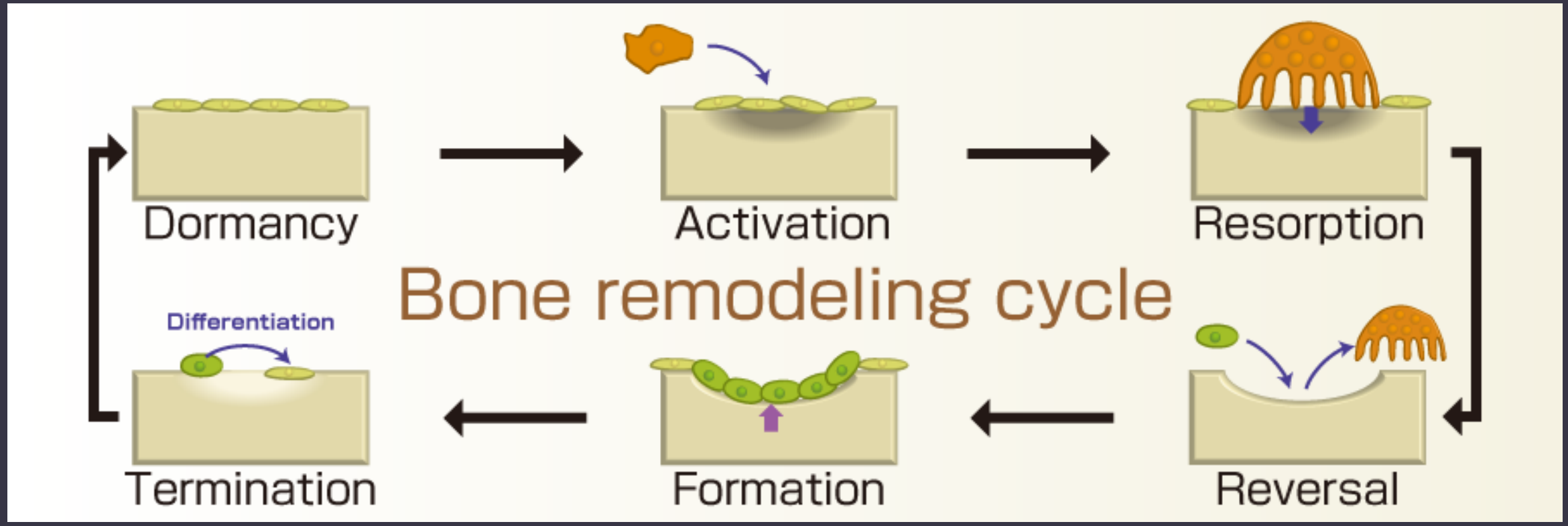
Overview

- **What**: Define bone health
- **So What?** Cancer-Specific Changes in Bone Health
- **What?** Resistance Exercise
- **So What?** Resistance Exercise & Cancer
- **Now What?**

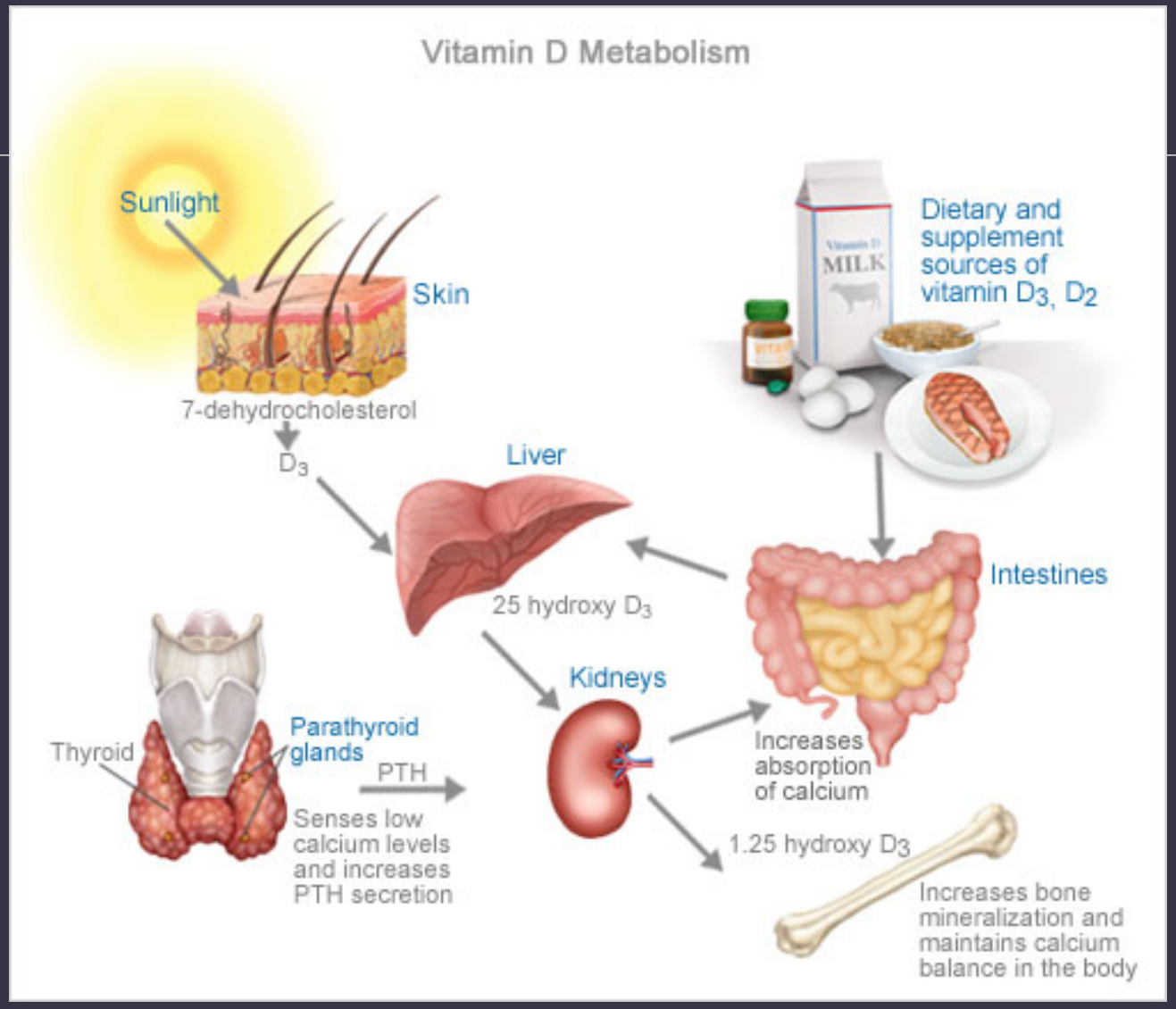
What?



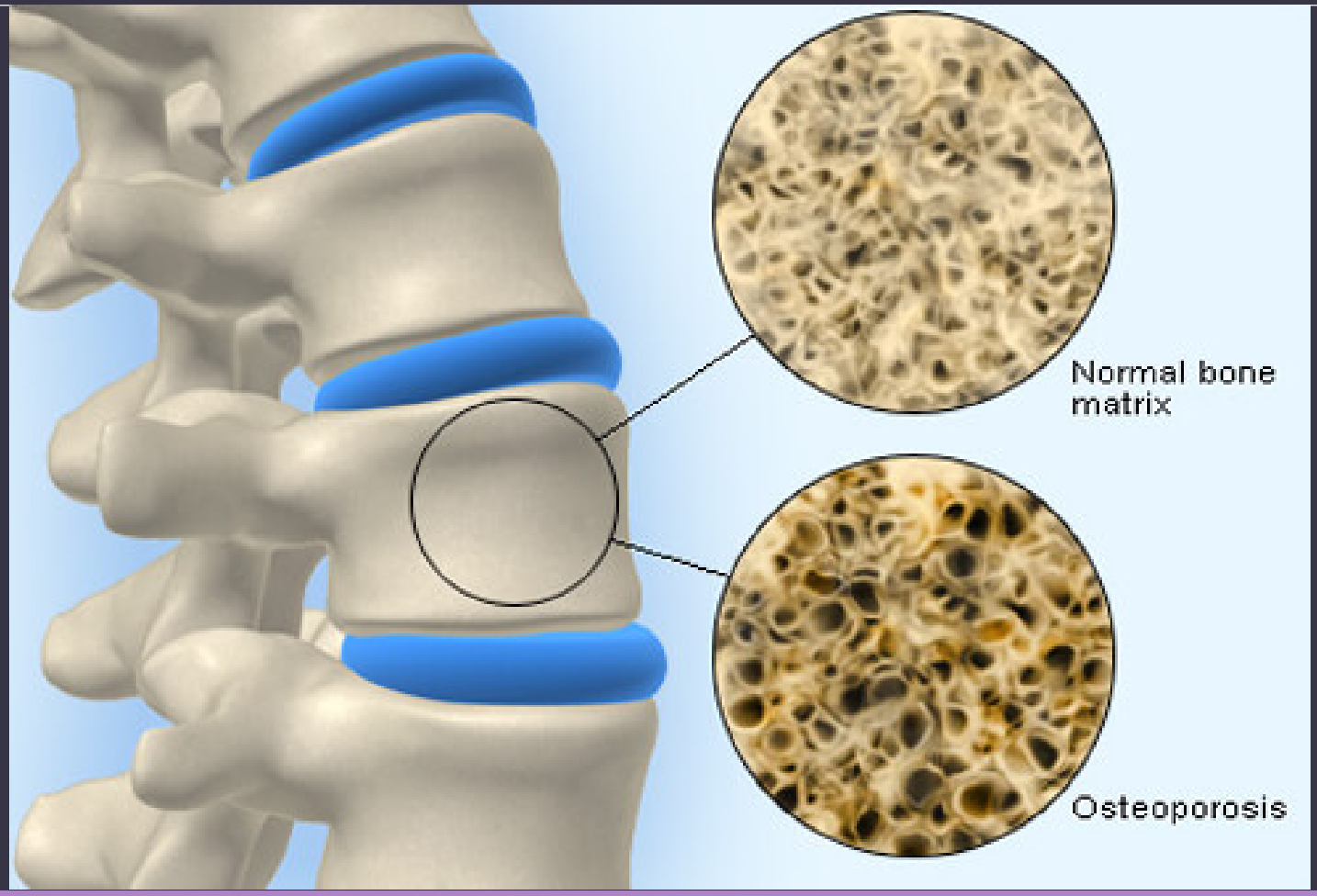
- Bones are continuously re-modeling (breaking and building)

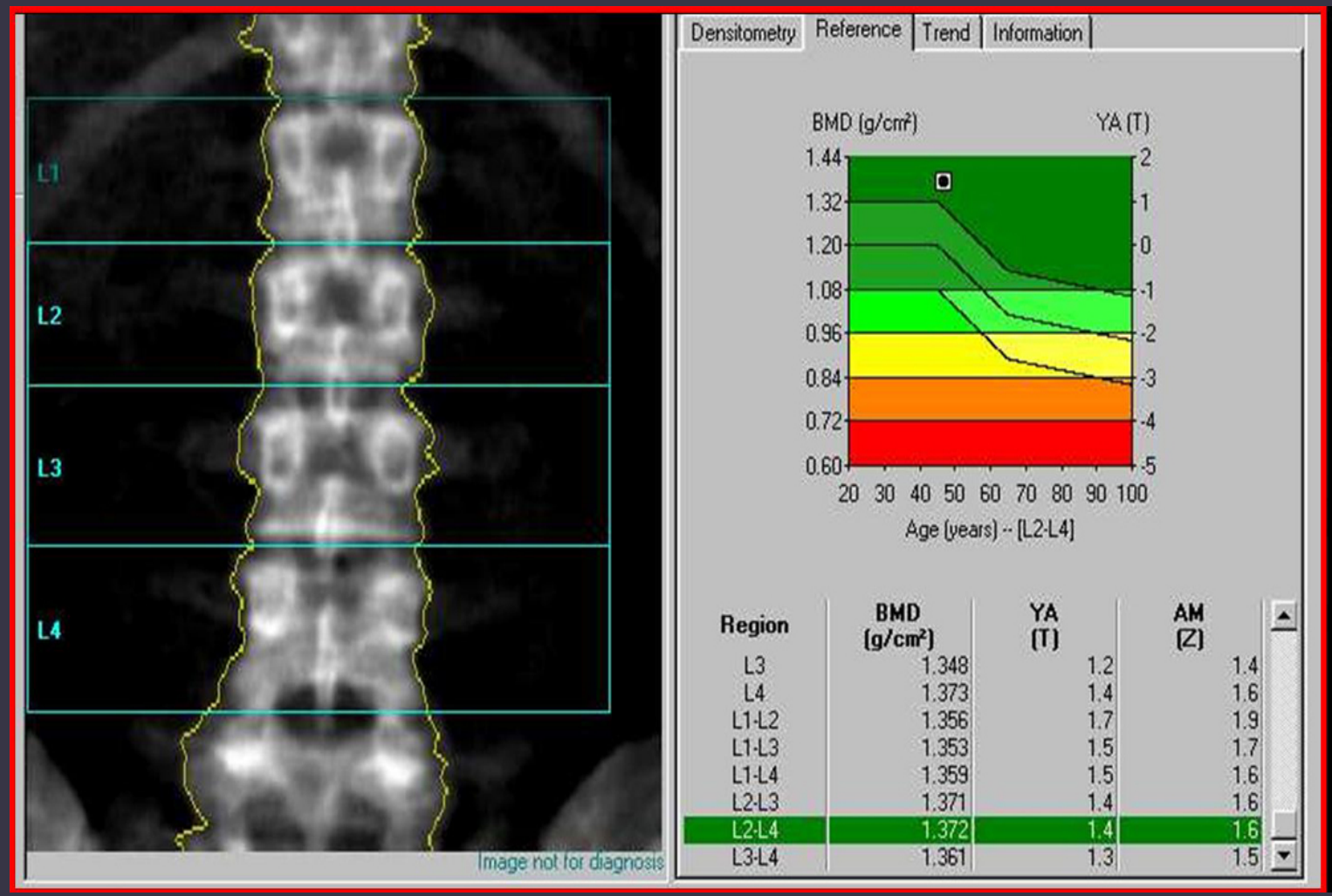

Bone Remodeling
AMGEN

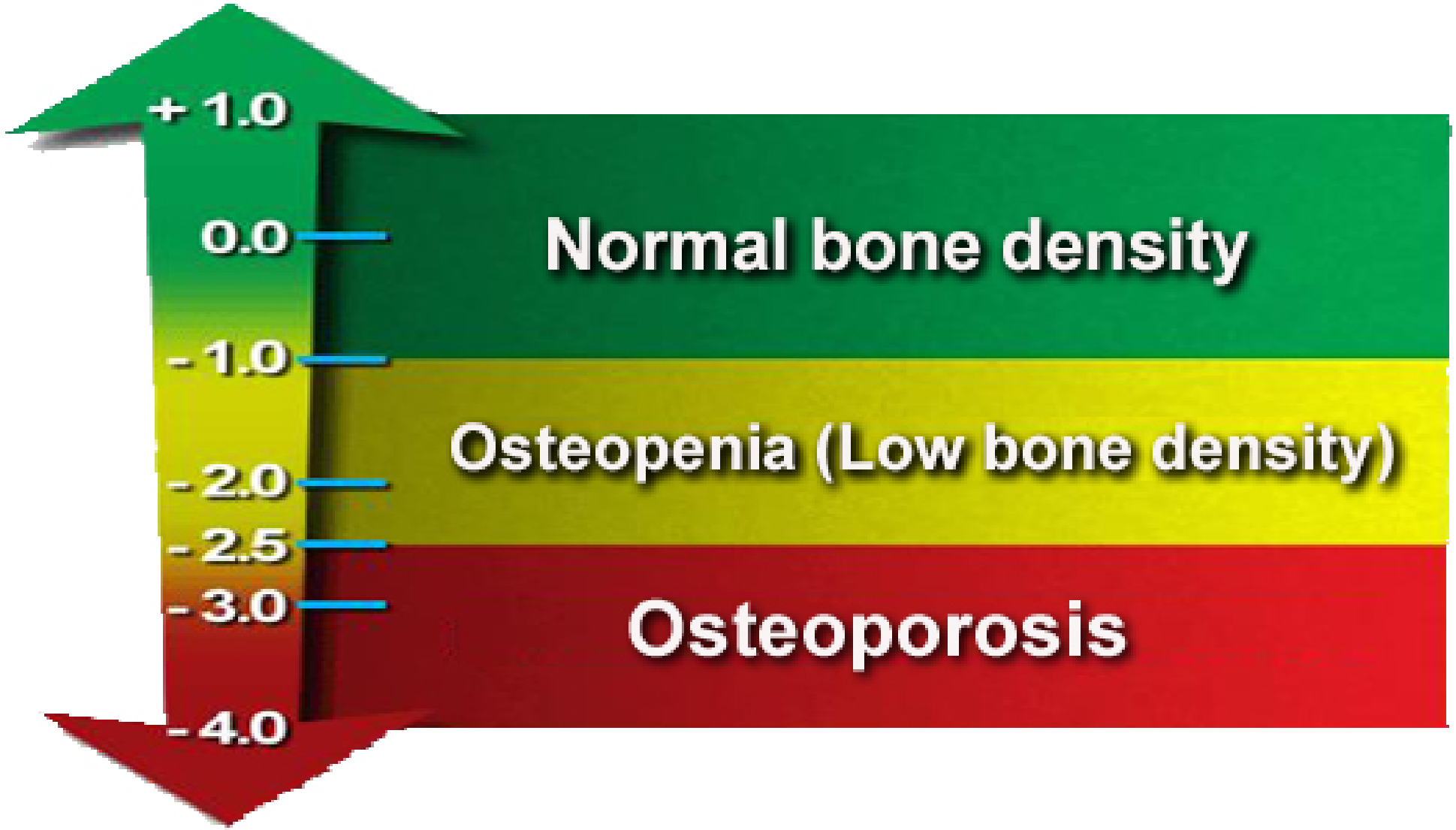
The Sun, Vitamin D, Calcium



What is Osteoporosis?




L1
L2
L3
L4
Image not for diagnosis
Densitometry
Reference
Trend
Information
BMD (g/cm²)
YA (T)
1.44
1.32
1.20
1.08
0.96
0.84
0.72
0.60
2
1
0
-1
-2
-3
-4
-5
20 30 40 50 60 70 80 90 100
Age (years) -- [L2-L4]
Region
BMD (g/cm²)
YA (T)
AM (Z)
L3 1.348 1.2 1.4
L4 1.373 1.4 1.6
L1-L2 1.356 1.7 1.9
L1-L3 1.353 1.5 1.7
L1-L4 1.359 1.5 1.6
L2-L3 1.371 1.4 1.6
L2-L4 1.372 1.4 1.6
L3-L4 1.361 1.3 1.5


+ 1.0
0.0
- 1.0
- 2.0
- 2.5
- 3.0
- 4.0
Normal bone density
Osteopenia (Low bone density)
Osteoporosis

FRAX

Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: UK Name/ID: About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
   Age: 58 Date of Birth: Y: M: D:
2. Sex — Male / Female
3. Weight (kg) 70
4. Height (cm) 168
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/cm^2)

Select BMD

Clear Calculate

BMI: 24.8

The ten year probability of fracture (%)

without BMD

Major osteoporotic	5.7
Hip Fracture	0.9

View NOGG Guidance

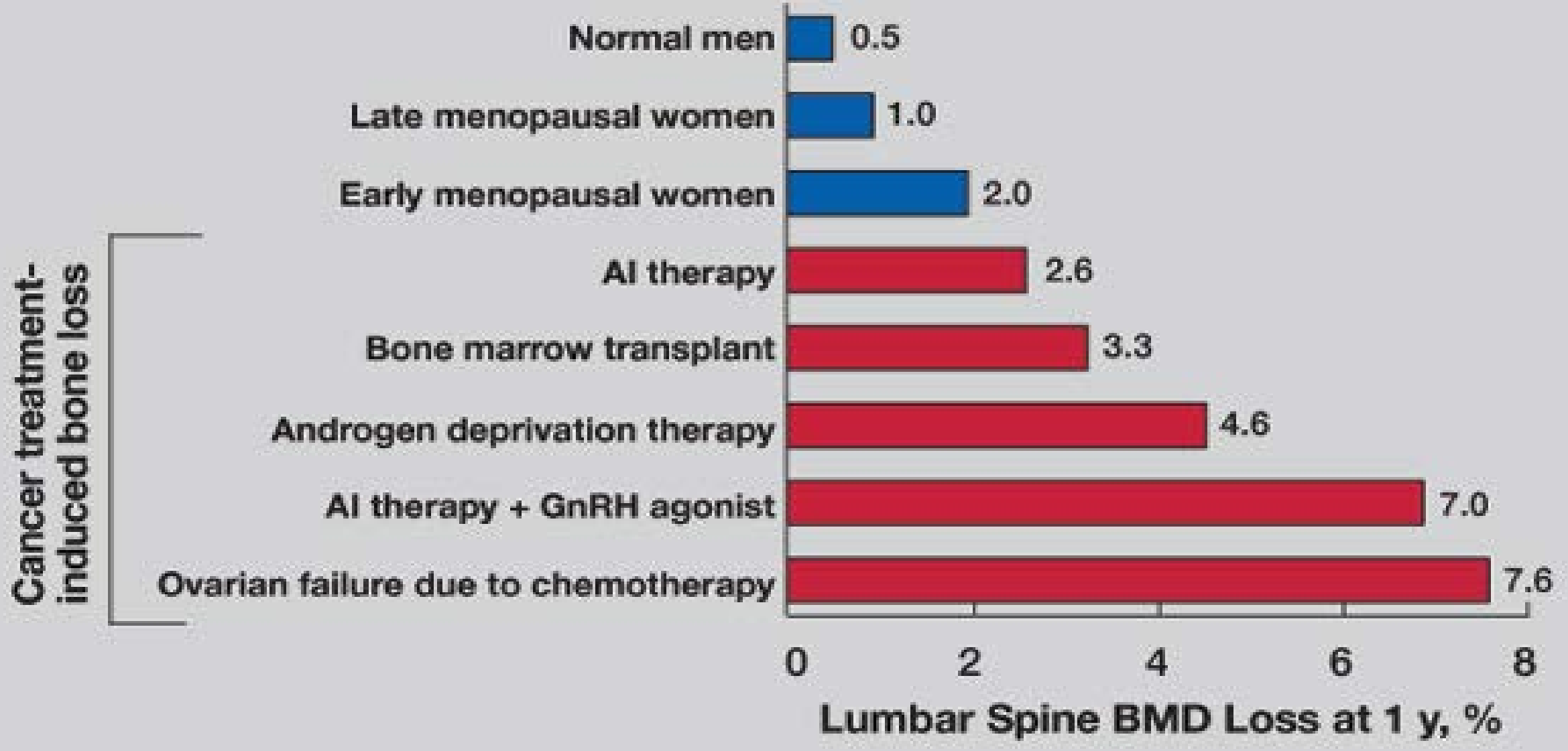
Risk Factors

- Age over 50 years
- Female
- Low body weight
- Smoking
- 3 or more alcoholic drinks in a day

So What?

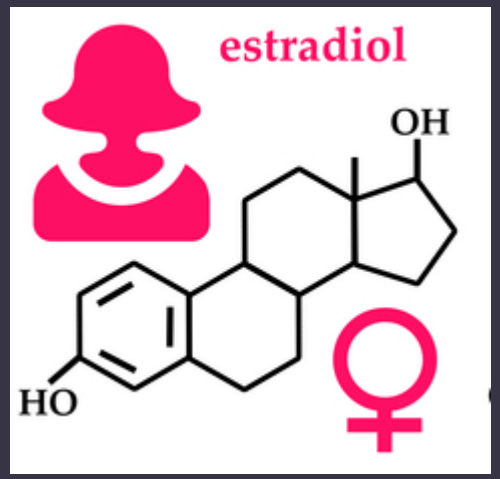
- Decreased Bone Mass
- Decreased Lean Body Mass
- Increased body fat

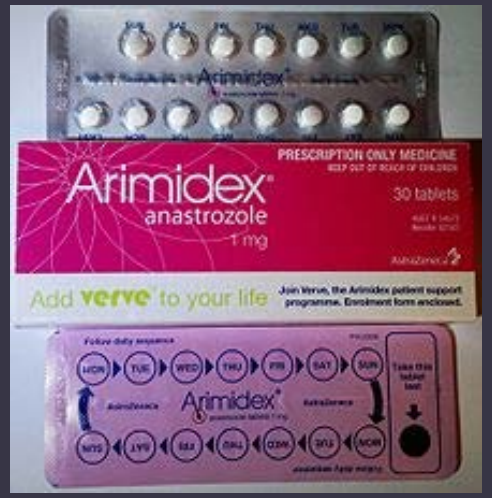
=Increased fracture risk


Normal men
0.5
Late menopausal women
1.0
Early menopausal women
2.0
AI therapy
2.6
Bone marrow transplant
3.3
Androgen deprivation therapy
4.6
AI therapy + GnRH agonist
7.0
Ovarian failure due to chemotherapy
7.6
Cancer treatment-induced bone loss
0
2
4
6
8
Lumbar Spine BMD Loss at 1 y, %

Breast Cancer & Bone Health Changes

Decreased Bone Mineral Density & Increased Risk of Fractures





Chemotherapy

Early Menopause

Breast Cancer & Bone Health Changes

Decreased BMD	Fracture Risk
5% loss	May increase by 55%
Decrease T-Score by 0.04 to 0.06	

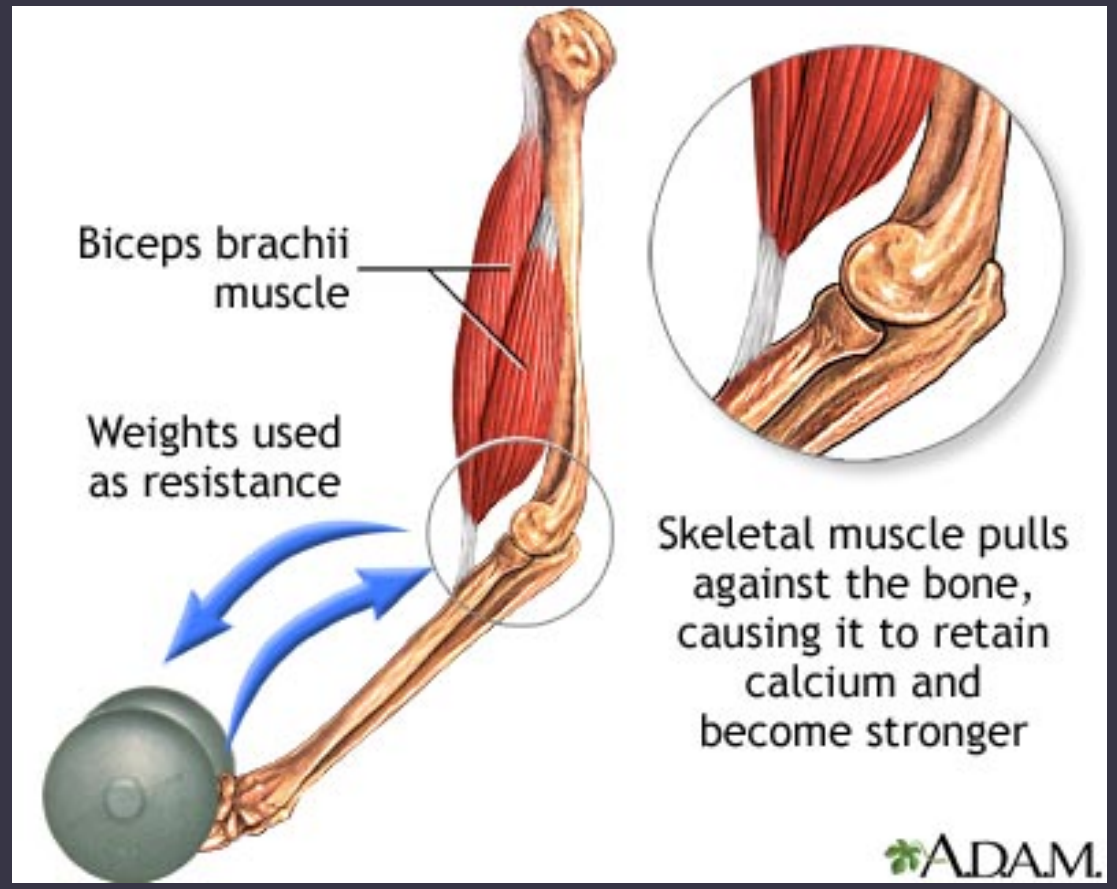
Prostate Cancer & Bone Health Changes

- ***Androgen Deprivation Therapy***

Decreased BMD	Decreased Lean Body mass	Osteoporosis Risk	Fracture Risk
Up to 10 fold	2 to 3.6% (Owen)	Increased by 30-40% (Lomax 20, Gardner)	19% compared to 12%
Hip: 0.6 to 4%			
Spine: 2 to 4.8%			

- ***Greatest Loss is seen in the first 6-12 Months (Owen)***

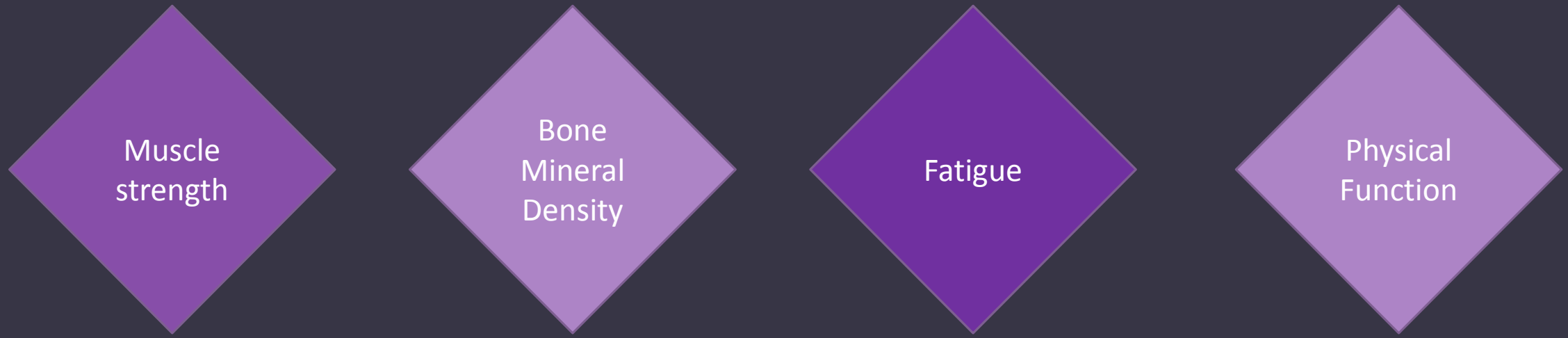
What? Resistance Exercise



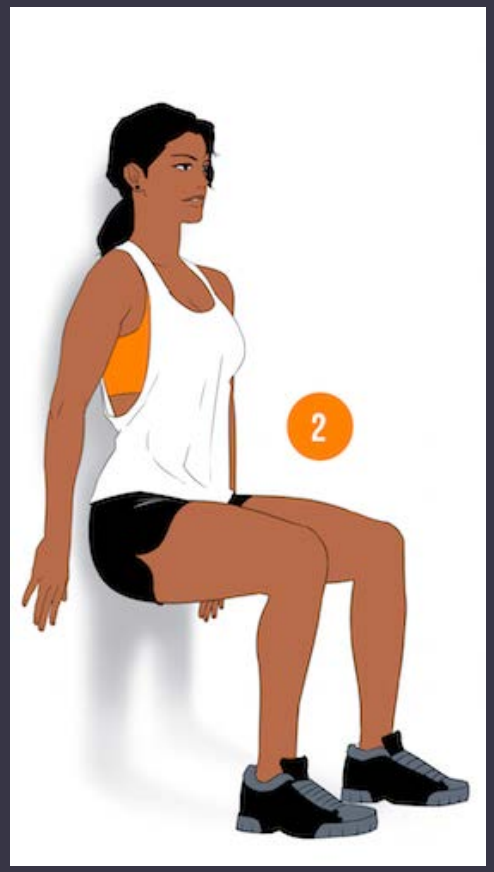
Osteopenia	Osteoporosis
Jumping/hopping	Free Weights
Plyometrics	Machines
Free weights, kettle bells, resistance bands	Resistance bands
Sports that involve jumping (basketball, volleyball)	Stairclimbing
Weight bearing aerobic activities (jogging, tennis, stairclimbing)	Walking

Benefits of Resistance Exercise?

- In Non-Cancer Individuals, Normal Aging
  - Lose 5-10% of muscle mass every 10 years after age 50 (Strasser)
- Training 2 times/week → Increased 1-2 kg of muscle mass every 6 months (Strasser)
- Takes 8-12 weeks to see a difference (Strasser)

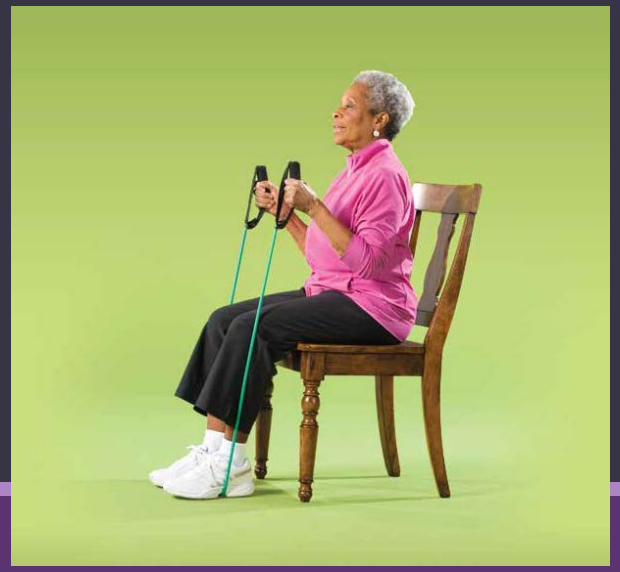


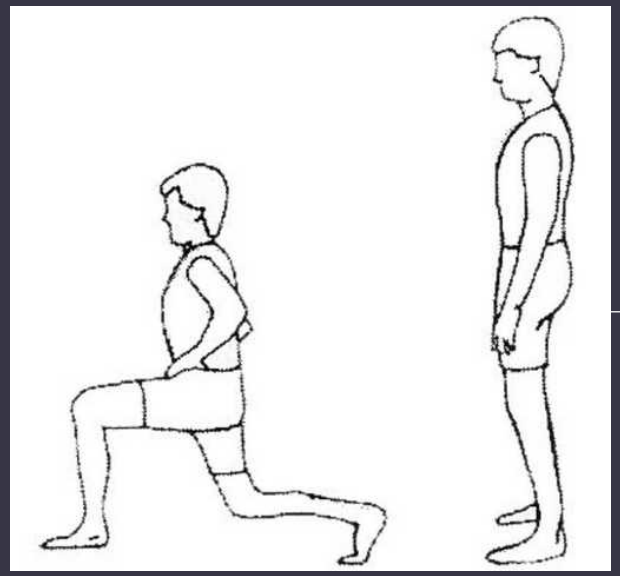

5LB

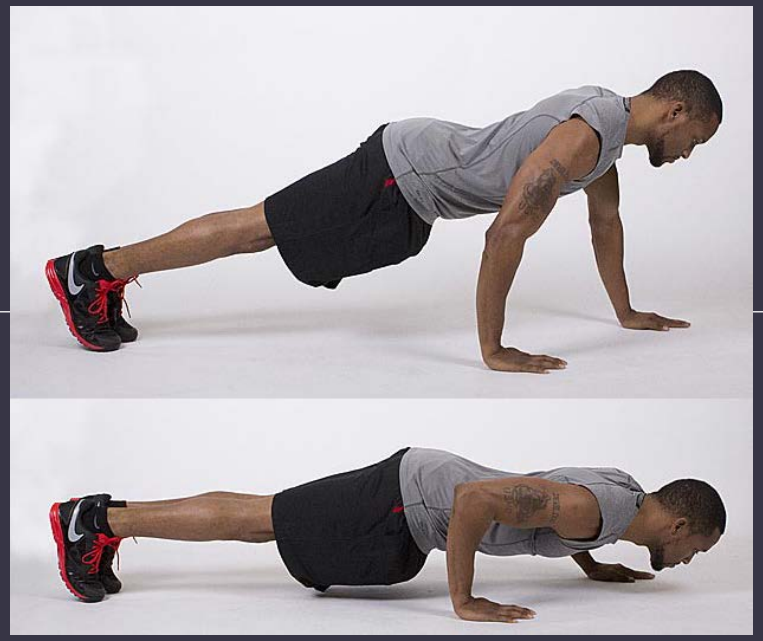

2

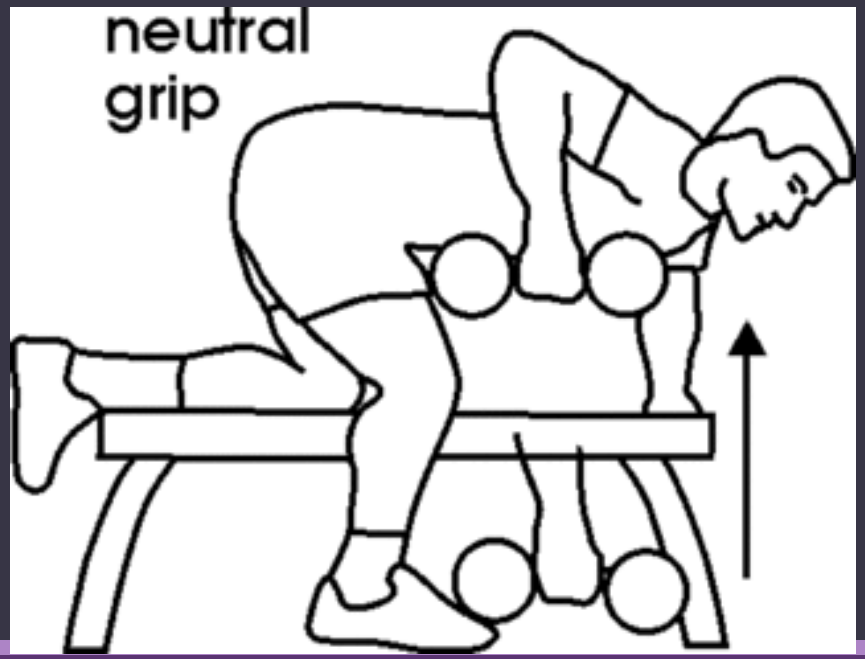

Squat Technique
Butt-back
Tight Arch
Chest Up
Knee In-line
with toe

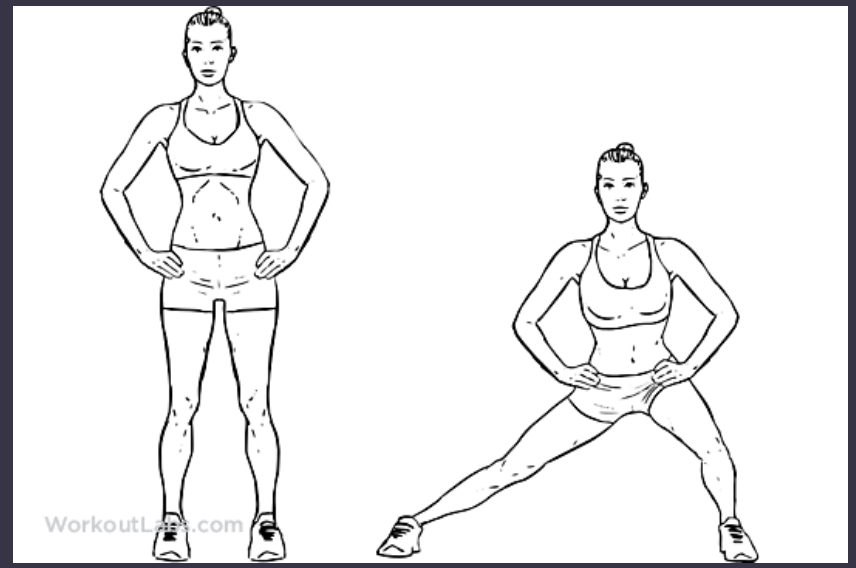

WACCES








neutral
grip


WorkoutLabs.com

So what? Resistance Exercise & Breast cancer

Exercise Group	No Resistance Exercise group
Maintained bone mineral density (Dobek)	Greater loss of bone mineral density (3%) (Dobek)
Increased lower body strength (Dobek)	Increased lower body strength (Dobek)
Less of a delay in starting chemotherapy (Courneya)	

So What? Resistance Exercise & Prostate Cancer

- Fewer Studies (10-15)

Exercise Group
No change in in bone mineral density (Gardner)
Increased upper body strength (Gardner)
Increased lower body strength (Gardner)
Increased lean body mass (Gardner)

General Conclusions

- ***These studies were done in very structured, supervised, almost "lab-like" settings***
- Resistance exercise increased upper body muscle strength by 7 kg (Strasser)
- Resistance exercise increased lower body muscle strength by 15 kg (Strasser)
- ***Higher intensity does not necessarily mean greater gain in strength*** *(Strasser)*

- Bone Mineral Density: Less is known but it appears to maintain or slow done loss of density

- See improvements with resistance exercise during and after cancer treatment
- Resistance Exercise is **SAFE** in Cancer Survivors

To consider

- Length of program

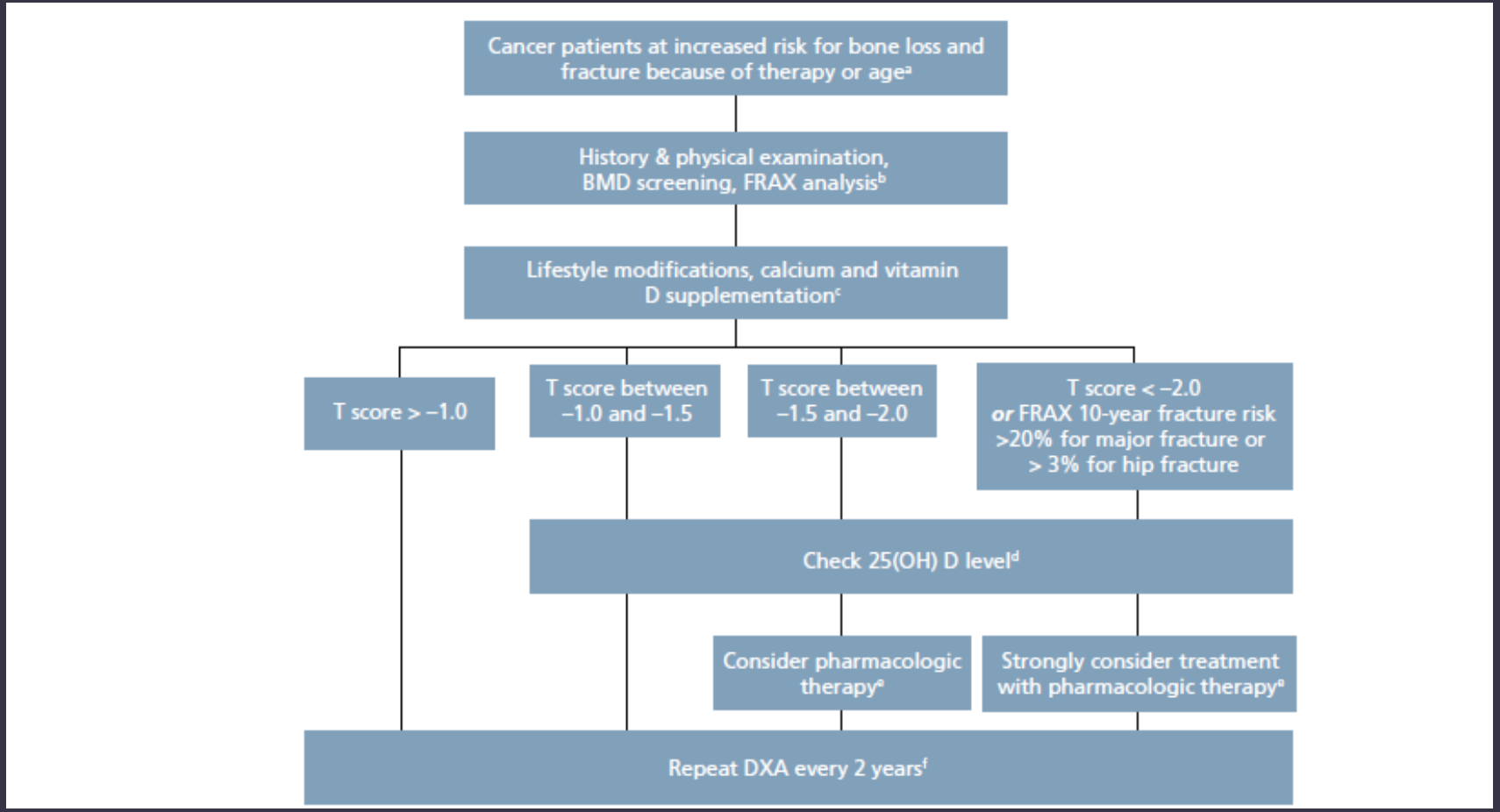
- Sustainability
  - Bone Mineral Density Changes may be maintained with less frequency and intensity
  - Muscle Strength maintenance requires regular frequency, maintained intensity

- **Zero training over a 6 month period → reverses bone and muscle improvements**

Questions to be answered

- Are the effects of resistance exercise long-lasting?
- How much is needed to enhance bone health?
- How does the effect vary across different cancers?
- Optimal timing during treatment course?

NCCN Guidelines: Bone Health Screening



ACSM Guidelines for Cancer Survivors: Resistance Exercise

Survivors=time of diagnosis

2 days a week. Moderate intensity

Post-Menopausal:

- 60-70% of RM
- 8-12 repetitions per set
- 1-3 sets

Exercise is Medicine

Exercise Prescription

- 2 Times per Week
  - Upper and Lower Body
- Intensity: 50-80% of Maximum Resistance
- 2-3 Sets of 8-12 Repetitions

Now What?

Talk to your Oncologist or Primary Care Physician

- Restrictions or Precautions

To think about

- Are you interested in it?
- Do you feel ready to incorporate into your life?
- Which barriers or factors prevent you from exercising?
  - Time
  - Knowledge
  - Comfort Level
  - Fatigue
  - Weakness
  - Pain

Physiatrist or PM&R Doctor

Cancer Certified Exercise Physiologist

Physical Therapist

Fitness Center

Resources

National Cancer Institute

American Cancer Society

National Institute on Aging: Exercise & Physical Activity

Local Resources in Chicago

Gilda's Club

RIC Fitness Center

Strength Daily Record

You can use this form to keep track of the strength exercises you do each day. Try to do strength exercises for all of your major muscle groups on 2 or more days a week for 30-minute sessions each, but don't exercise the same muscle group on any 2 days in a row. Record the number of repetitions and the amount of weight you use.

		Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday	
Week of _____		Lbs.	Reps	Lbs.	Reps	Lbs.	Reps	Lbs.	Reps	Lbs.	Reps	Lbs.	Reps	Lbs.	Reps
Upper-Body	Hand Grip														
	Wrist Curl														
	Overhead Arm Raise														
	Front Arm Raise														
	Side Arm Raise														
	Arm Curl														
	Seated Row														
	Wall Push-Up														
	Elbow Extension														
	Chair Dip														
Lower-Body	Back Leg Raise														
	Side Leg Raise														
	Knee Curl														
	Leg Straightening														
	Chair Stand														
	Toe Stand														

Monthly Progress Test

Take the tests on page 92 monthly, record your scores, and watch your progress.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Endurance — Pick a fixed course, such as the distance from your house to the corner, and see how long it takes you to walk that far.												
Upper-Body Strength — Count the number of arm curls you can safely do in 2 minutes.												
Lower-Body Strength — Count the number of chair stands you can safely do in 2 minutes.												
Balance — Time yourself as you stand on one foot, without support, for as long as possible. Repeat with the other foot.												
Flexibility — Note how far you can reach until you feel a stretch.												

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