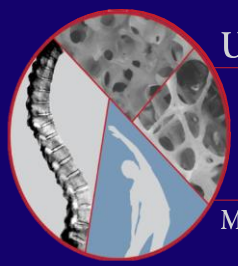
“Dysmobility Syndrome”
The Future of Fracture Risk Reduction

Canadian Musculoskeletal Conference, October 15, 2016

Neil Binkley, M.D.
University of Wisconsin School of Medicine and Public Health
Madison, WI, USA



UNIVERSITY OF WISCONSIN
Osteoporosis Clinical Research Program
MADISON, WI

Disclosures

- Research support
  - Amgen
  - Eli Lilly
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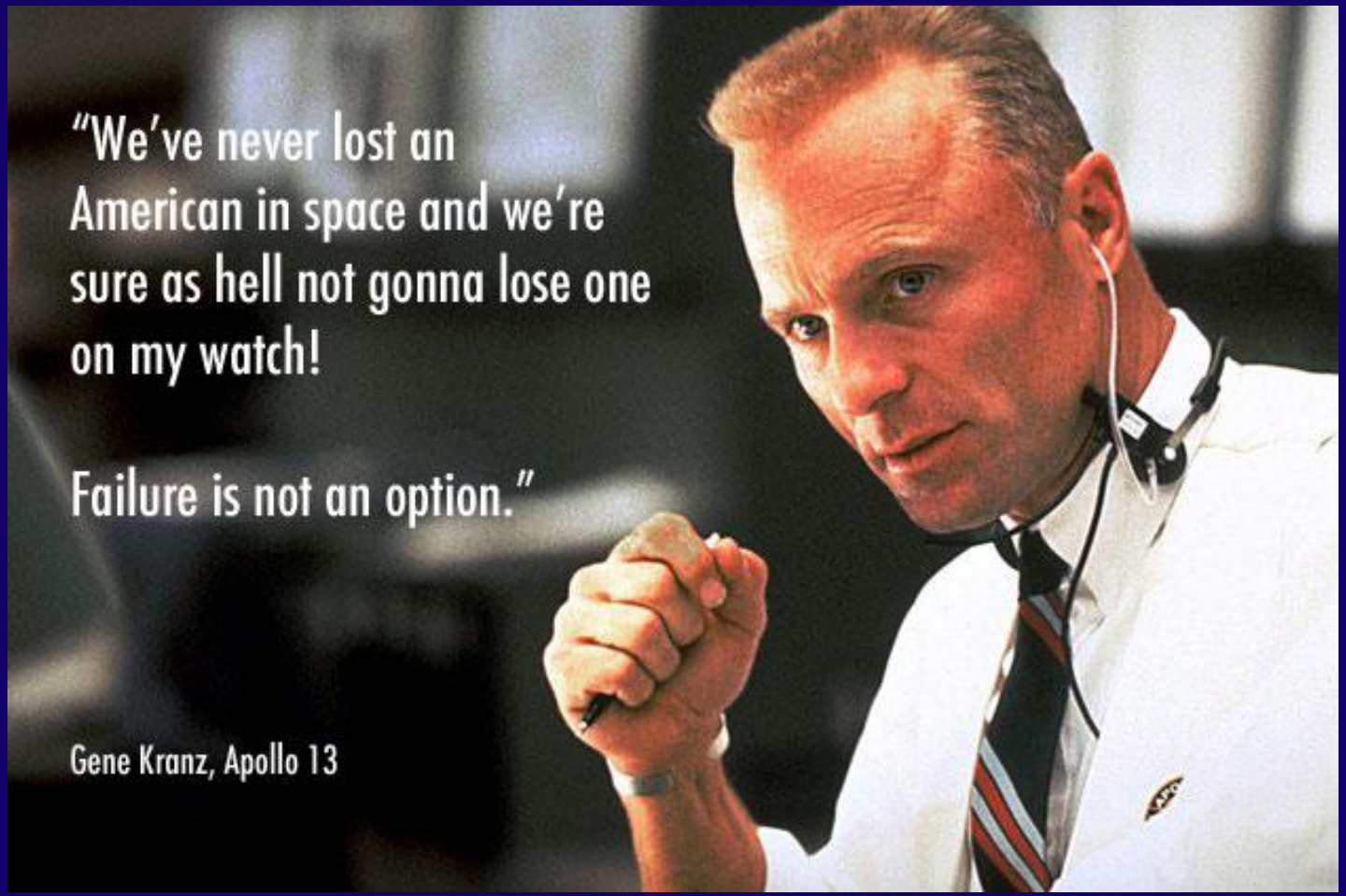
  - Merck
  - Novartis
- Advisory boards
  - Amgen
  - Astellas
  - Bristol Myers Squibb
  - Eli Lilly
  - Merck
  - Nestle
  - Quidel

- Much of this is my opinion
- Noted by orange text

Why Do You Treat “Osteoporosis?”

Fracture is What’s Important



On Our Watch, We Have Failed to Prevent Fractures

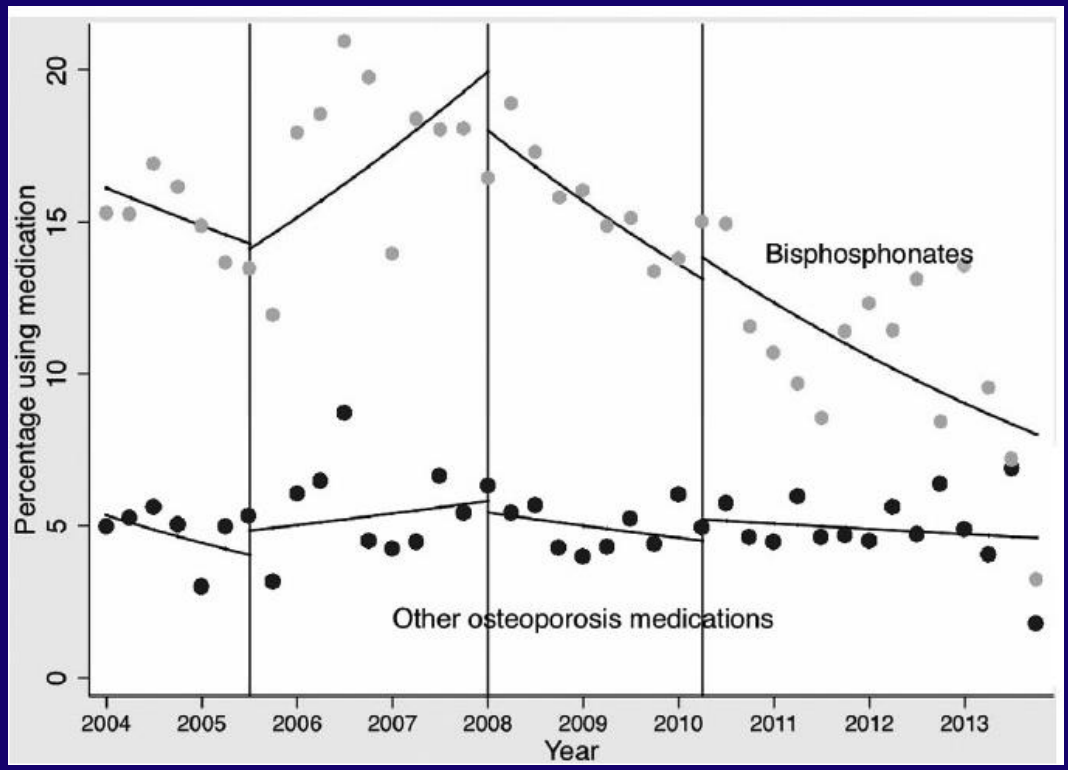
SHORT REPORT

JBMR®

Impact of the U.S. Food and Drug Administration's Safety-Related Announcements on the Use of Bisphosphonates After Hip Fracture

Seoyoung C Kim,[1,2] Dae Hyun Kim,[1,3] Helen Mogun,[1] Wesley Eddings,[1] Jennifer M Polinski,[1,4] Jessica M Franklin,[1] and Daniel H Solomon[1,2]

- United HealthCare data; Proportion of patients in each quarter (2004-2013) who received a BP or other osteoporosis med after hip fx
- n = 22,000+
- Average age 72
- 68% female



"…these results highlight the need to weigh benefits versus harms of bisphosphonates and to improve the communication of drug safety information with both clinicians and patients."

Kim, et. al., J Bone Min Res, 2016 DOI: 10.1002/jbmr.2832

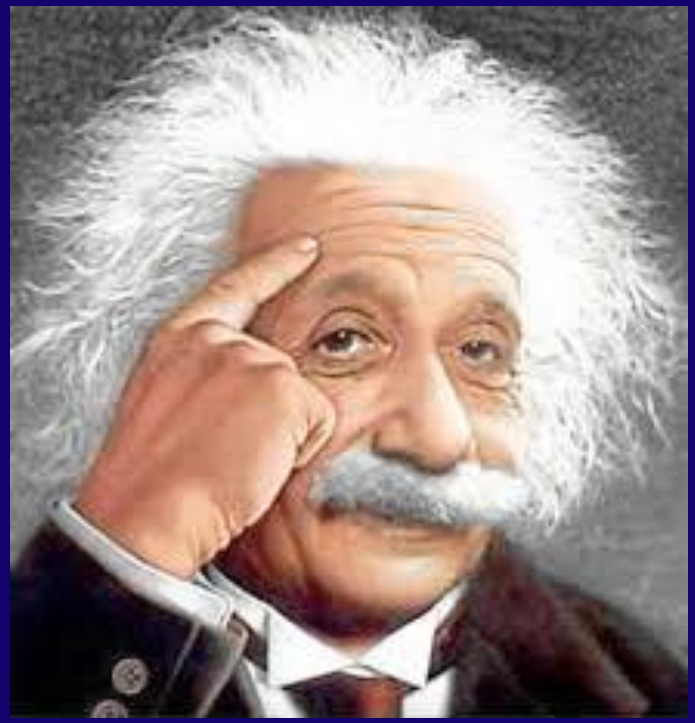
EDITORIAL

JBMR®

A Crisis in the Treatment of Osteoporosis

"To draw an analogy from another field, in 2016 it is virtually inconceivable that a patient discharged from the hospital following a myocardial infarction would not be prescribed a full armamentarium of drugs for secondary cardiovascular prevention (eg, a statin, antihypertensive, and others). ***Yet what is inconceivable for a patient following a myocardial infarction is the norm in the vast majority of patients discharged from hospital after a hip fracture."***

Khosla and Shane, J Bone Min Res, 2016 DOI: 10.1002/jbmr.2888



“Insanity: doing the same thing over and over again and expecting different results.”

Albert Einstein

A Different Approach to “Osteoporosis” is Needed

Osteoporos Int
DOI 10.1007/s00198-013-2427-1

OPINION PAPER

What's in a name revisited: should osteoporosis and sarcopenia be considered components of "dysmobility syndrome?"

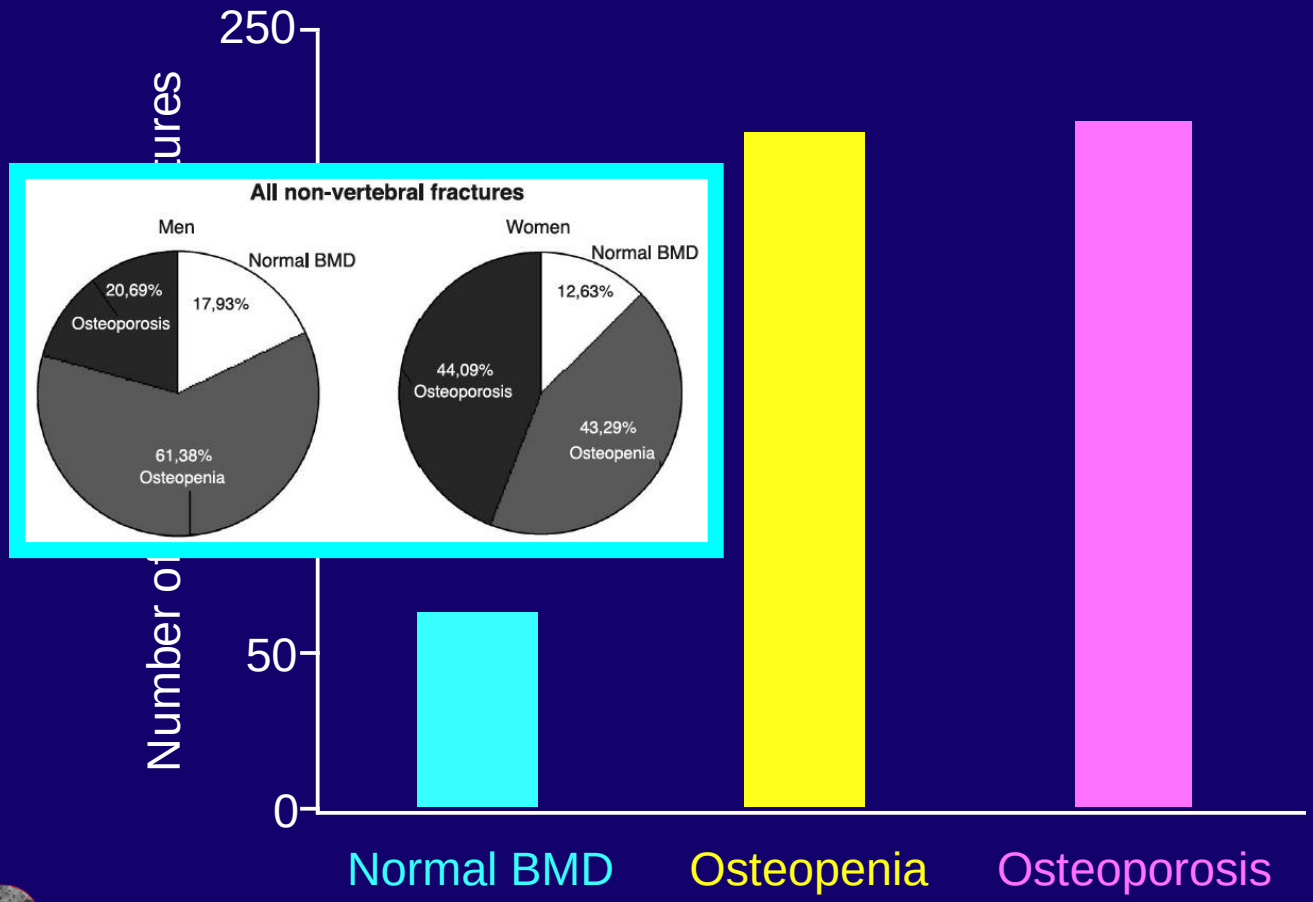
N. Binkley · D. Krueger · B. Buehring

"Rather than focusing on a single component, i.e., osteoporosis, sarcopenia, or obesity, an opportunity exists to combine clinical factors thereby allowing improved identification of older adults at risk… Such a combination could be termed dysmobility syndrome."

Binkley, et. al, Osteoporos Int, 2013: 24:2955-2959

Focusing Only on Bone Identifies Less than Half of Women Who Will Fracture

Only 44% of women (and 21% of men) who sustain non-vertebral fractures have “osteoporosis” by BMD



5794 participants in the Rotterdam study;
Mean follow-up 6.8 yrs
FN BMD at baseline

(Female data shown here)

Adapted from Schuit, Bone. 2004;34:195-202

Despite the Fact That Approximately 1/6 Fragility Fractures Occur in People With NORMAL BMD….
Our Guidelines Call this "Osteoporosis"

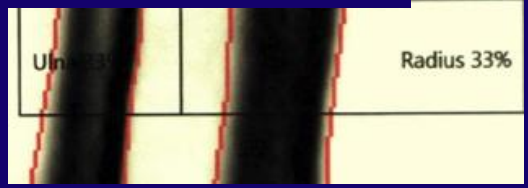
"The diagnosis of osteoporosis is established by measurement of BMD or by the occurrence of adulthood hip or vertebral fracture in the absence of major trauma (such as a motor vehicle accident or multiple story fall)."

NOF Clinician's Guide: 2014

Does This Man Have Osteoporosis?

History of fall with scalp laceration 2 months prior
Severe knee OA, unable to arise from chair without using his arms
Slipped in his garage with left hip fracture at age 66; BMI = 34.9

We Need to Think About More Than Just the Bones and Focus on Fracture

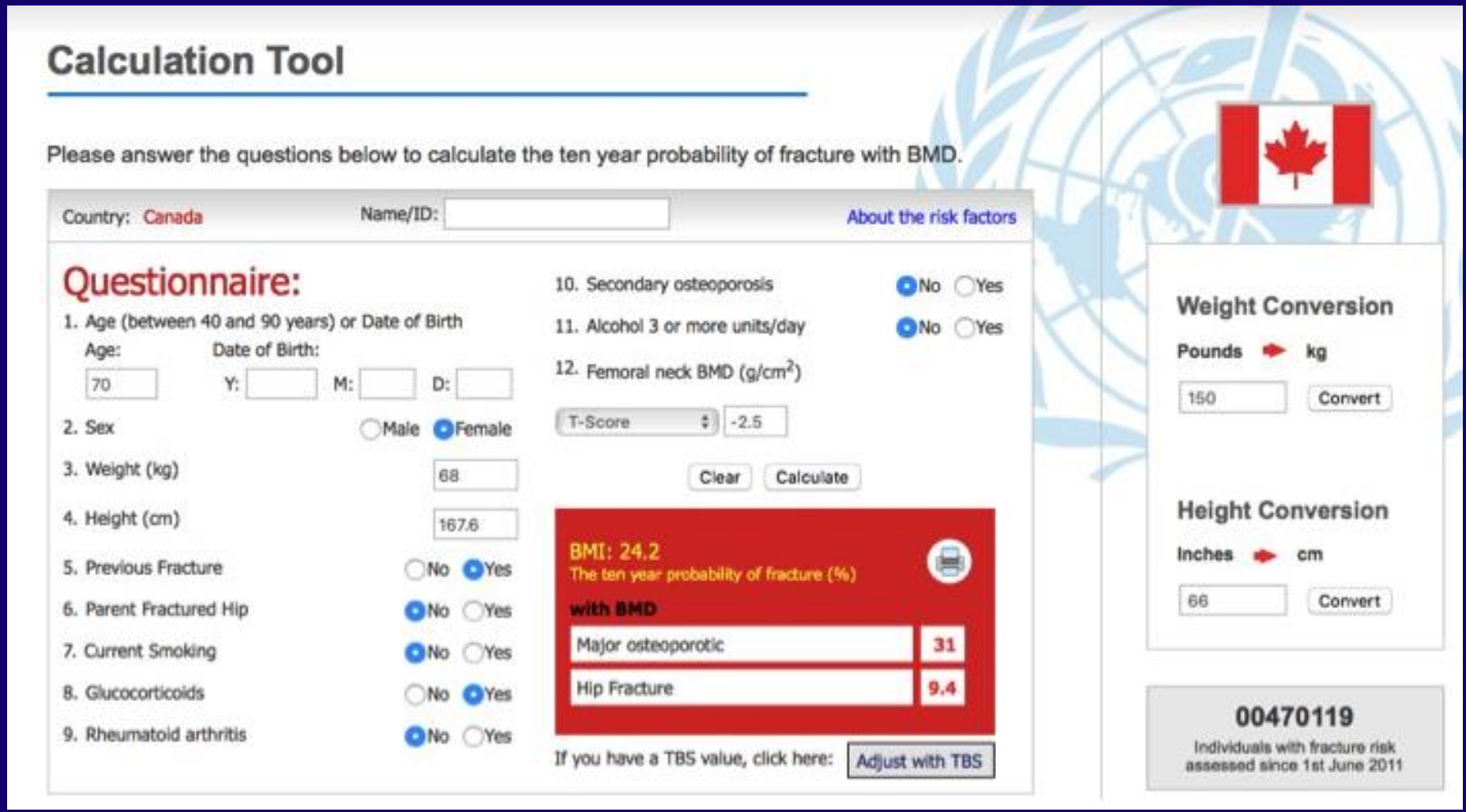


L1-L4 1.989 g/cm^2
T-score = +6.4

FN 1.190 g/cm^2; T-score = +0.9
TF 1.241 g/cm^2; T-score = +1.0

.3 Radius 1.189 g/cm^2
T-score = +1.9

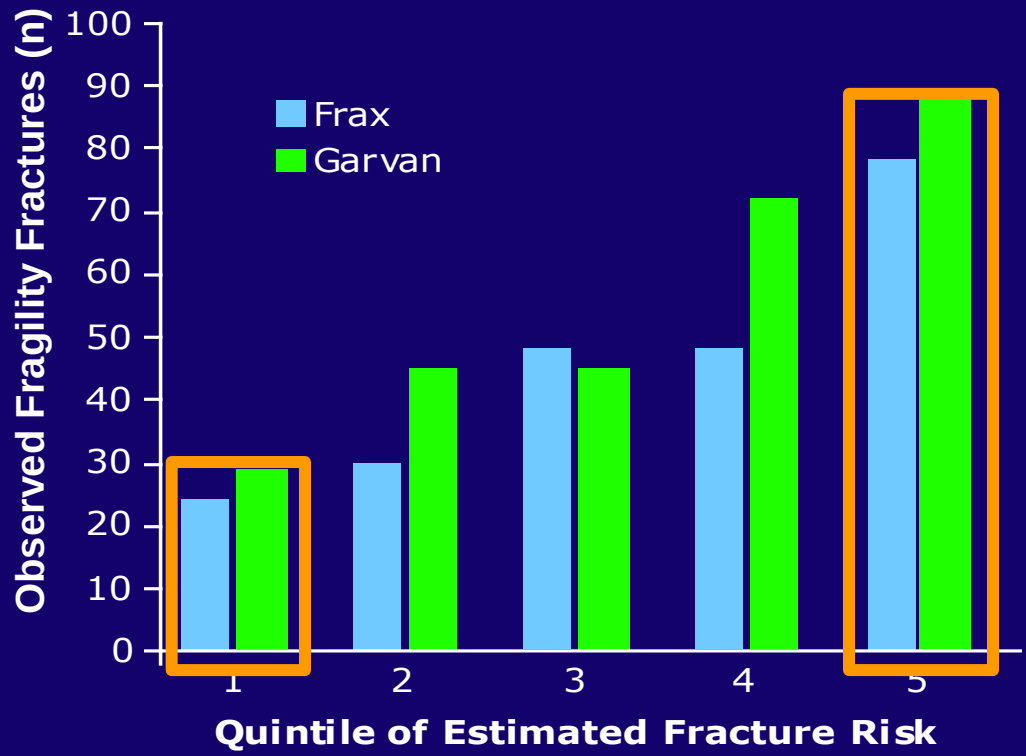
Fracture Risk Calculators, e.g. FRAX, Are An Important Step in the Right Direction



www.shef.ac.uk/FRAX

While an Improvement, Fracture Calculators are An Imperfect Estimate of Risk

- 1422 healthy post-menopausal women
- Followed ~ 10 years
- Fracture risk estimated using Garvan and FRAX calculators with BMD measurement
- Quintiles by risk calculations, n ~ 245



Bolland MJ et. al, JBMR 26:422-427, 2011

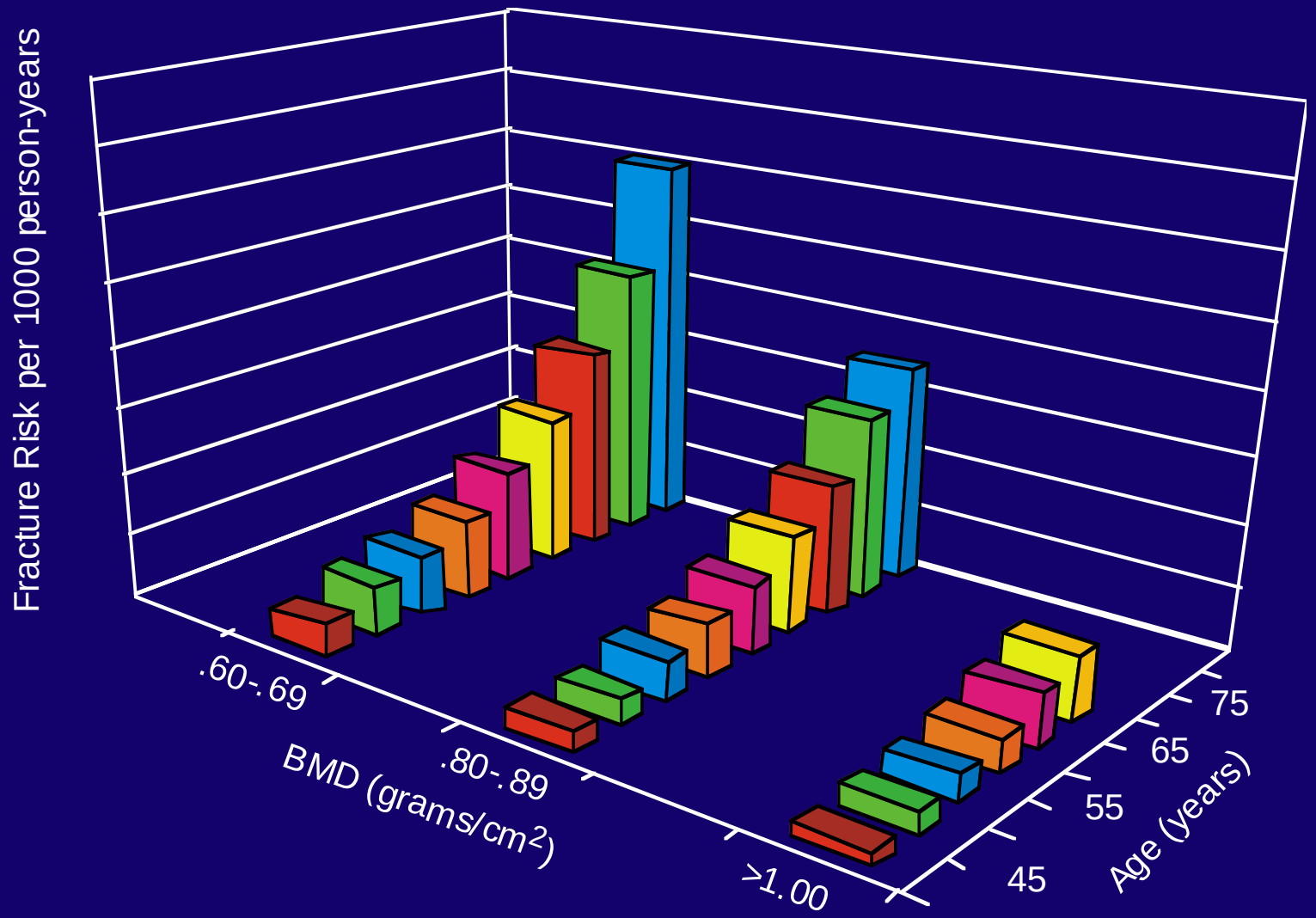
"The FRAX® assessment does not tell you who to treat which remains a matter of clinical judgement."

www.shef.ac.uk/FRAX

It is Clear That Low Bone Density, i.e., Osteoporosis is Only Part of the Clinical Constellation that Contributes to What is Currently Called "Osteoporosis-Related" Fracture

Think "Beyond the Bone"

We Know That "Age" Powerfully Predicts Fracture



Adapted from Hui, JCI 1988; 81:1804-1809

Chronologic Age is a Poor Predictor of Functional Status

There must be a better way to estimate a patient's fracture risk than simply using age….

Why Do Fractures Increase With Age?

- Multiple reasons….
- Falls become common with advancing age
  - ~1/3rd of adults age 65 and >40% over age 75 fall each year
- Many osteoporosis-related fractures due to falls
  - Over 90% of hip fractures due to falls

Rizzoli, et. al, Curr Med Res Opin, 25:2373-2387, 2009
Guideline for falls prevention; AGS/BGS, JAGS 49:664-672, 2001

Prediction of osteoporotic fractures by postural instability and bone density

Tuan Nguyen, Philip Sambrook, Paul Kelly, Graeme Jones, Stephen Lord, Judith Freund, John Eisman

Does Age Truly Affect Fracture Risk?

- Dubbo osteoporosis study; 3851 men and women age 60+
- All fractures x-ray confirmed
- Measured BMD, body sway and quad strength

"Subjects with fracture have significantly higher body sway and lower muscle strength than subjects without fracture and, more importantly, ***that age alone has NO influence on the probability of fracture****."*

Nguyen, et. al., BMJ, 1993, 307:1111-1115

Falls Risk Factors Predict Hip Fracture Independent of BMD

- These risk factors include
  - History of falls
  - Self reported health
  - Self reported physical activity
  - Slower walking speed

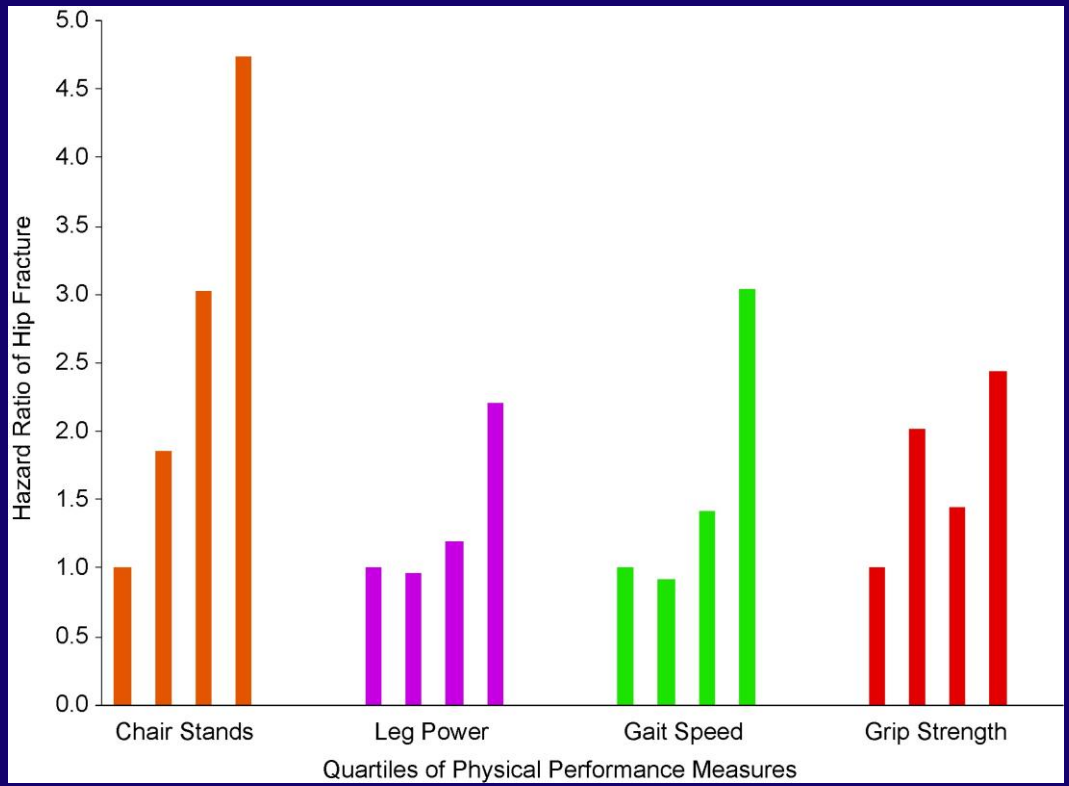
} Indicators of Impaired Function

Sarcopenia/Impaired Function Is What Actually Predicts Fracture

Masud & Morris. 2001, Age & Ageing 30;Suppl 4:3-7
Geusens et. al., 2010, Therap Advances Musculoskel Dis 2:63-67

Impaired Physical Performance Increases Hip Fracture Risk

Evaluated the association of physical performance and hip fracture risk in MrOS;
5995 men age 65+



"Poor physical function is independently associated with an increased risk of hip fracture in older men."

Adapted from Cawthon, et. al., J Bone Miner Res, 2008, 23:1037-1044

Sarcopenia: the Age-related Gradual Loss of Muscle mass, Strength and Function

Sarc for flesh (muscle), penia for deficiency

Term coined in 1989;
more recently defined as: “The age-associated loss of skeletal muscle mass and function…. a complex syndrome associated with muscle mass loss alone or in conjunction with increased fat mass.”

Fielding, et. al, J Am Med Dir Assoc 2011; 12: 249-256

There is No Single Consensus Definition of Sarcopenia at This Time

All current definitions include a measure of lean mass and measure(s) of physical function

European Working Group	ALM/ht^2 M: 7.26 kg/m^2 F: 5.45 kg/m^2	Gait Speed: ≤ 0.8 m/s	Grip Strength M: < 30 kg F: < 20 kg
International Working Group	ALM/ht^2 M: ≤ 7.23 kg/m^2 F: ≤ 5.67 kg/m^2	Gait Speed: < 1.0 m/s	
Foundation of the NIH	ALM/BMI M: < 0.789 F: < 0.512		Grip Strength M: < 26 kg F: < 16 kg

Cruz-Jentoft, Age Aging, 2010, 39:412-423
Fielding, JAMDA, 2011, 12:249-256
Studenski, J Gerontol A Biol Sci Med Sci, 2014, 69:547–558

Consequences of Sarcopenia Include:

- Impaired ability to perform activities of daily living/functional impairment
- Falls
- Fractures
- Reduced quality of life
- Healthcare costs
- Death

Fielding, et. al, J Am Med Dir Assoc 2011; 12: 249-256

"Impaired muscle strength is highly predictive of incident disability and all-cause mortality in the elderly."

Cesari and Pahor, J Nutr Health Aging, 2008; 12:470-478, 2008

Osteoporosis Pathogenesis is Multifactorial

- Hormonal declines
  - GH/IGF-1, testosterone, estrogen
- Increased inflammation
  - IL-6, TNF-alpha, etc, etc.
- Malnutrition
  - Protein, vitamin D
- Sedentariness/Diseases leading to decreased use
- Toxin exposure
- Neuronal loss
- Reduced bone "quality" expressed ultimately as reduced function
  - Changes in structure, fat and connective tissue

Are osteoporosis and sarcopenia the same process?

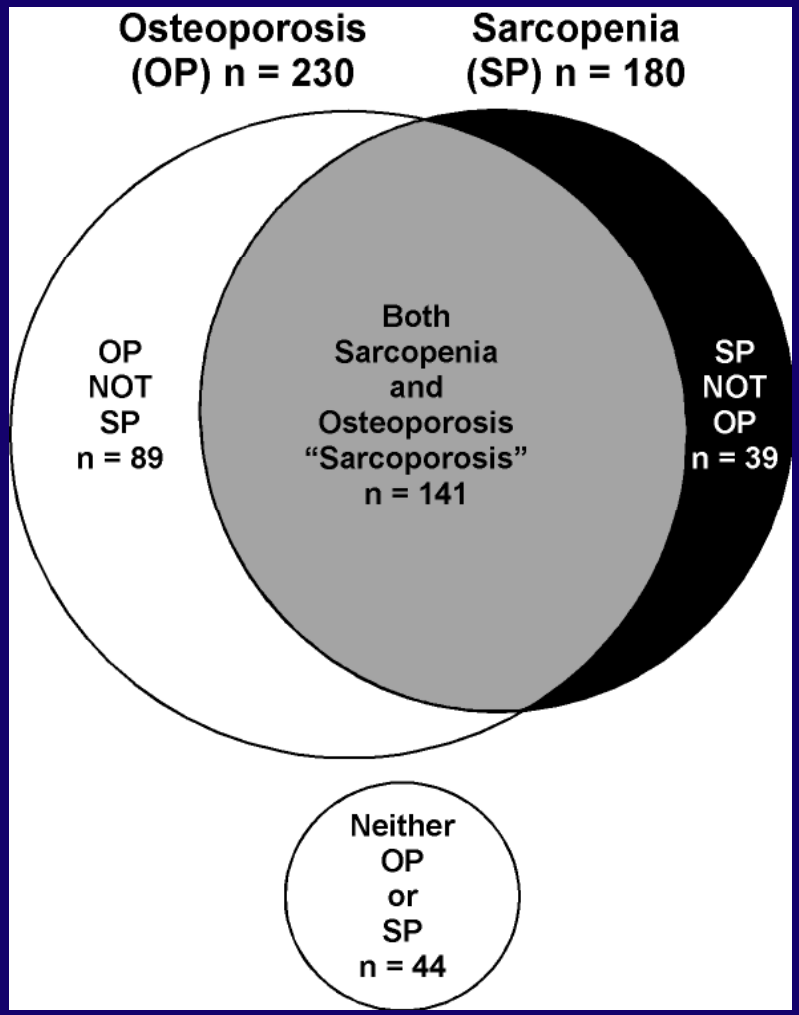
With the disease being fracture?

Jensen, J Parenter Enteral Nutr, 32;656-659, 2008

Women With Hip Fracture Often Have Sarcopenia and Osteoporosis by DXA

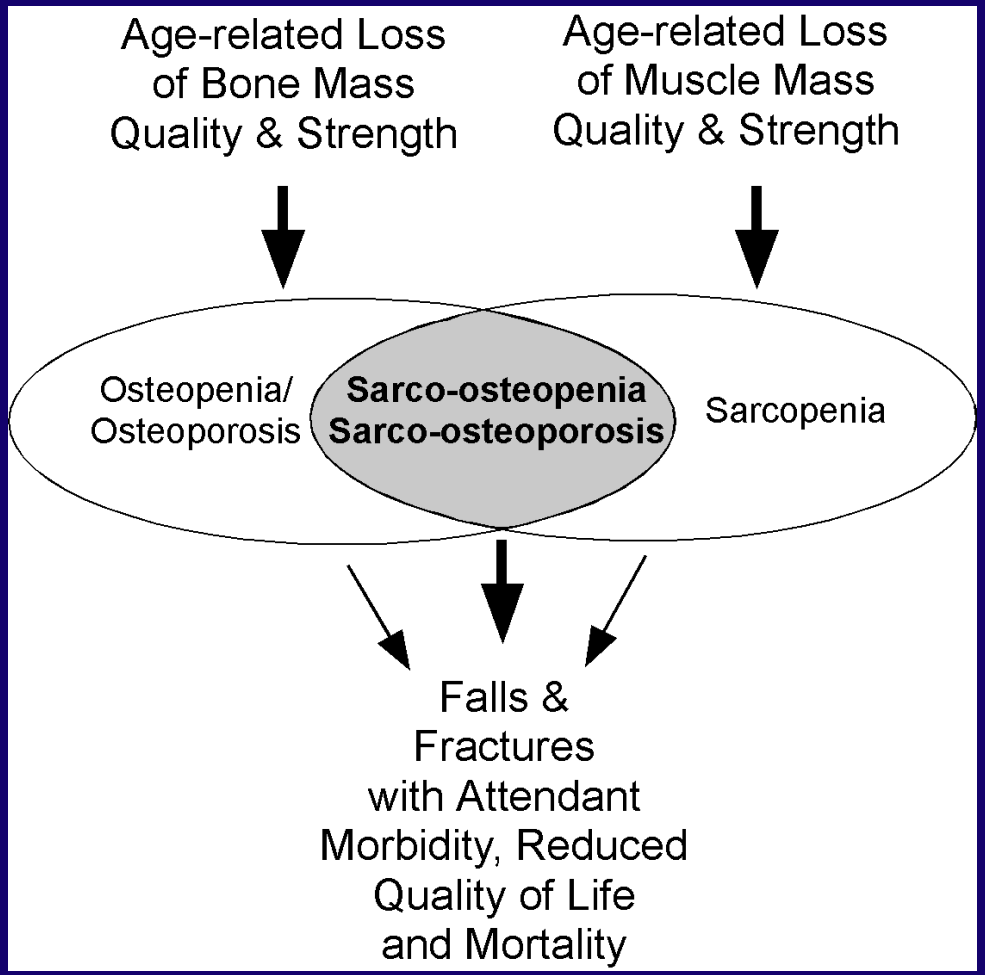
313 white women with
low-trauma hip fracture
Sarcopenia; ALM/Ht^2 < 5.45 kg/m^2
Osteoporosis; Femur T-score ≤ -2.5

"We show.. A significant association between sarcopenia and osteoporosis in a large sample of hip-fracture women. ***Data supports… preventive strategies and treatment options for sarcopenia and osteoporosis targeting both bone and muscle…"***



Adapted from Di Monaco, et. al, Arch Gerontol Geriatr, 52; 71-71, 2011

Perhaps The Diagnosis Should be "Sarco-osteoporosis"

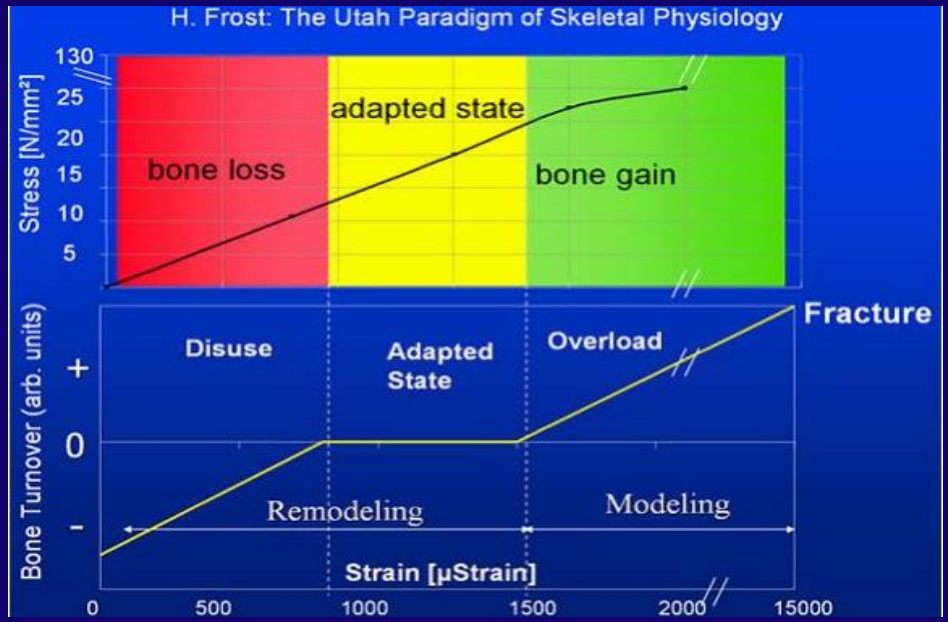


Binkley and Buehring, J Clin Densitom, 12;413-416, 2009

Interdependency of Bone and Muscle is Not a New Concept

The “mechanostat” model of bone regulation was described in 1960 by Dr. Frost in his “Utah Paradigm”

Holds that bone growth and loss is stimulated by local mechanical elastic deformation of bone due to muscle force.



More muscle, more strain, more bone
Less muscle, less strain, less bone

Frost H.M., *The Utah Paradigm of Skeletal Physiology Vols 1 and 2*, ISMNI, 1960

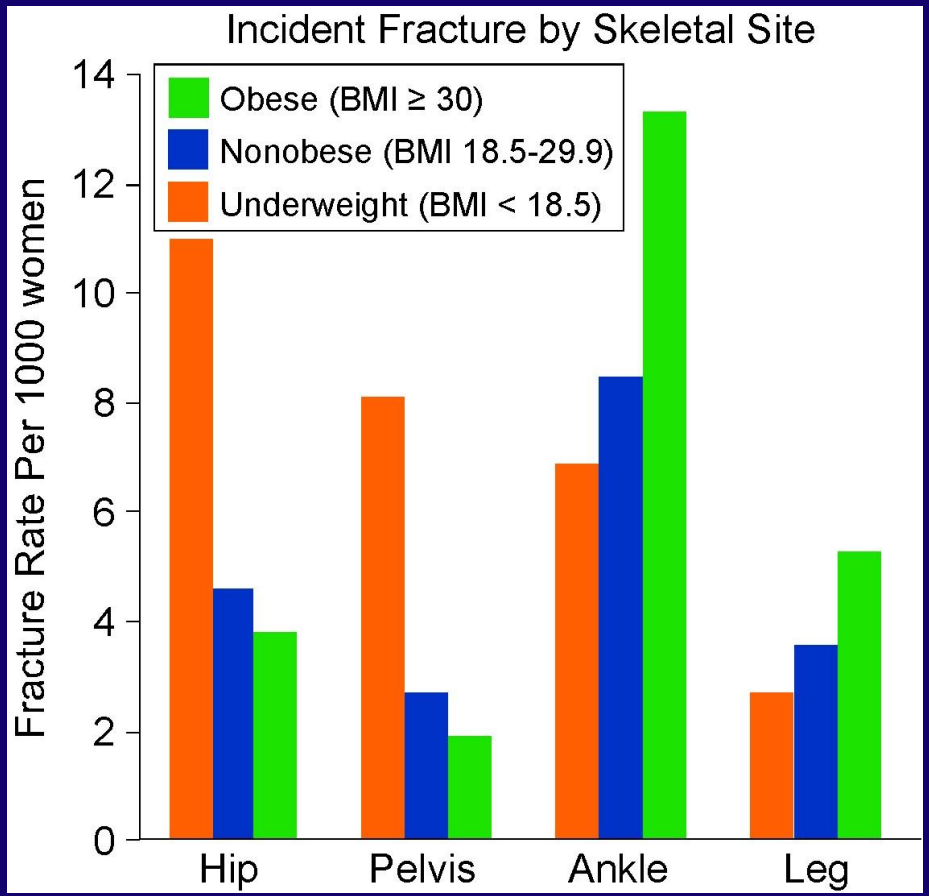
Frost, HM . J Bone Miner Metab. 2000; 18:305-316

Even Bone + Muscle Isn't the Whole Story

Obesity Increases Fracture Risk

Global Longitudinal Study
60,393 women age ≥ 55
Followed for 2 years

"Our results demonstrate that obesity is not protective against fracture in postmenopausal women and is associated with increased risk of ankle and upper leg fractures."



Compston, et al. Am J Med. 2011, 124:1043-1050

Sarcopenic Obesity: The combination of low muscle mass and function (sarcopenia) and high fat mass (obesity) that adversely affects health and independence

Kemmler, et al., Osteoporos Int, 2016; 27:275-281

Concept of “Sarcopenic Obesity”

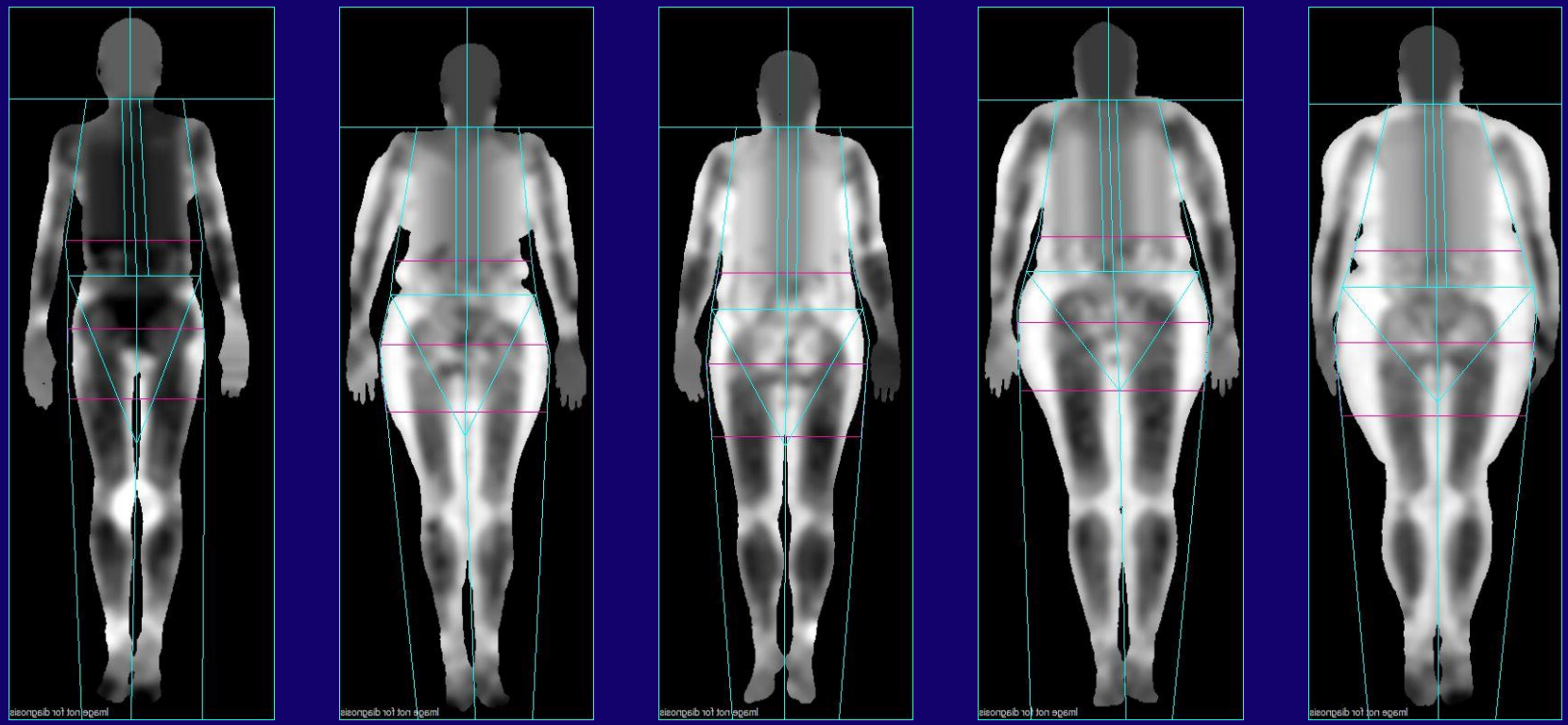
FNIH group suggested this be captured by ALM/BMI

Change in ALM/BMI as Fat Mass Increases

Assume ALM = 16 kg (~ average for an 80 year old women)

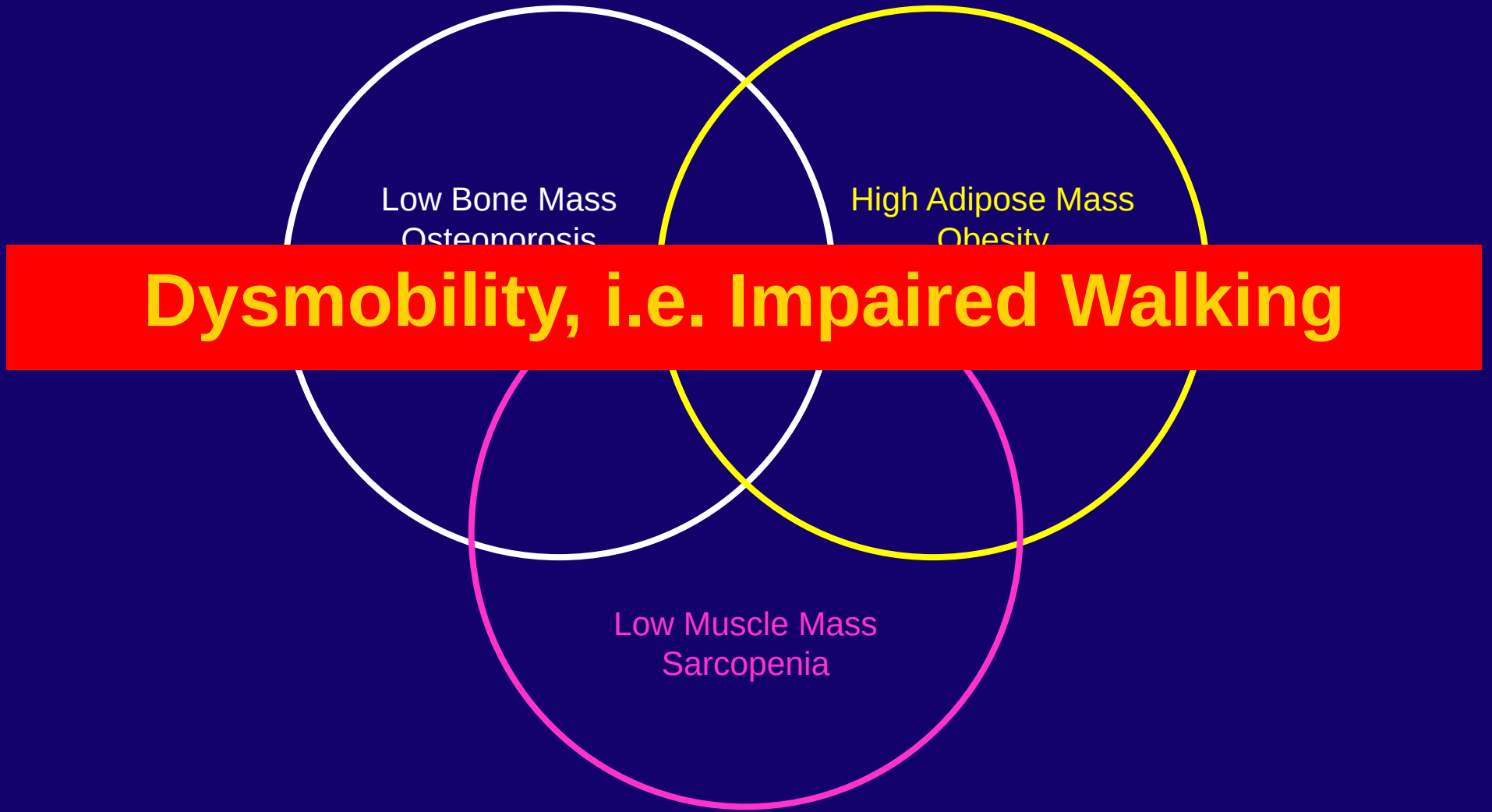
Low < 0.512 per FNIH

BMI	20.0	23.7	27.6	32.1	36.9
ALM/BMI	0.800	0.675	0.580	0.498	0.434



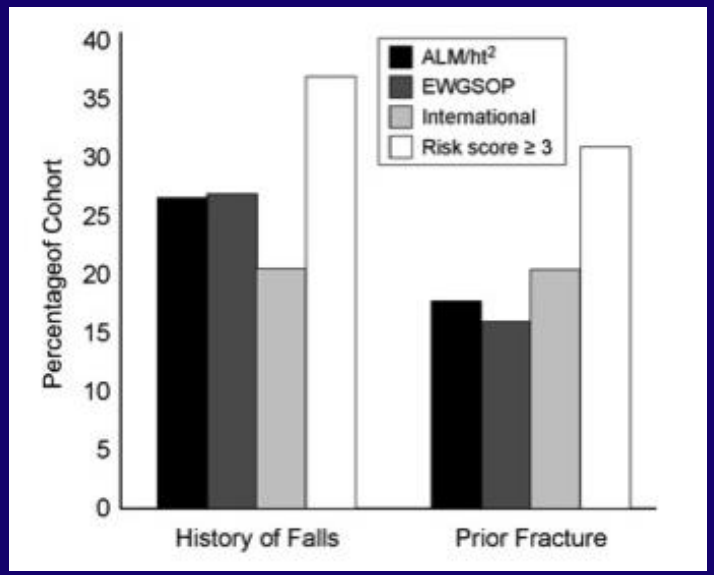
Too Little Bone, Too Little Muscle and Too Much Fat is Bad…

Should the Diagnosis be “Osteo-Sarcobesity?”



A Potential Score-Based Approach to Diagnose Poor Musculoskeletal Health: Dysmobility Syndrome

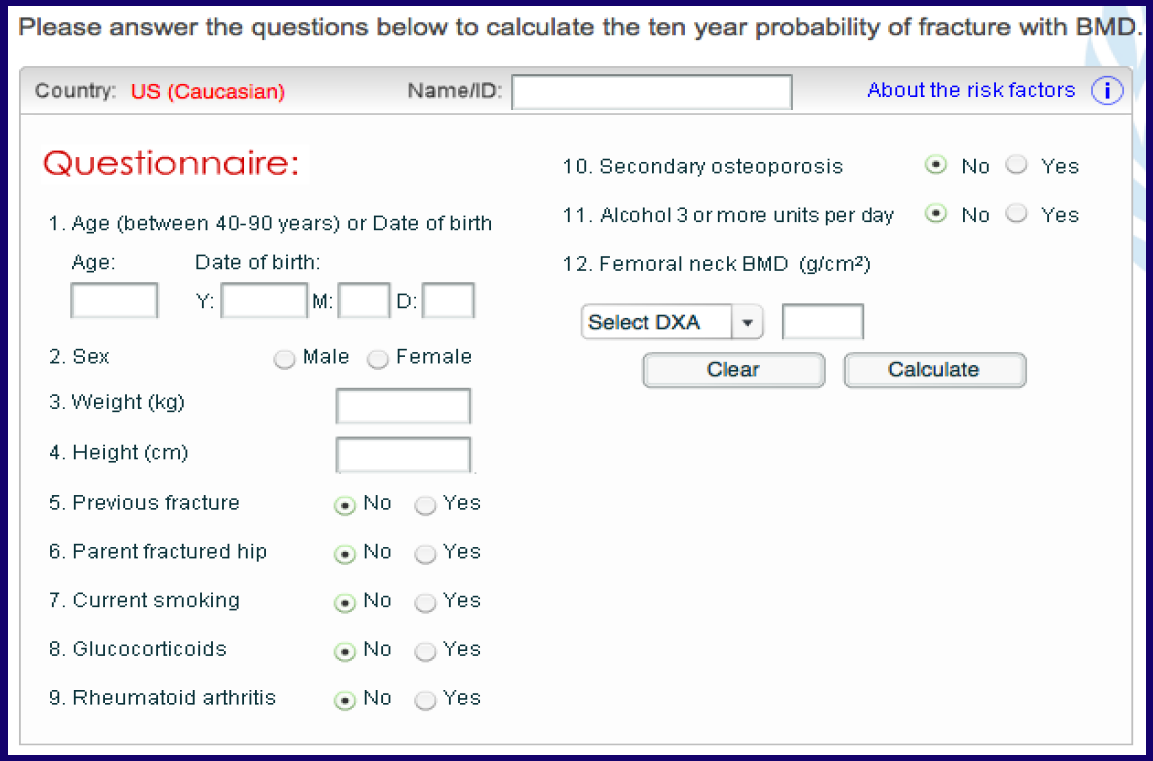
- Risk factors were arbitrarily selected:
  - Low Appendicular lean mass / height^2
  - High percent body fat
  - Osteoporosis based on BMD T-score ≤ -2.5
  - Low grip strength
  - Slow gait speed
  - History of ≥ 1 fall in last 12 months



- 1 point per risk factor for a total possible score of 6
- Dysmobility syndrome was defined by a score of ≥ 3

Binkley, Osteoporos Int. 2013, 24:2955-9

Combining Clinical Information for Risk Calculation and Diagnostic Classification Criteria is NOT a New Idea



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

Country: US (Caucasian) Name/ID: About the risk factors

Questionnaire:

1. Age (between 40-90 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 per day ● No ○ Yes
12. Femoral neck BMD (g/cm²)

Select DXA | Clear | Calculate

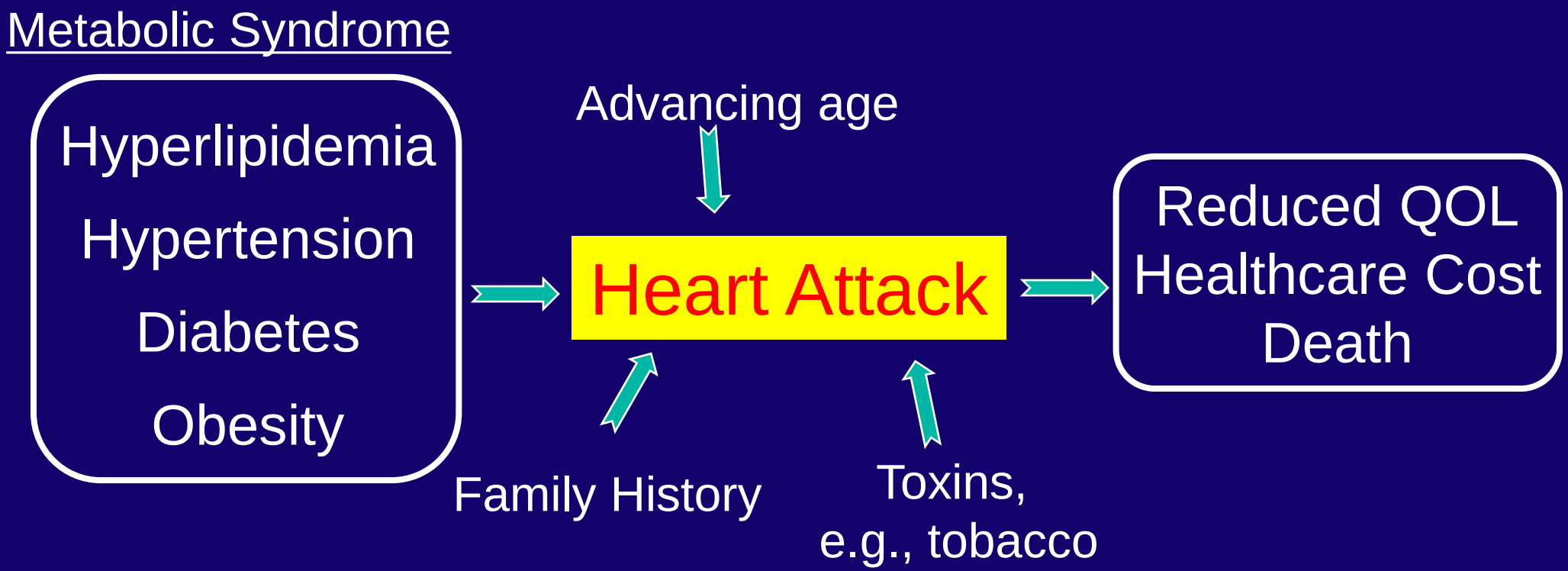
JOINT DISTRIBUTION (0-5)	
1 large joint	0
2-10 large joints	1
1-3 small joints (large joints not counted)	2
4-10 small joints (large joints not counted)	3
>10 joints (at least one small joint)	5
SEROLOGY (0-3)	
Negative RF AND negative ACPA	0
Low positive RF OR low positive ACPA	2
High positive RF OR high positive ACPA	3
SYMPTOM DURATION (0-1)	
<6 weeks	0
≥6 weeks	1
ACUTE PHASE REACTANTS (0-1)	
Normal CRP AND normal ESR	0
Abnormal CRP OR abnormal ESR	1

FRAX® calculator www.shef.ac.uk/FRAX/

Aletaha, Arthritis Rheum. 2010 Sep;62(9):2569-81

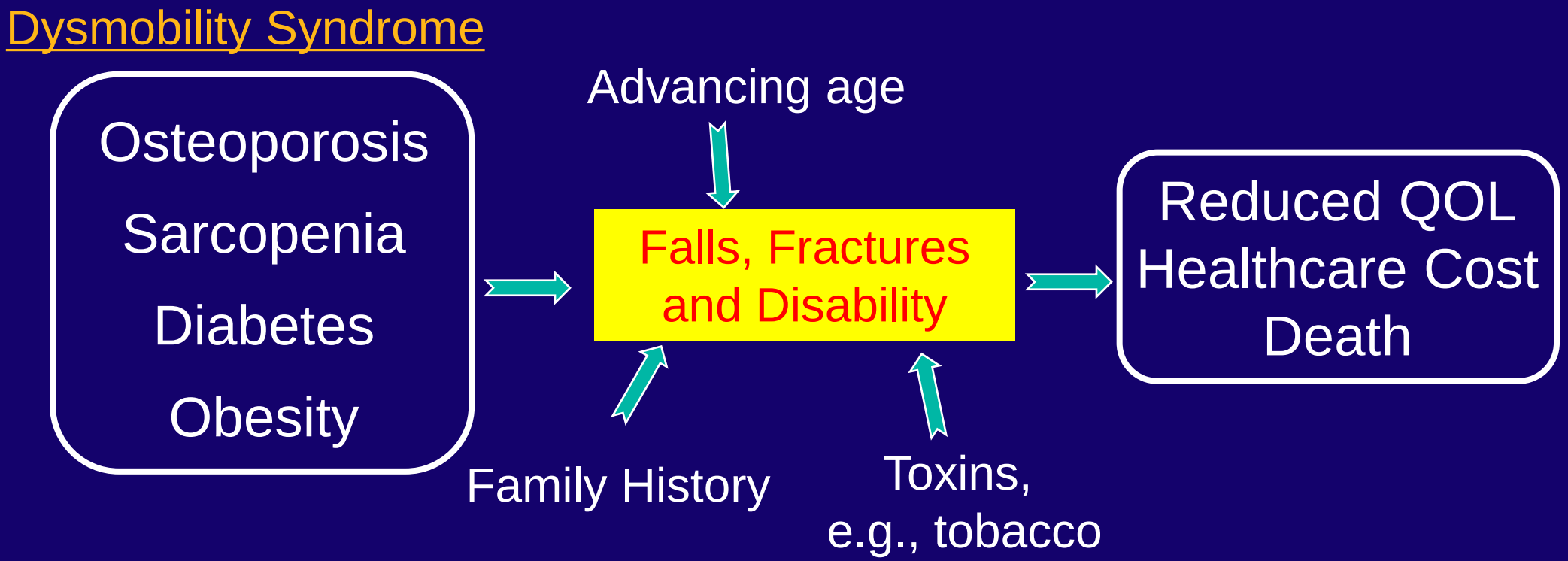
Consider the Heart Attack Analogy

Treatment is Directed at Various Conditions to Reduce Risk
For a Potentially Catastrophic Outcome



The Same Approach Makes Sense for Musculoskeletal Health

Treatment Should be Directed at Various Conditions to Reduce Risk For a Potentially Catastrophic Outcome



Is There Any Evidence That Dysmobility Syndrome is Linked to Adverse Health Outcomes?

Dysmobility syndrome and mortality risk in US men and women age 50 years and older

A. C. Looker

- National Health and Nutrition Examination Survey (NHANES) 1999-2002 Dataset
- NHANES data was linked to National Death Index
- Dysmobility defined as 3 or more of high body fat, osteoporosis, low muscle mass, low muscle strength, slow gait or falling risk
- Adapted the originally proposed risk factors
  - Knee strength was used instead of grip strength
  - Balance problems instead of history of falls

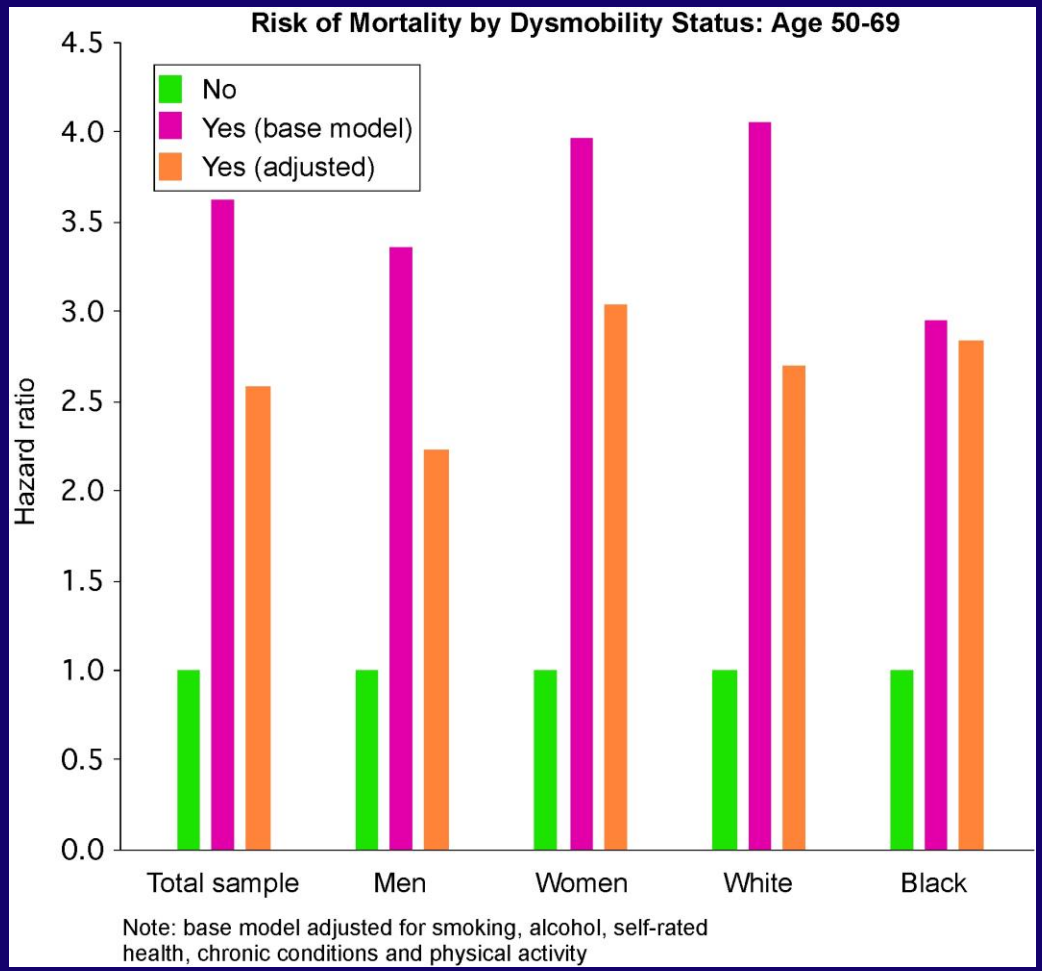
Looker A, Osteoporos Int 2015; 26:93-102

Dysmobility syndrome and mortality risk in US men and women age 50 years and older

A. C. Looker

- NHANES 1999-2002 data
- (n = 2975) assessed relationship between dysmobility and mortality in adults age 50+

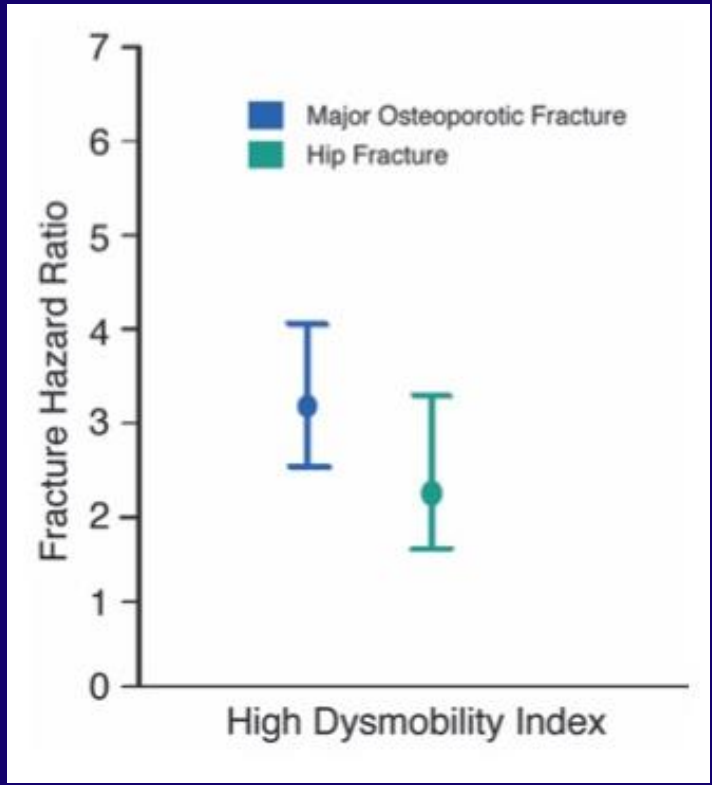
"Dysmobility was associated with increased mortality risk"
"Additional work is needed to evaluate relationship with other outcomes"



Adapted from Looker A, Osteoporos Int 2015; 26:93-102

Dysmobility Syndrome Predicts Fractures Independent of FRAX Score

- 5,826 men in the MrOS cohort followed for a mean of 6.2 years
- ~7% had dysmobility defined as ≥ 3 of:
  - Low BMD
  - High fat mass
  - Slow gait speed
  - Low grip strength
  - History of fall within past year
  - Low ALM/ht^2



Dysmobility syndrome is an independent predictor of fracture, even when adjusted for FRAX score

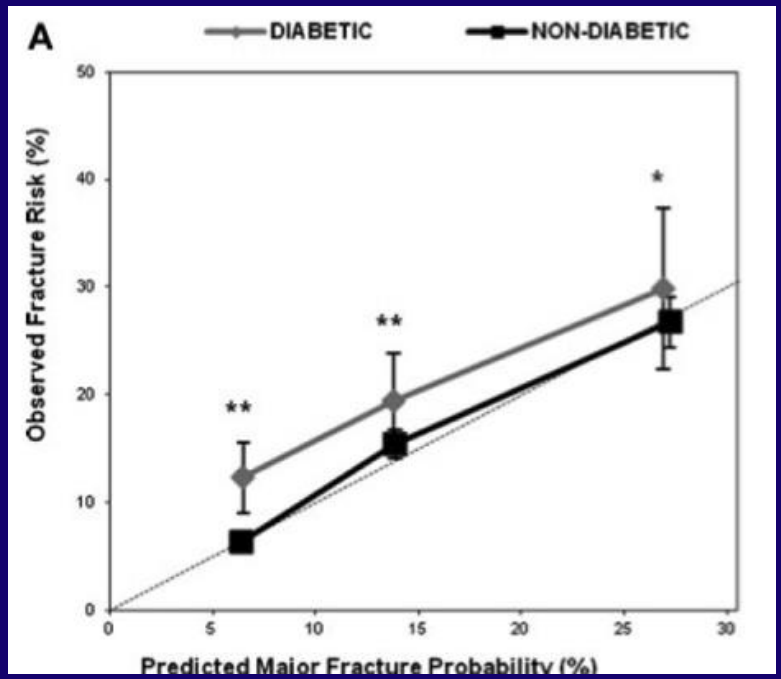
Buehring, et. al, presented at ASBMR 2016

Dysmobility Syndrome: An Important Concept but Clearly a Work in Progress

- Which factors to include requires further study:
  - Arthritis?
  - Multiple Fractures?
  - Multiple and/or injurious falls
  - Diabetes?
  - Neuropathy?
  - Others??
- Factors likely need to have different weights rather than simply being scored equally
- Dysmobility syndrome (as crudely defined) predicts mortality and falls
  - Additional studies need to examine whether it predicts other health outcomes, e.g., falls and fractures

Diabetes Almost Certainly Should be Included as a Risk Factor

Manitoba, CA clinical data
3518 M/W age 50+ with,
and 36085 without DM at
Time of BMD testing
Mean f/u 5.4 years
Fx ascertained by ICD code



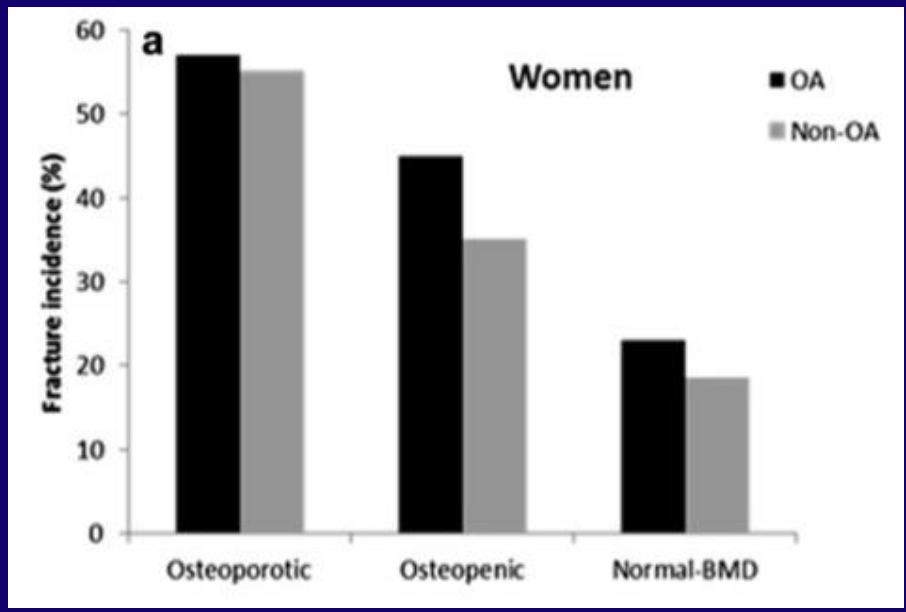
"FRAX underestimated observed major osteoporotic and hip fracture risk in diabetics. We conclude that diabetes confers an increased risk of fracture that is independent of FRAX derived with BMD."

Giangregorio, et al, J Bone Miner Res, 2012, 27:301-308

Osteoarthritis Perhaps Should Also be Included as a Risk Factor

- 2412 women and 1452 men; age >45 years
- Dubbo Osteoporosis Epidemiology Study (DOES)
- Median follow-up 7.5 years
- OA by self-report
- Fx incidence from X-ray reports

"Women with OA have an increased risk of fragility fracture"



Fracture risk was significantly higher in women with OA; Mainly observed in osteopenia

Chan, et al, Osteoarthritis and Cartilage 22; 2014, 1251-1258

Integrating Dsymobility Risk into FRAX is an Ideal Way to Facilitate Clinical Implementation

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
   Age: 60 Date of Birth: Y: M: D:
2. Sex — Male / Female
3. Weight (kg): 96
4. Height (cm): 184
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): GE-Lunar 0.753 T-score: -2.1

Clear Calculate

Falls — No / Yes
Sarcopenia — No / Yes
Diabetes — No / Yes
Symptomatic Osteoarthritis — No / Yes

BMI: 28.4
The ten year probability of fracture (%)
with BMD

Major osteoporotic	13
Hip Fracture	3.3

One year probability of falls (%)

Any fall	75
Injurious fall	28

Development of Such a Calculator Will Take Time: Can We "Diagnose" Dysmobility in Clinic Today?

We Do Not Require a Consensus Definition: We Can Ask our Patients

- How many times have you fallen in the past year?
  - Did any of these falls cause injury?
- Would you please stand up for me?

If history of falls, particularly injurious falls and/or cannot arise without use of arms:

Likely has dysmobility and is at increased risk for falls and fracture

In Summary:

THE DISEASE IS FRACTURE

Osteoporosis, Sarcopenia, Obesity, DM and "Other" Conditions are Part of the Fracture Risk Syndrome

How Can We Take This to Clinical Care?

Seems Likely That We Will Follow the Current "Osteoporosis" Paradigm

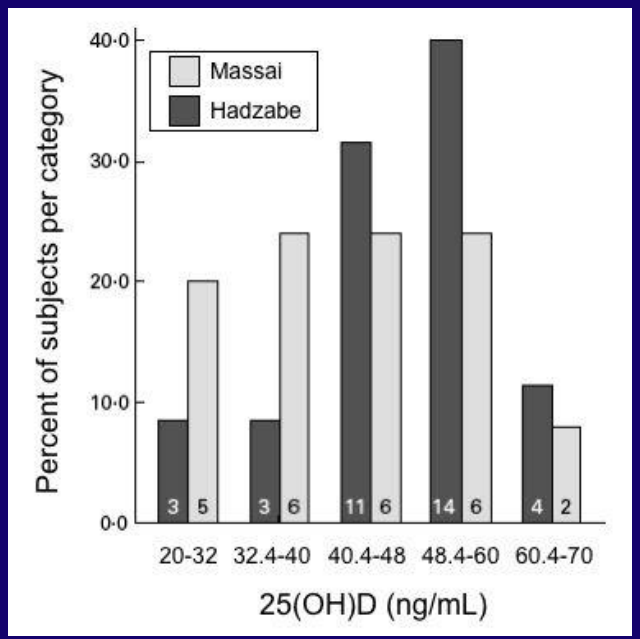
Existing and Future Dysmobility Syndrome Treatments Look Like What We are Currently Calling "Osteoporosis" Treatment

- Nutrition
  - Under-nutrition is common
    - ~40% of hip fracture patients have energy/protein malnutrition
  - Inadequate protein intake reduces muscle synthesis
    - ~40% of older adults not meeting current RDA of 0.8 g/kg daily
    - Protein intake of 1.2-1.5 g/kg daily is likely optimal
  - Calcium and Vitamin D
- Exercise/physical therapy/falls risk reduction
- Medications

Hanger, et. al. N Z Med J. 1999 26;112:88-90
Morley, J Nutr, Health, Aging, 12;452-456, 2008
Mithal, et. al., Ost Int, 2013; doi 10.1007/s00198-012-2236y

Calcium Required for Bone
Vitamin D Required for Bone & Muscle

- Calcium ~1200 mg/day (diet + supplements)
- Vitamin D: USPSTF and AGS recommend vitamin D to reduce falls risk
  - Daily intake = “enough”

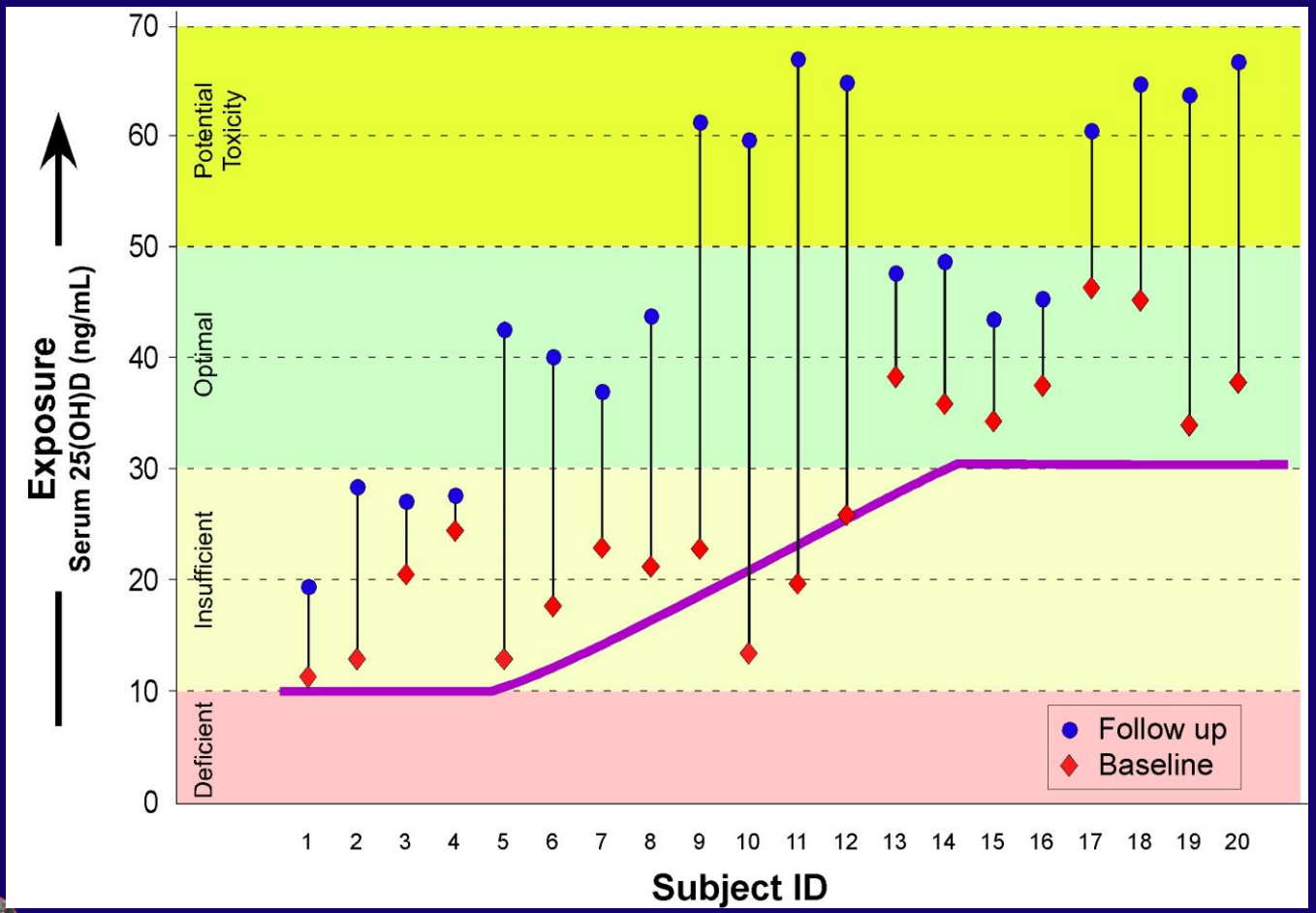


Mean
25(OH)D
46 ng/mL
(115 nmol/L)

Luxwolda, et. al., B J Nutr, V 108 / Issue 09 / November 2012, pp 1557-1561

There is Between Individual Variation in 25(OH)D Response to a Given Oral Dose

No RCTs have used a “treat to target” strategy



Of these 20 women receiving 2500 vitamin D3 daily, 8 had NO chance of a positive response, 4 remained low and 4 went “too high.” Thus 4/20 were ideally supplemented

We Need More Protein To Preserve Muscle Mass and Function

Expect new dietary intake recommendations sometime in the not too distant future

1.2 grams/kg = ~54 grams/100 pounds
190 # = ~100 grams…

(I need to eat a chicken breast, 3 large eggs, a can of tuna and a glass of milk)

Exercise Works

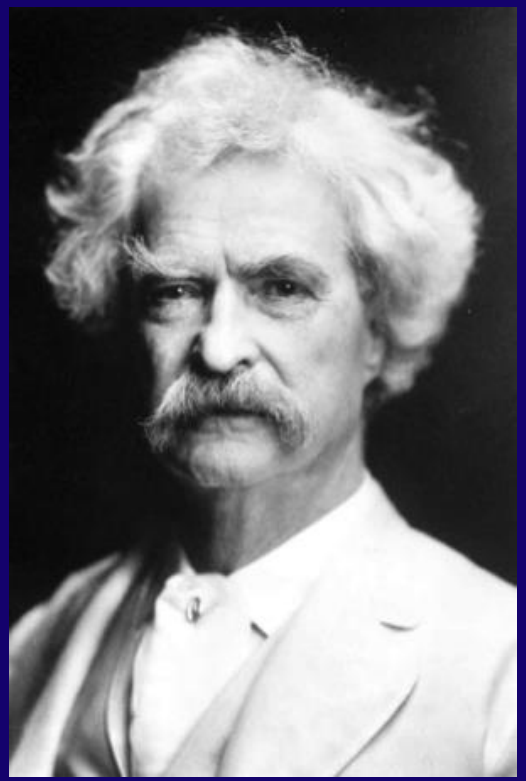
- Improves muscle strength
- Preferably resistance training
  - This works; strength gains of 30% to >100% rapidly
- Injuries not common but do occur
- May require supervision (PT)

Doherty, J Applied Physiol, 95;1717-1727, 2003

- But, we don't exercise….
  - Only **32%** of 23,153 adults age 35-65 years exercise for ≥ 3.5 hours per week Ford, et. al., Arch Intern Med, 169;1355-1362, 2009
  - **~12%** of people age 65-74 and **10%** of those ≥ 75 perform strength training exercise two or more days/week MMWR, 53;25-28, 2004

Mark Twain Had It Wrong…..

“Whenever I get the urge to exercise, I lie down until the feeling passes away.”



DO SOMETHING…..

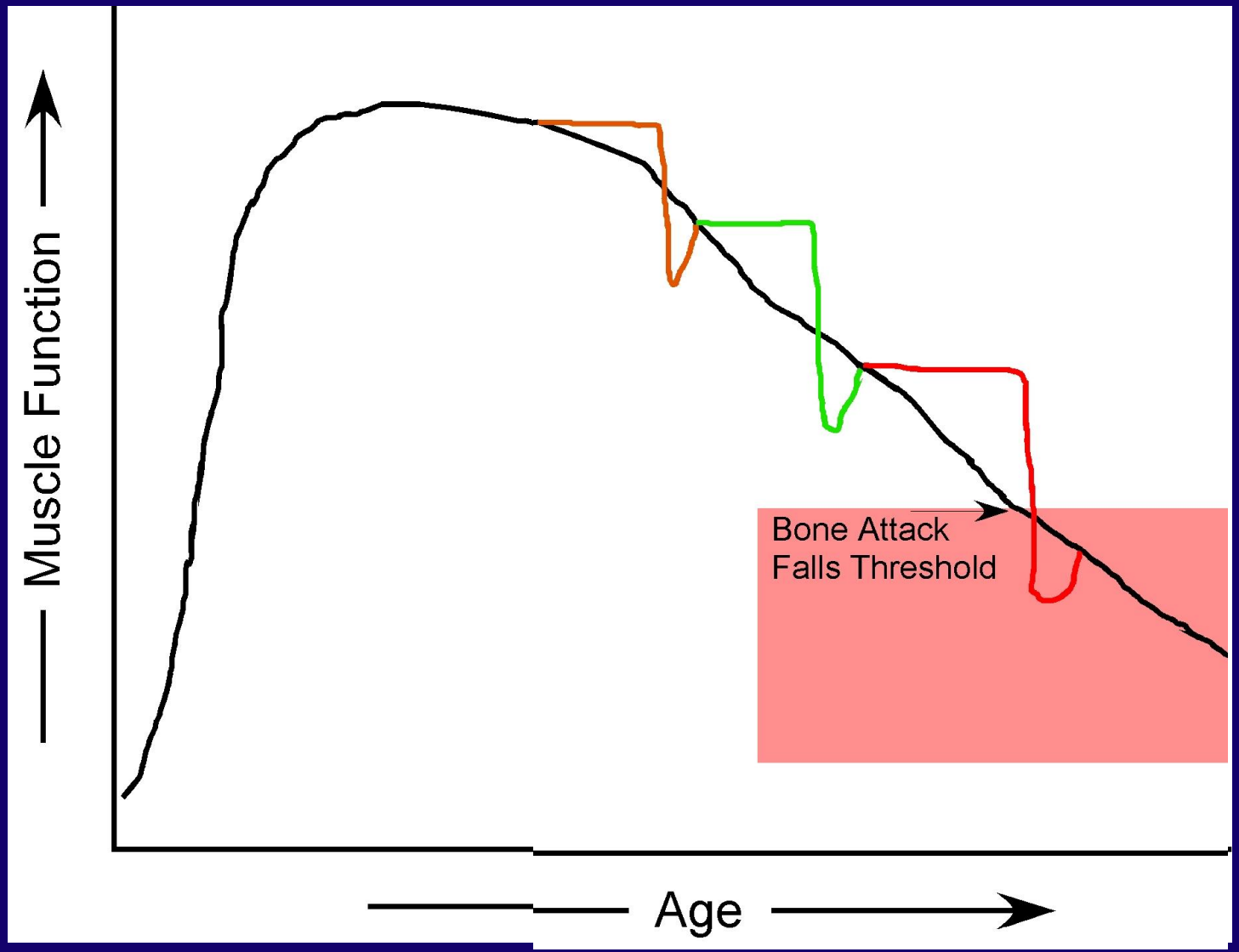
Potential Pharmacologic Approaches for Dysmobility Syndrome Include

- Anabolic steroids
- Selective androgen receptor agonists
- Myostatin antagonists
- Others

This is NOT Why I Think Muscle Medications are Needed

This is Why I Think Muscle Medications are Needed

Muscle Medications Might Ideally be Used After Illnesses/Events to Get Back to Baseline



Current Osteoporosis Medications

- Estrogen
- Raloxifene (Evista)
- Calcitonin (Miacalcin)
- Bisphosphonates
  - Alendronate (Fosamax)
  - Risedronate (Actonel)
  - Ibandronate (Boniva)
  - Zoledronate (Reclast)
- Teriparatide (Forteo)
- Denosumab (Prolia)

These medications work;
they cut fracture risk
approximately in half

Osteoporosis Medications Are Extremely Well Studied and Documented to Reliably Reduce Fracture Risk by ~50%

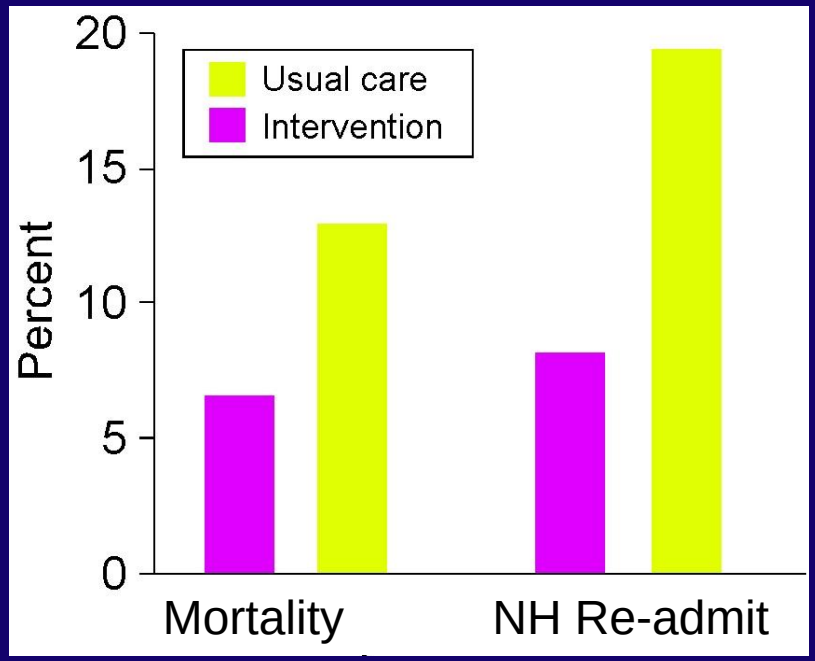
In People at High Risk for Fracture, Especially Those Who Have Recently Sustained a Fragility Fracture, BPs (or other osteoporosis medications) Should be Prescribed for 3-5 years

People are concerned about drug risks but not fracture risk;
We need to convey drug and disease risk

Comprehensive Treatment After Hip Fracture Reduces Mortality and NH Readmission

124 patients with hip fracture
12 mo of high-intensity weight lifting exercise and targeted treatment of balance, osteoporosis, nutrition, vitamin D/calcium, depression, cognition, vision, home safety, polypharmacy and social support vs. usual care

Note: Usual care included inpatient orthogeriatric and allied health consultation followed by 6-12 weeks of standard inpatient/outpatient physical therapy.



ADL decline was less and fewer use of assistive devices

"The intervention reduced mortality, nursing home admissions and ADL dependency compared with usual care."

Adapted from Singh, et. al, JAMDA, 13: 24-30, 2012

Dysmobility Syndrome
What Can We Do Today?

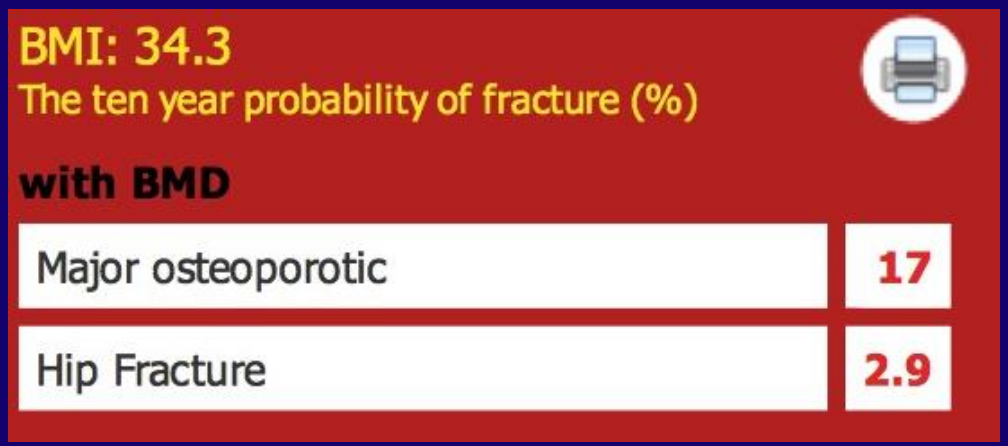
- Recognize the problem; dysmobility with falls and fractures:
  - May be fatal
  - May lead to inability to live independently
  - Can be prevented (or at least have the risk for another fracture reduced)
  - Reflects disease of bones/muscles (and other issues): it's not just "getting old"
    - Having falls/fractures indicates increased risk for another
  - Requires evaluation: it's not just "I fell"

Sarcopenia/Dysmobility/Bone Attack

What Can We Do Today?

- Use “osteoporosis” medications to treat the bones
- Discuss risk; consider the Garvan calculator to advise re: fracture risk in patients with sarcopenia/falls
  - Many patients “know” that osteoporosis drugs are “bad”

68 yo White woman, wt 200#, ht 64”, T-score -2.0, wrist Fx, 3 falls last year



A 45%/21% risk sounds different than 17%/3%

Sarcopenia/Dysmobility
What Can We Do Today?

- Reduce falls
  - Ask "How many times have you fallen in the past year?"
  - Observe gait, ask to stand up without use of arms
  - "The usual" falls risk reduction strategies including a PT consult
  - Recognize that obesity increase risk
- Food is a good thing; but excess is not
  - Nutritional supplements improve outcomes after hip fracture
- Optimize vitamin D status
  - 2,000 IU daily is a reasonable place to start
  - Measure 25(OH)D in those with falls/fractures
- Use existing "osteoporosis" medications to treat the bones

In Summary, it is My Opinion That "Age-Related Fracture" is the Disease and That This Results from a Syndrome of Osteoporosis, Sarcopenia, Obesity and Diabetes Plus Other "Stuff"

We Need to Focus Not Just on Bone, But On the Patient

Treat the Person, Not Just Their Bones

“The good physician treats the disease; the great physician treats the patient who has the disease.”

Sir William Osler

Thank You