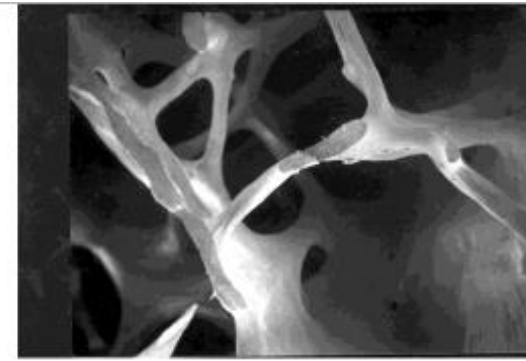


Normal bone



Osteoporotic bone

Osteoporosis: A Practical Approach for 2022

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Director, MGH Bone Density Center



HARVARD
MEDICAL SCHOOL



Financial Disclosures

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 - » Amgen
 - » Seres Therapeutics
- Additional research funding from NIDDK, Doris Duke Clinical Research Foundation
- UpToDate

Objectives

- **Why and how to diagnose?**
 - » **Examine clinical impact of osteoporosis**
 - » **Review bone density screening guidelines**
 - » **Discuss use and limitations of fracture risk calculators**
- **How to treat?**
 - » **Review risks and benefits of osteoporosis treatment options**
 - » **Discuss controversies surrounding duration of treatment**
 - » **New osteoporosis therapy**

**Top 10
Misconceptions in
Osteoporosis**

TOP 10 MISCONCEPTIONS in osteoporosis

MISCONCEPTION	TRUTH
1. Osteoporotic fractures are an inevitable consequence of aging, and therefore do not need to be treated	
2. The majority of patients who suffer fragility fractures have osteoporotic T-scores ≤ -2.5	
3. My calcium supplement contains 1000 mg per tablet	
4. Calcium supplements cause heart attacks	
5. Bisphosphonates impair fracture healing	

TOP 10 MISCONCEPTIONS in osteoporosis

MISCONCEPTION	TRUTH
1. Osteoporotic fractures are an inevitable consequence of aging, and therefore do not need to be treated	Fractures can and should be prevented!
2. The majority of patients who suffer fragility fractures have osteoporotic T-scores ≤ -2.5	Most fragility fractures occur in <u>osteopenic</u> patients
3. My calcium supplement contains 1000 mg per tablet	Calcium labels are <i>misleading</i> ; tablets never contain more than 600 mg elemental calcium per tablet
4. Calcium supplements cause heart attacks	Calcium supplements do <u>not</u> cause heart attacks
5. Bisphosphonates impair fracture healing	Multiple studies show <u>no</u> delay in fracture healing by bisphosphonates

TOP 10 MISCONCEPTIONS in osteoporosis

MISCONCEPTION	TRUTH
6. Bisphosphonates should only ever be used for 3-5 years	
7. Osteoporosis medications cause fractures and so shouldn't be used	
8. All fractures occurring in the subtrochanteric femur are atypical femoral fractures (AFFs)	
9. AFFs occur only in patients treated with bisphosphonates	
10. Drug holidays should be used after all osteoporosis medications	

TOP 10 MISCONCEPTIONS in osteoporosis

MISCONCEPTION	TRUTH
6. Bisphosphonates should only ever be used for 3-5 years	Longer-term bisphosphonate treatment may be warranted in high-risk patients
7. Osteoporosis medications cause fractures and so shouldn't be used	Atypical femoral fractures (AFFs) are rare; osteoporosis medications are 1000 times more likely to <u>prevent</u> fractures
8. All fractures occurring in the subtrochanteric femur are atypical femoral fractures (AFFs)	<5% of subtrochanteric fractures are AFFs (and <0.5% of all hip fractures)
9. AFFs occur only in patients treated with bisphosphonates	AFFs occur with denosumab; also occur among <u>treatment-naïve</u> patients
10. Drug holidays should be used after all osteoporosis medications	Caution with stopping denosumab! Transition to another agent to prevent rebound fractures

A Public Health Problem



www.2million2many.org

- **½ of women and ¼ of men over 50 will have a low-trauma fracture during their lifetime**
 - » 2 million fractures/year in the U.S.
 - » Associated medical costs \$20 billion/year
- **Osteoporotic fractures have dramatic impact on individuals**
 - » Development of chronic pain
 - » Decline in physical functioning
 - » Loss of independence
 - » Increased mortality

A Widening Gap: Treatment after Fracture

Hip fracture patients

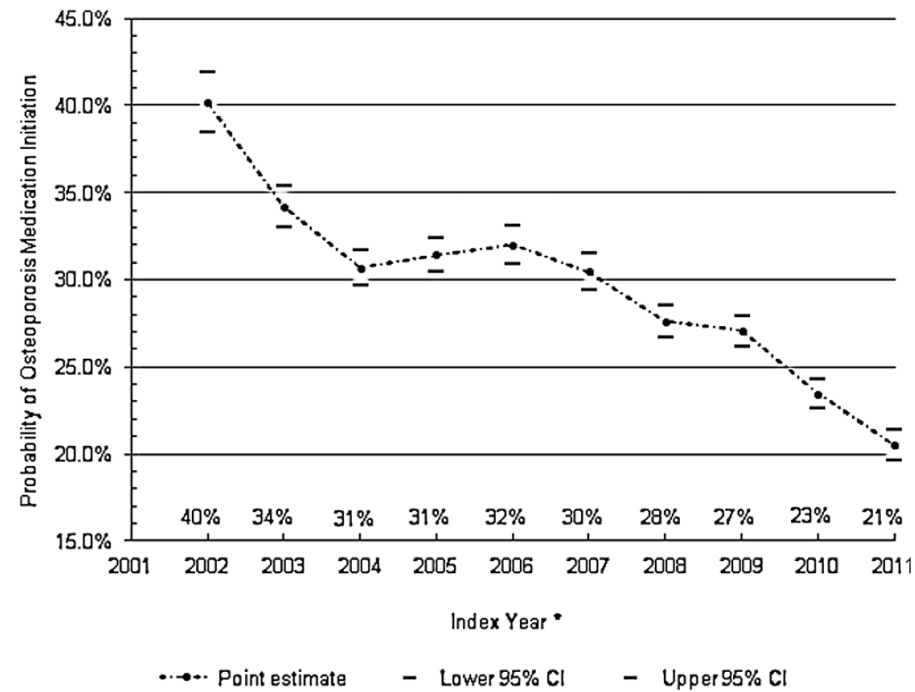
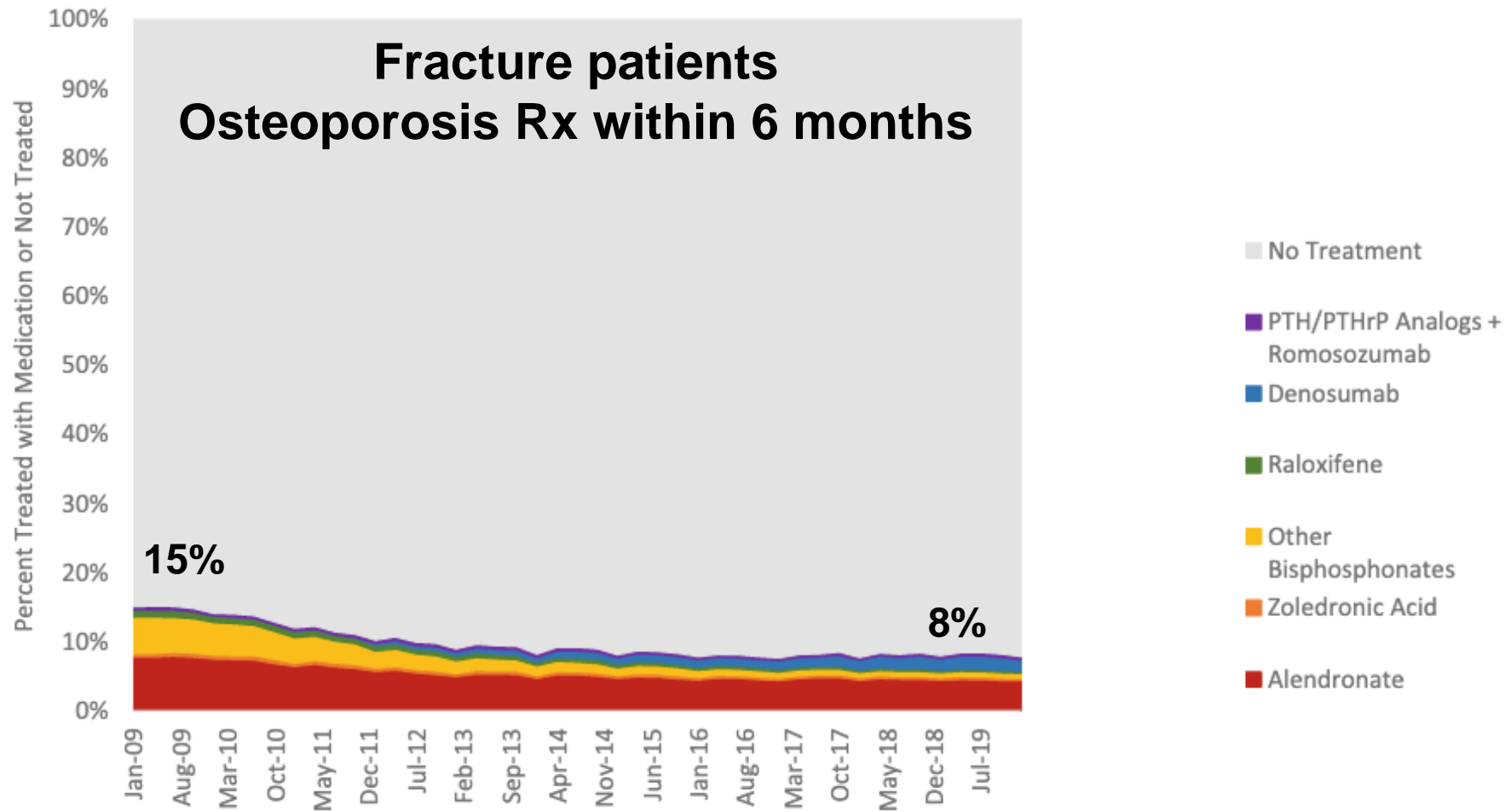


Fig. 2. Annual unadjusted probability of osteoporosis medication use within 12 months after discharge (Kaplan-Meier method).

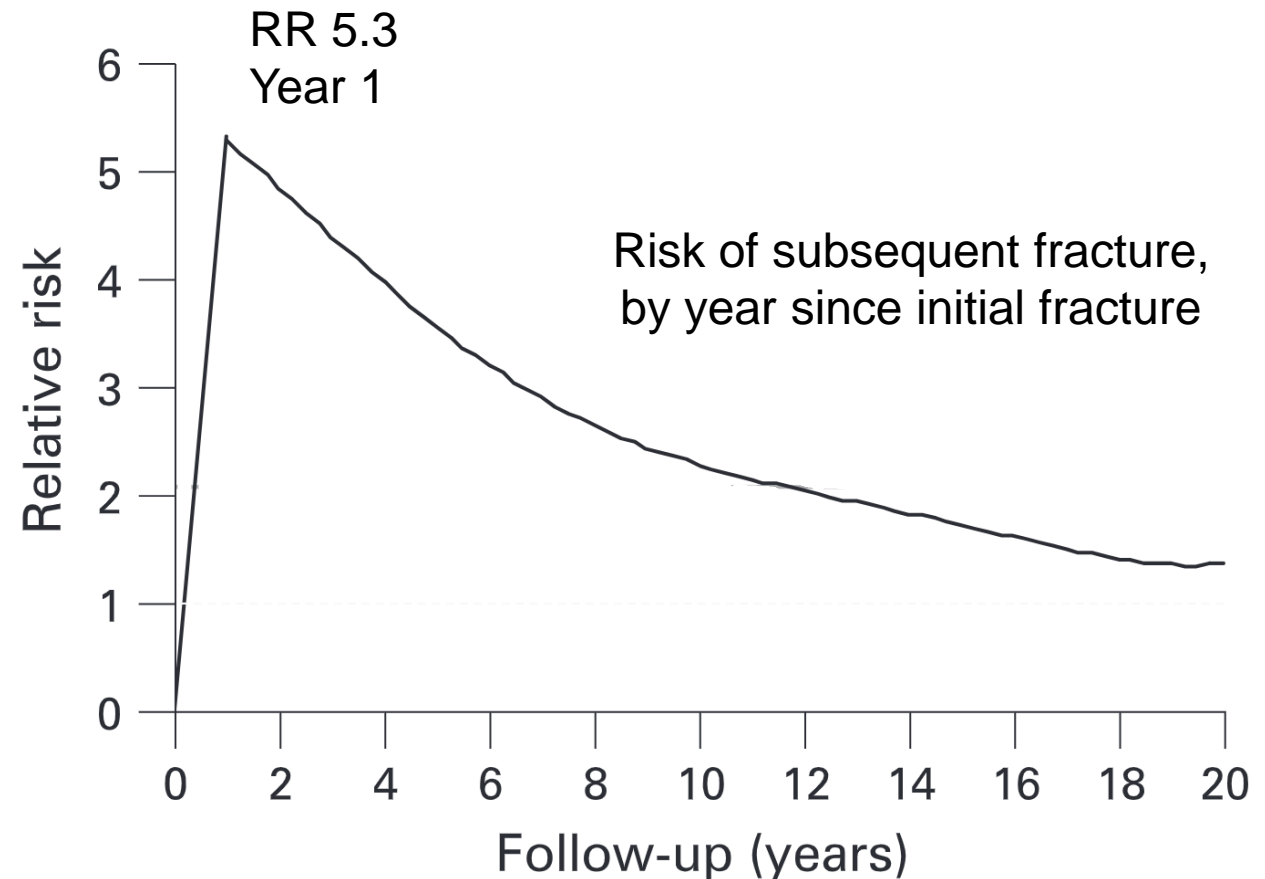
Widening osteoporosis treatment gap



Importance of Secondary Fracture Prevention

32% of patients with an osteoporotic fracture will have another fracture within 5 years

Balasubramanian et al Osteopor Int 2019



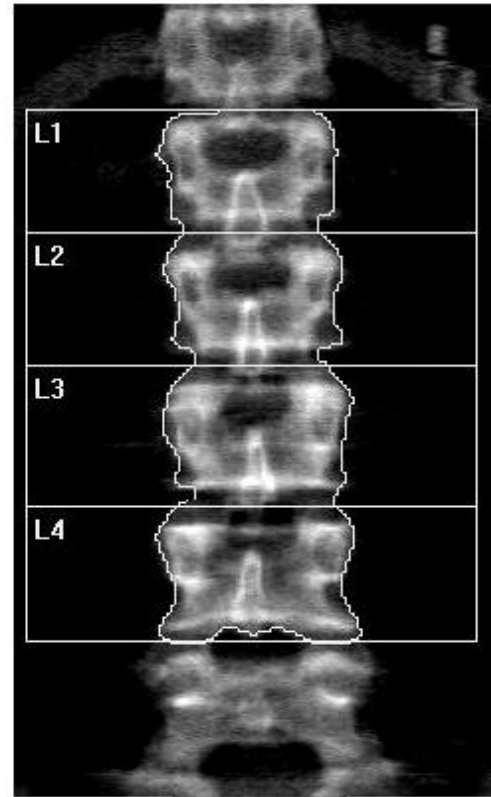
Van Geel et al Ann Rheum Dis 2009

Closing the Gap: Primary Prevention

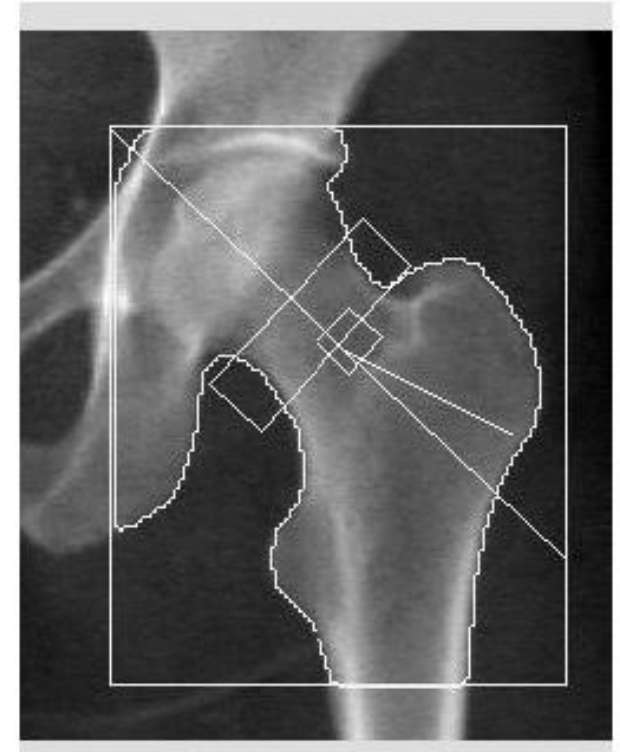
**Dual-energy X-ray
Absorptiometry (DXA)**

**Bone Mineral Density
(BMD)**

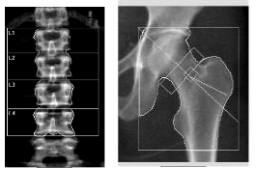
Lumbar spine



Proximal femur



U.S. guidelines = universal DXA screening



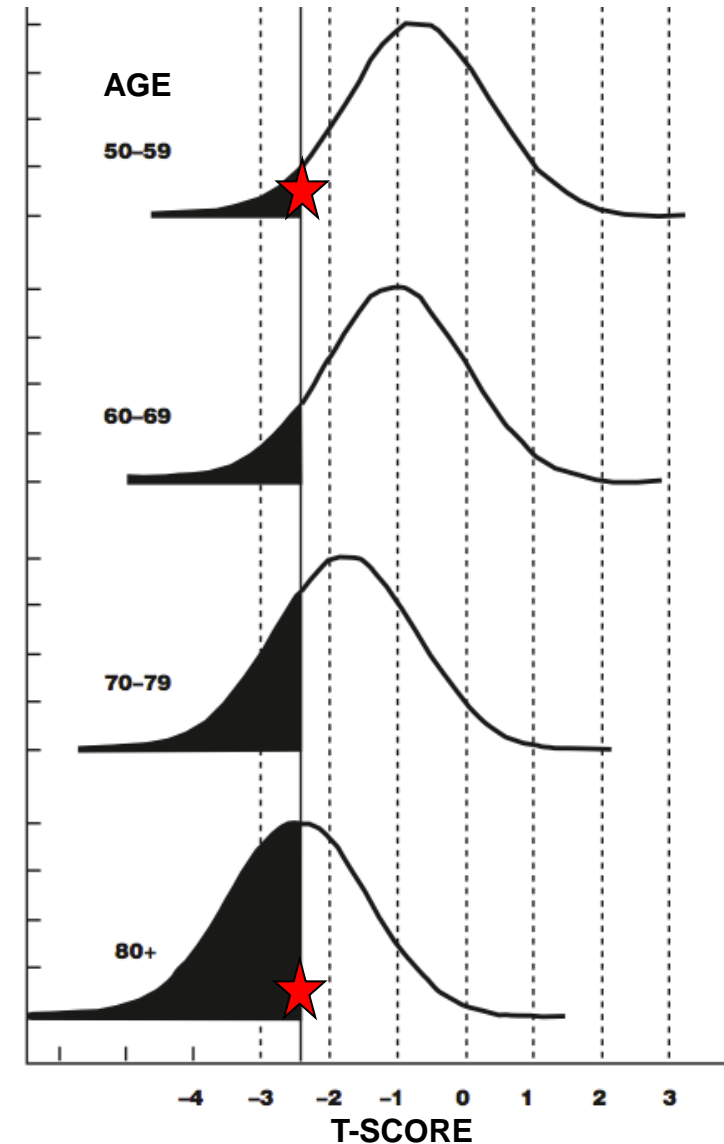
	U.S. Preventative Services Task Force	National Osteoporosis Foundation	American Association for Clinical Endocrinology	North American Menopause Society
Postmenopausal women ≥ 65 years	Yes	Yes	Yes	Yes
Adults ≥ 50 years with risk factors	Yes, if FRAX MOF $\geq 8.4\%$	Yes	Yes	Yes

Osteoporosis Risk Factors

- Previous fractures
- Low BMI
- Family history
- Lifestyle
 - » Low calcium intake
 - » Alcohol (>3 drinks/day)
 - » Active smoking
 - » Physical activity / Fall risk
- Medications
 - » Glucocorticoids (>5 mg prednisone/day)
 - » GnRH agonists
 - » Aromatase inhibitors
 - » Anti-convulsants
- Endocrine
 - » Hyperthyroidism
 - » Hyperparathyroidism
 - » Early menopause
 - » Hypothalamic amenorrhea / hypogonadism
 - » Diabetes
- GI disorders
 - » Inflammatory bowel disease
 - » Celiac disease
 - » Gastric bypass
- Other
 - » Rheumatoid arthritis
 - » Chronic kidney disease
 - » Eating disorders
 - » Post-transplant bone disease

Lab testing

- Standard testing:
 - » Ca, Phos, Cr, Alk Phos, 25OHD, PTH
- Further w/u indicated when severity of osteoporosis exceeds expectations
 - » Z-score < -2.0 (*not validated*)
- Based on clinical history, consider:
 - » TSH
 - » SPEP/UPEP
 - » Testosterone (*for men*)
 - » 24 hr urine Ca + Cr
 - » Celiac panel
 - » 24 hour urine free cortisol



Data from WHO 2004

Dual-energy x-ray absorptiometry (DXA)

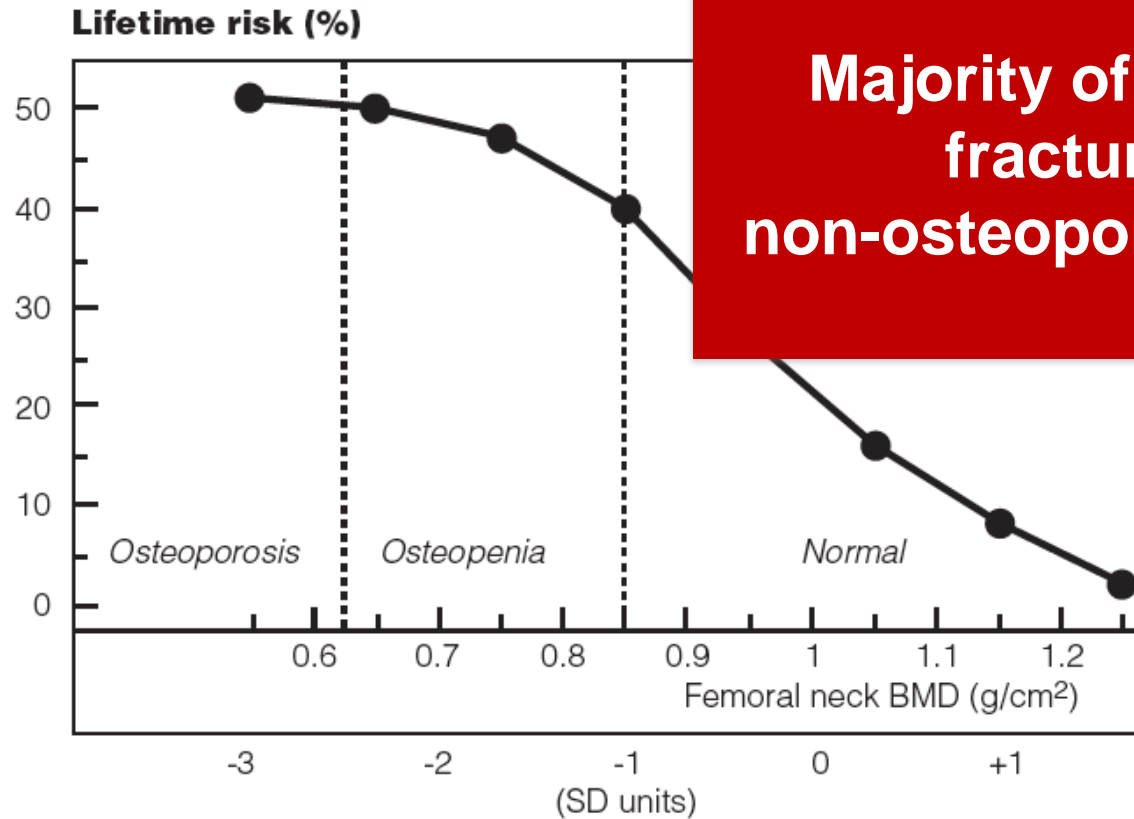
For every 1 Std Dev decrease in age-adjusted bone density, there is a 2-fold increase in fracture risk

Marshall et al, BMJ 1996

	T-score
Normal	-1.0 or above
Osteopenia	Between -1.0 and -2.5
Osteoporosis	-2.5 or below

Bone density and fracture risk as a continuum

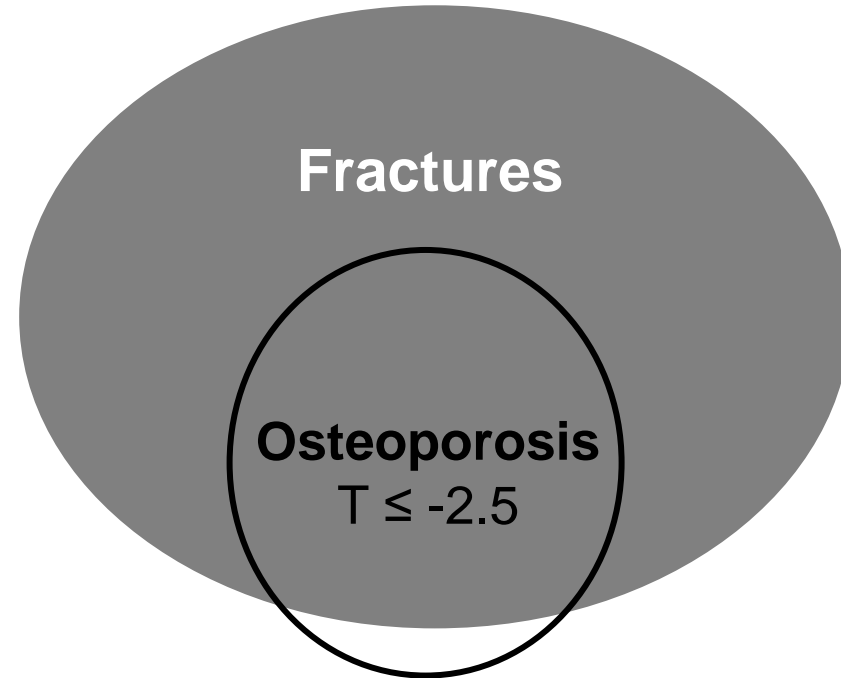
Remaining lifetime risk of hip fracture in women at age 50 years based on BMD at the femoral neck



Majority of adults who fracture have non-osteoporotic T-scores

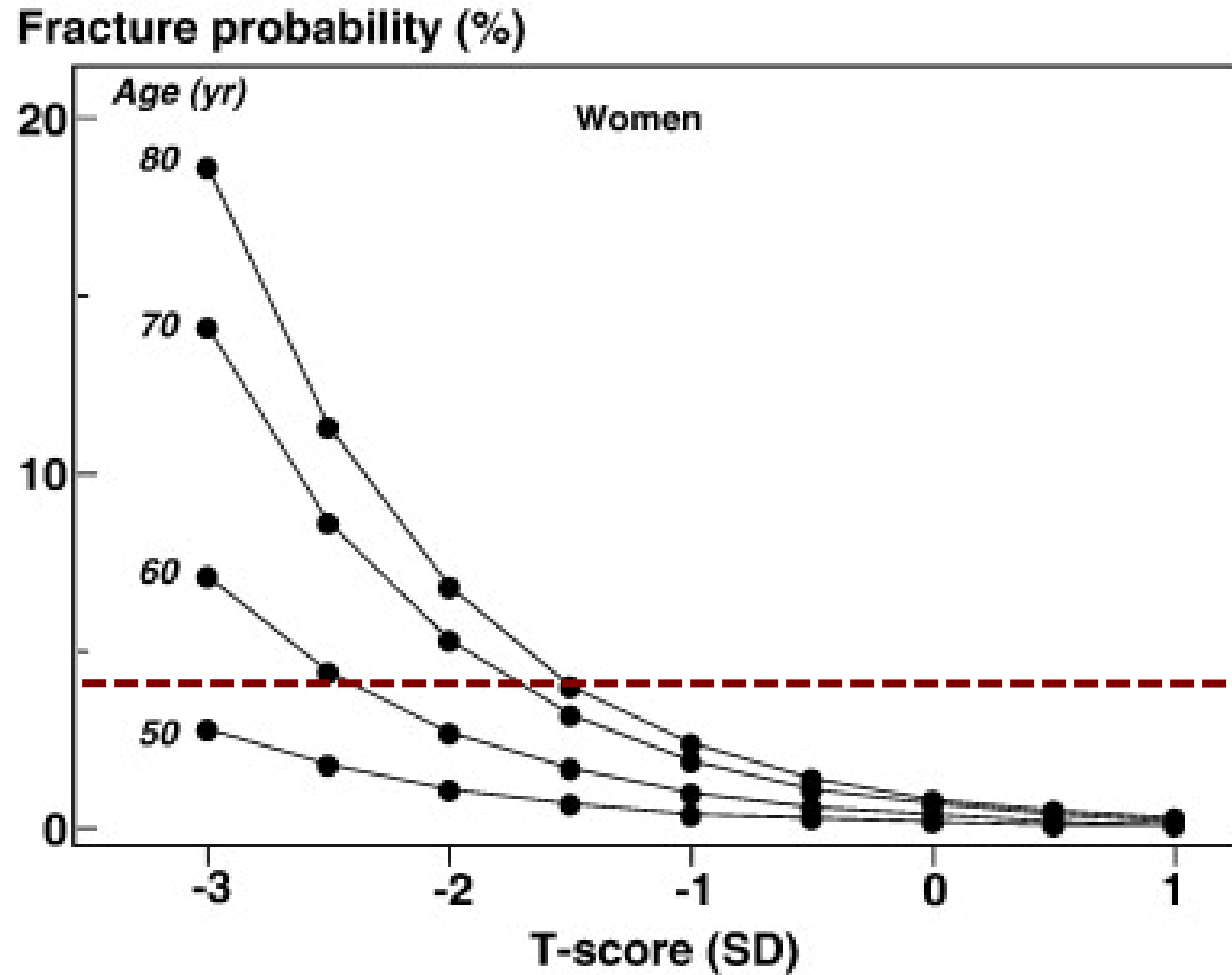
WHO 03.163

Fundamental problem

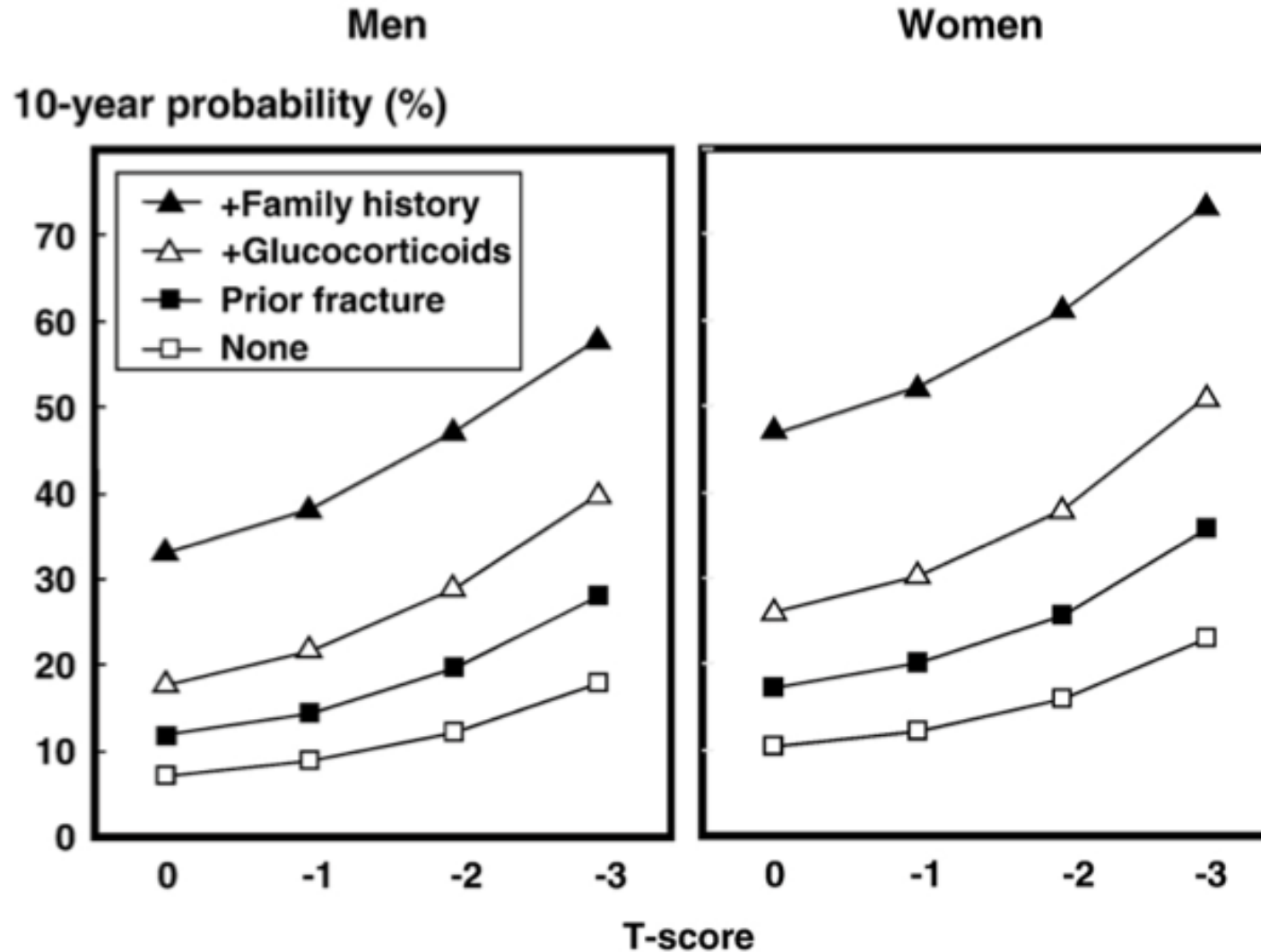


**Risk stratification on the basis
of T-score alone is insufficient**

Age increases fracture risk independent of bone density



Other clinical factors increase fracture risk independent of bone density



FRAX: Fracture Risk Assessment Tool

- Online tool to estimate 10-year fracture risk
- Country-specific calculations
- Goal: to risk-stratify treatment-naïve osteopenic patients

<http://www.shef.ac.uk/FRAX/>

The screenshot shows the FRAX WHO Fracture Risk Assessment Tool interface. At the top, there is a red banner with the FRAX logo and the text 'WHO Fracture Risk Assessment Tool'. Below the banner is a navigation menu with links for 'Home', 'Calculation Tool', 'Paper Charts', 'FAQ', and 'Ref'. The main heading is 'Calculation Tool'. Below this, a message reads: 'Please answer the questions below to calculate the ten year probability of fracture with BMD.' The form includes a 'Country' dropdown set to 'US (Caucasian)', a 'Name/ID' input field, and a link 'About the risk factors'. The 'Questionnaire' section contains 12 questions with radio button options for 'No' and 'Yes'. The results section shows 'BMI: 25.0', 'The ten year probability of fracture (%) with BMD', and a table with two rows: 'Major osteoporotic' with a value of 27, and 'Hip Fracture' with a value of 5.6.

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

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

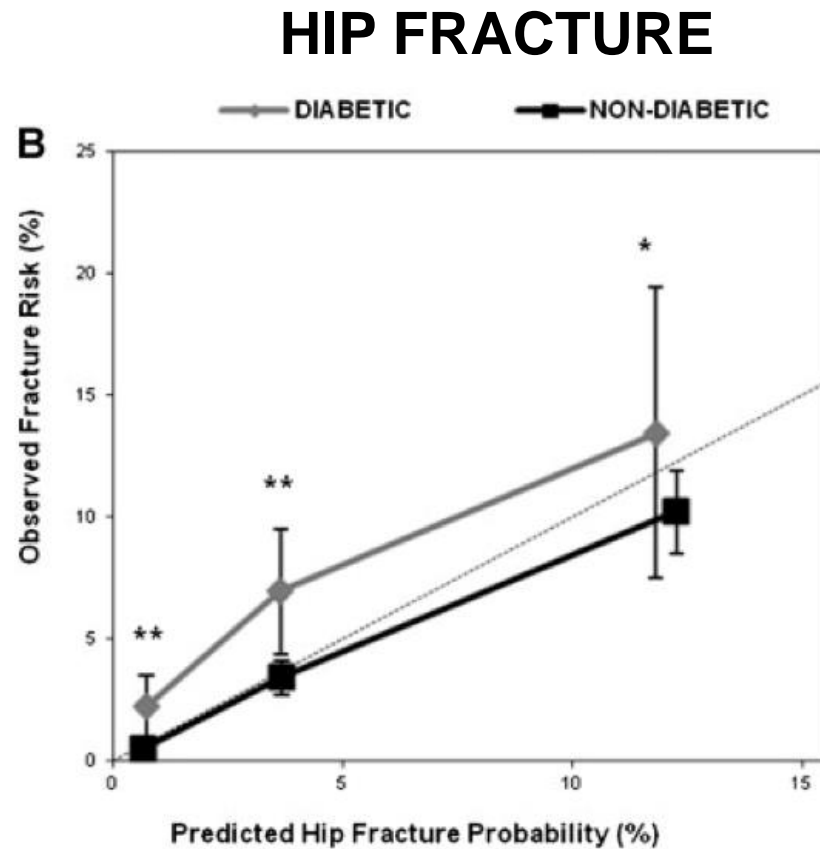
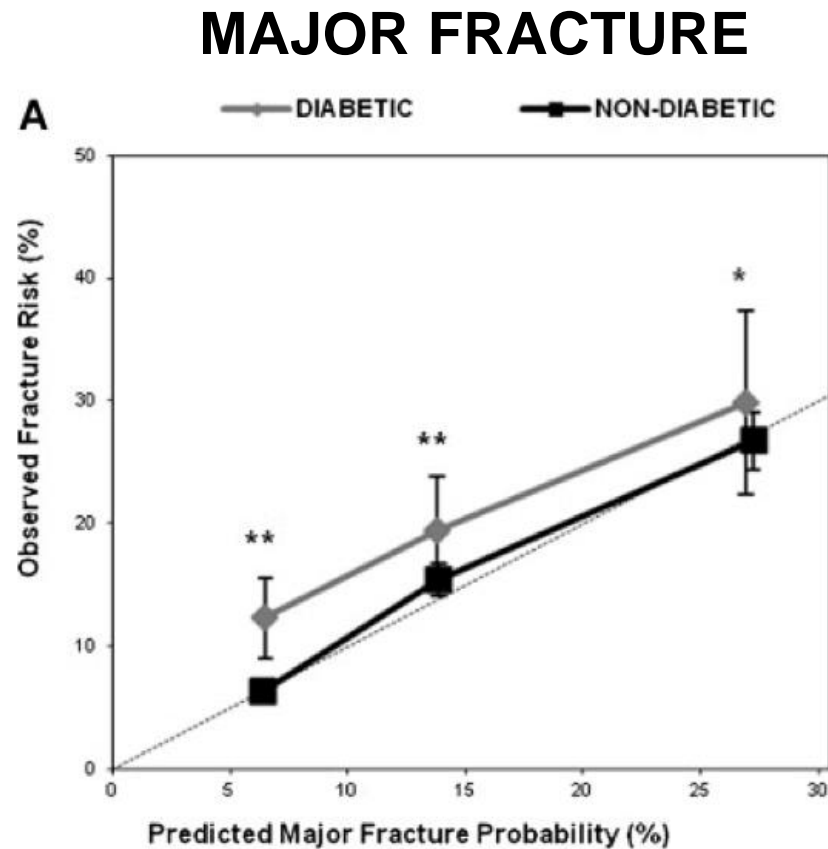
11. Alcohol 3 or more units/day No Yes

12. Femoral neck BMD (g/cm²)
 T-score: -1.7

BMI: 25.0
The ten year probability of fracture (%) with BMD

Major osteoporotic	27
Hip Fracture	5.6

FRAX underestimates fracture risk in T2DM



FRAX adjustment for T2DM

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 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)
T-Score

BMI: 32.2
The ten year probability of fracture (%)

Major osteoporotic	11
Hip Fracture	2.4

If you have a TBS value, click here:

Option 1:
Add 10 years to patient's age

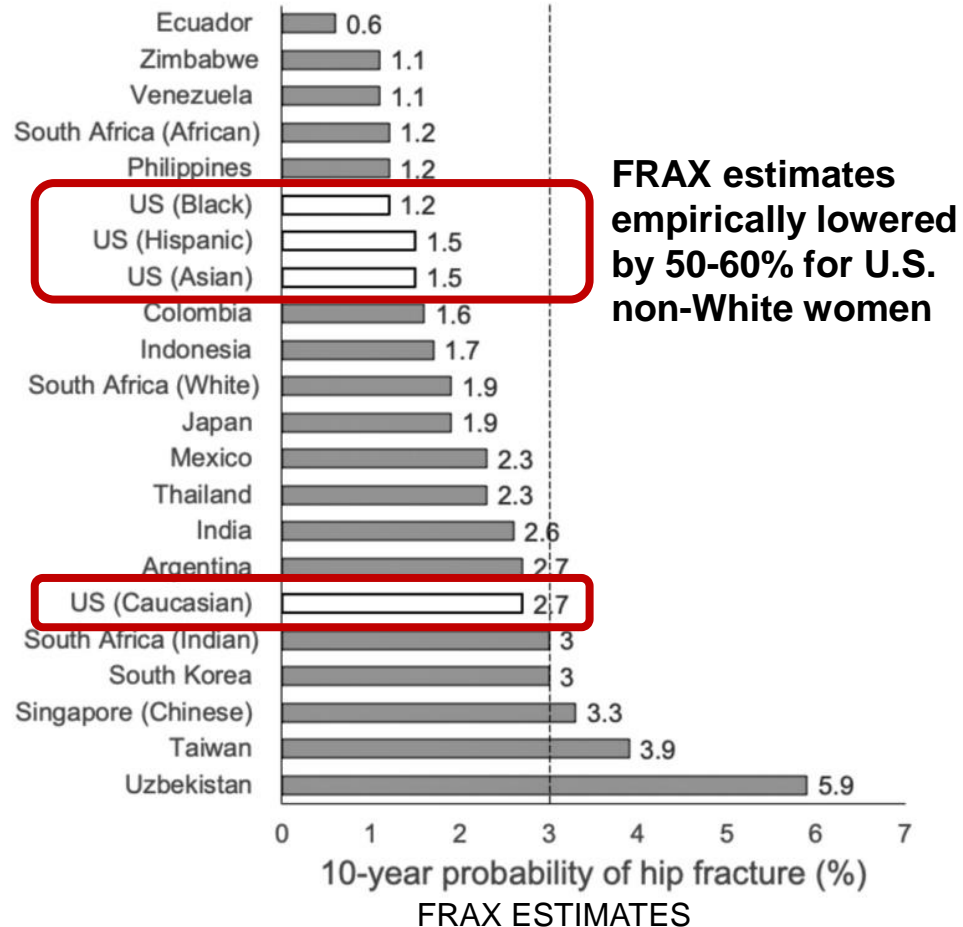
Option 2:
Click "yes" to rheumatoid arthritis

Limitations of FRAX

- May underestimate risk of fracture in patients with:
 - » Diabetes
 - » Recent fractures
 - » Frequent falls
 - » Discordance between spine vs. femoral neck T-score
- Cannot take into account dose-response relationships:
 - » Glucocorticoids
 - » Smoking
 - » Number of prior fractures
- Should not be used in patients who have received pharmacologic osteoporosis therapy

U.S. FRAX and race/ethnicity adjustments

65 yo woman with T -2.0



Wu JBMR 2021

ASBMR Creates Task Force to Reassess the Inclusion of Race in Determining Bone Fracture Risk in Patients

ASBMR Creates Task Force to Reassess the Inclusion of Race in Determining Bone Fracture Risk in Patients

Jun 24, 2021

WASHINGTON, June 24, 2021 – As recent conversations over race-based corrections to clinical algorithms have raised questions about the scientific data doctors rely on to treat their patients across a variety of medical fields, the American Society for Bone and Mineral Health (ASBMR) has formed a task force to examine the inclusion of race and/or ethnicity in the diagnosis and subsequent management of individual bone fracture risk in patients.

Racial Disparities and Osteoporosis:

Teysir et al Maturitas 2022

Noel et al JBMR 2021

U.S. Osteoporosis Treatment Guidelines

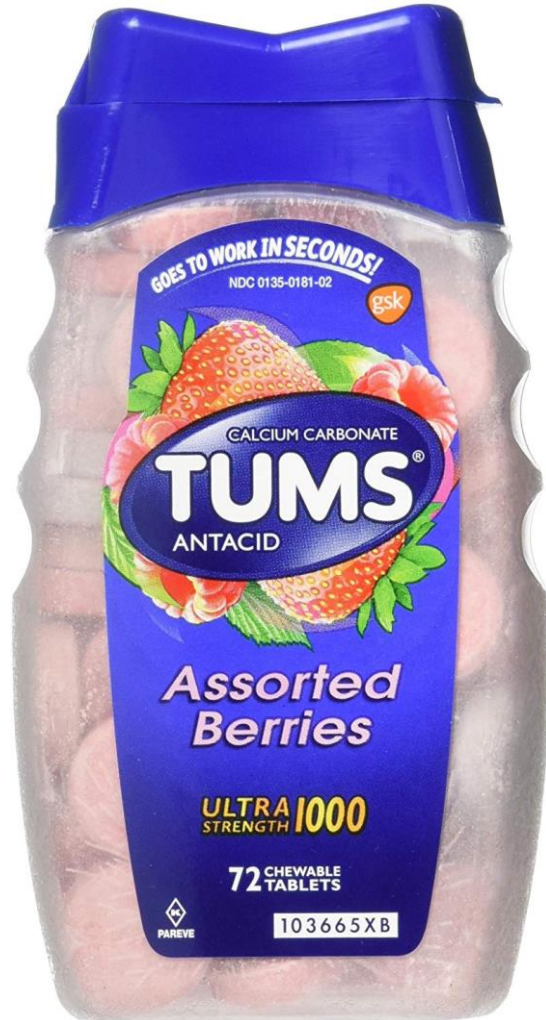
- Treat postmenopausal women and men age 50+ with osteoporosis medications if any of the following:
 - » History of fragility fractures
 - » T-score ≤ -2.5 at PA spine, total hip, or femoral neck
 - » Absolute 10-year fracture risk (FRAX score)
 - $\geq 3\%$ for hip or
 - $\geq 20\%$ for major osteoporotic fracture
- Supported by AACE, ISCD, IOF, NAMS, ACOG, ACR, ASBMR, Endocrine Society, and others

Lifestyle improvements

- Calcium ~1200mg/day
 - » Milk = 300 mg/cup
 - » Cheese = 150-300 mg/oz
 - » Yogurt = 300-450 mg/ 8 oz
 - » Calcium supplements: calcium carbonate, calcium citrate
- Vitamin D ~800 IU/day
 - » IOM suggests >20 ng/dL
 - » Osteoporosis experts suggest >30 ng/dL
- Weight-bearing exercise
 - » Work with a physical therapist
 - » Discuss fall prevention, home safety, spine-sparing strategies
 - » “Too Fit To Fracture” program <https://osteoporosis.ca/health-care-professionals/clinical-practice-guidelines/exercise-recommendations/>

Calcium and vitamin D
modestly reduce fracture risk
USPSTF Meta-analysis: Chung et al Ann Intern Med.
2011;155(12):827-838

400 mg elemental calcium / tablet



Drug Facts

Active ingredient (per tablet)	Purpose
Calcium Carbonate USP 1000mg.....	Antacid

Uses relieves

- acid indigestion
- upset stomach associated with these symptoms
- heartburn
- sour stomach

Warnings
Ask a doctor or pharmacist before use if you are presently taking a prescription drug. Antacids may interact with certain prescription drugs.

When using this product

- do not take more than 7 tablets in 24 hours
- if pregnant do not take more than 5 tablets in 24 hours
- do not use the maximum dosage for more than 2 weeks except under the advice and supervision of a doctor

Keep out of reach of children.

Directions

- adults and children 12 years of age and over: chew 2-3 tablets as symptoms occur, or as directed by a doctor
- do not take for symptoms that persist for more than 2 weeks unless advised by a doctor

Other information

- each tablet contains: elemental calcium 400mg, sodium 2mg

Store below 30°C (86°F)

Inactive ingredients adipic acid, corn starch, FD&C blue #1 lake, FD&C red #40 lake, FD&C yellow #5 (tartrazine) lake, FD&C yellow #6 lake, flavors, mineral oil, sodium polyphosphate, sucrose, talc

Questions?
1-800-897-7535 weekdays

Safety sealed - Do not use if printed inner seal beneath cap is missing or broken.

250 mg elemental calcium / tablet



USP has tested and verified ingredients, potency and manufacturing process. USP sets official standards for dietary supplements. See www.uspverified.org

SUGGESTED USE: Take two (2) tablets daily, preferably with a meal.

Supplement Facts

Serving Size 2 Tablets	
Servings Per Container 100	
Each Serving Contains	% Daily Value*
Vitamin D3 800 IU	160%
Vitamin B6 10 mg	200%
Calcium 500 mg	100%
Magnesium 80 mg	20%
Zinc 10 mg	20%
Copper 1 mg	20%
Manganese 1 mg	20%
Boron 1 mg	20%

**Daily Value not established.

INGREDIENTS: Calcium Citrate, Magnesium Oxide, Cellulose (Plant Origin), Croscarmellose Gum, Cellulose Coating, Silicon Dioxide, Magnesium Stearate, Titanium Dioxide Color, Pyridoxine Hydrochloride, Zinc Oxide, Sodium Borate, Manganese Gluconate, Copper Gluconate, Gelatin, Cholecalciferol.

Tablet Color May Vary

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www.costco.com

VITAMIN INFOLINE 1-800-433-1213

IMPORTANT: TAMPER-EVIDENT SEAL UNDER CAP. DO NOT USE IF PRINTED SEAL IS BROKEN OR MISSING.

Lack of Evidence Linking Calcium With or Without Vitamin D Supplementation to Cardiovascular Disease in Generally Healthy Adults: A Clinical Guideline From the National Osteoporosis Foundation and the American Society for Preventive Cardiology

Stephen L. Kopecky, MD; Douglas C. Bauer, MD; Martha Gulati, MD; Jeri W. Nieves, PhD; Andrea J. Singer, MD; Peter P. Toth, MD, PhD; James A. Underberg, MD; Taylor C. Wallace, PhD; and Connie M. Weaver, PhD

Description: Calcium is the dominant mineral present in bone and a shortfall nutrient in the American diet. Supplements have been recommended for persons who do not consume adequate calcium from their diet as a standard strategy for the prevention of osteoporosis and related fractures. Whether calcium with or without vitamin D supplementation is beneficial or detrimental to vascular health is not known.

Recommendation: The National Osteoporosis Foundation and American Society for Preventive Cardiology adopt the position that there is moderate-quality evidence (B level) that calcium with or without vitamin D intake from food or supplements has no relationship (beneficial or harmful) to the risk for cardiovascular and cerebrovascular disease, mortality, or all-cause mortality in generally healthy adults at this time. In light of the evidence

Ann Intern Med. 2016;165:867-868. doi:10.7326/M16-1743 www.annals.org

For author affiliations, see end of text.

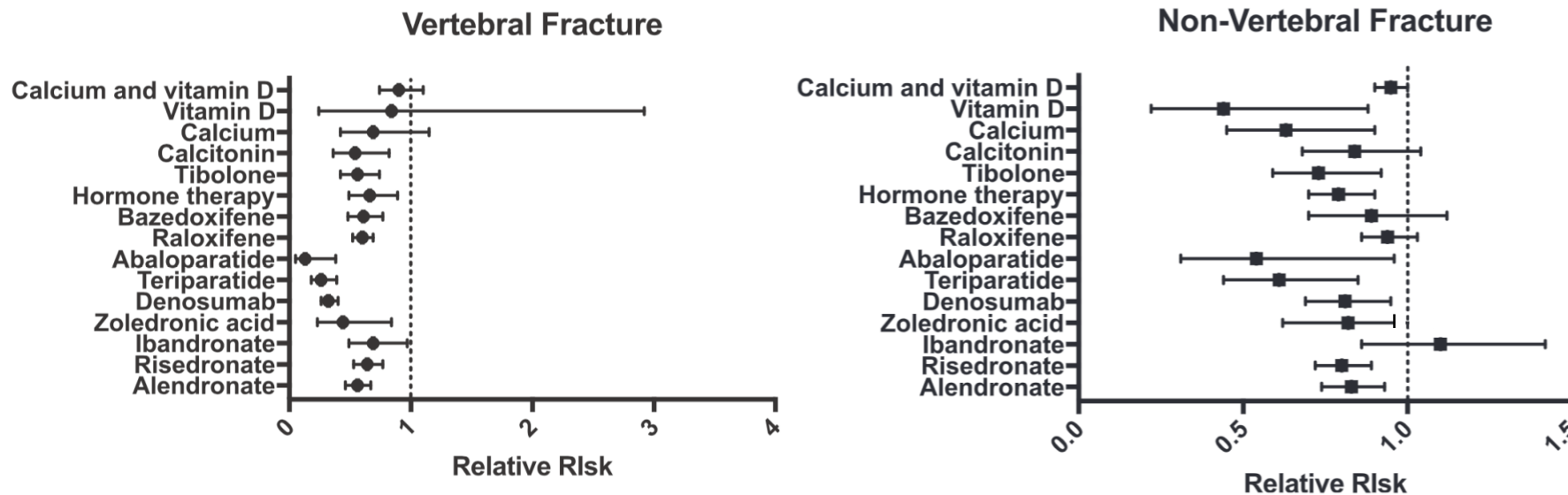
This article was published at www.annals.org on 25 October 2016.

FDA-approved Medications

Drug	Category	Mechanism of Action	Mode of administration	Side effects
Estrogen	Hormone replacement therapy	Anti-resorptive	PO daily	VTE, CVD, breast cancer
Raloxifene (Evista®)	Selective estrogen receptor modulator	Anti-resorptive	PO daily	Hot flashes, VTE
Alendronate (Fosamax®)	Bisphosphonate	Anti-resorptive	PO weekly	GI intolerance, ONJ, AFF
Risedronate (Actonel®)	Bisphosphonate	Anti-resorptive	PO weekly or monthly	GI intolerance, ONJ, AFF
Ibandronate (Boniva®)	Bisphosphonate	Anti-resorptive	PO monthly or IV q3 months	GI intolerance, ONJ, AFF
Zoledronate (Reclast®)	Bisphosphonate	Anti-resorptive	IV yearly	Inflammatory reaction, hypocalcemia, ONJ, AFF
Denosumab (Prolia™)	Monoclonal RANKL antibody	Anti-resorptive	SC q6 months	Hypocalcemia, ONJ, AFF, rebound fx after stopping
Teriparatide (Forteo®)	Recombinant PTH(1-34)	Anabolic	SC daily 2 year max	Hypercalcemia, theoretical risk of osteosarcoma
Abaloparatide (Tymlos®)	Recombinant PTHrp(1-34)	Anabolic	SC daily 2 year max	Hypercalcemia, theoretical risk of osteosarcoma
Romosozumab (Evenity®)	Monoclonal sclerostin antibody	Anabolic/Anti-resorptive	SC monthly 1 year max	? Cardiovascular risk

Pharmacological Management of Osteoporosis in Postmenopausal Women: An Endocrine Society* Clinical Practice Guideline

Richard Eastell,¹ Clifford J. Rosen,² Dennis M. Black,³ Angela M. Cheung,⁴ M. Hassan Murad,⁵ and Dolores Shoback^{6,7}



↓ 40-70%
fractures

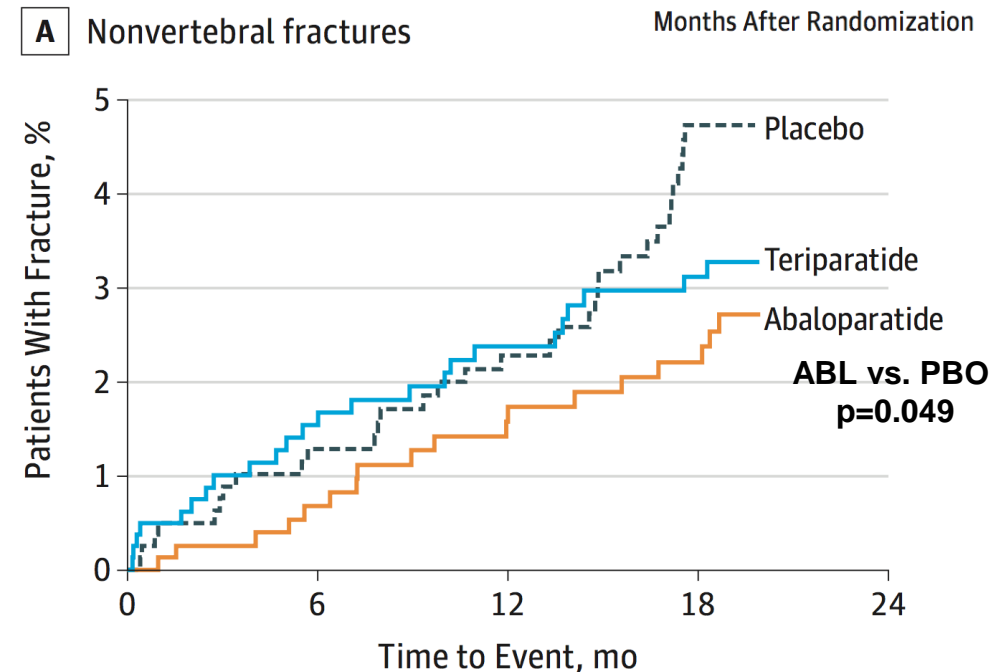
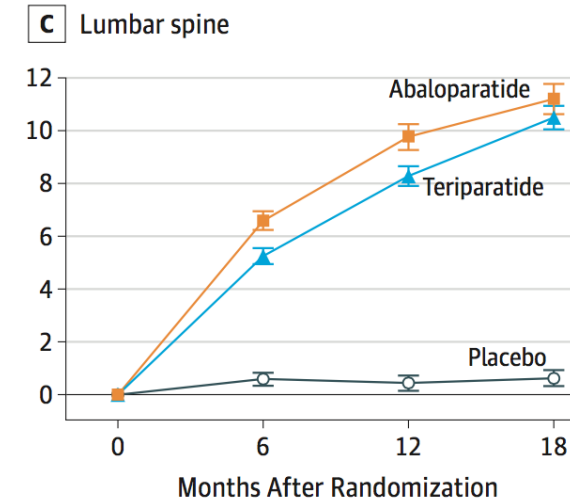
↓ 30%
fractures

Abaloparatide: PTHrP analog

FDA approved in 2017

- Daily SC self-injection
- Phase 3 trial (n=2463)
 - -86% vertebral fx
 - -43% nonvertebral fractures
- Potential concerns: hypercalcemia, (osteosarcoma)

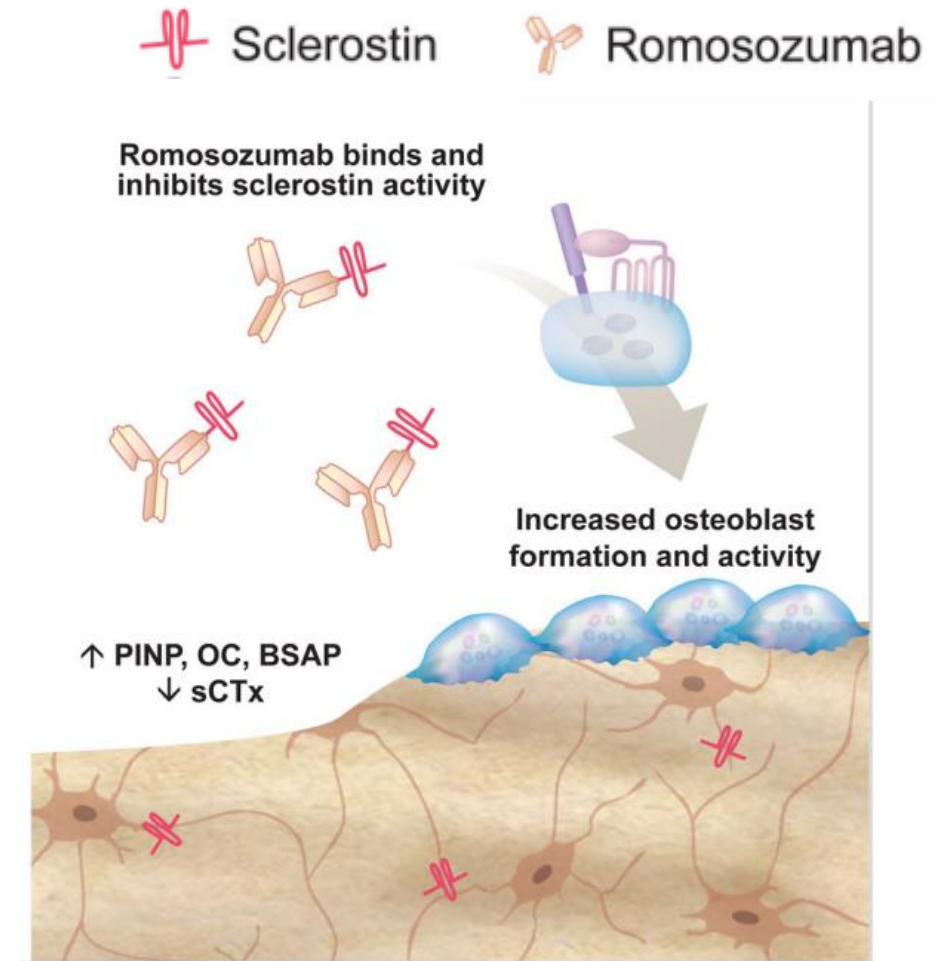
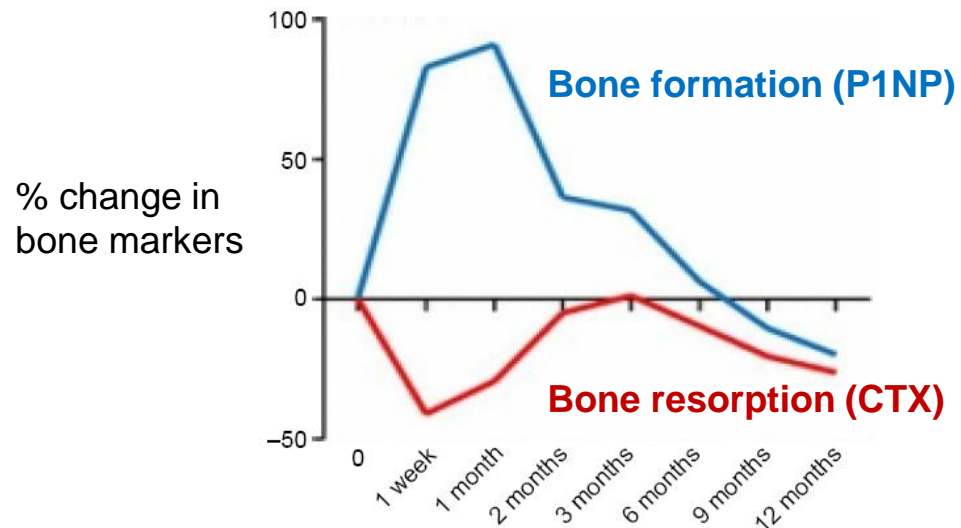
Abaloparatide does not require refrigeration



Romosozumab: sclerostin mAb

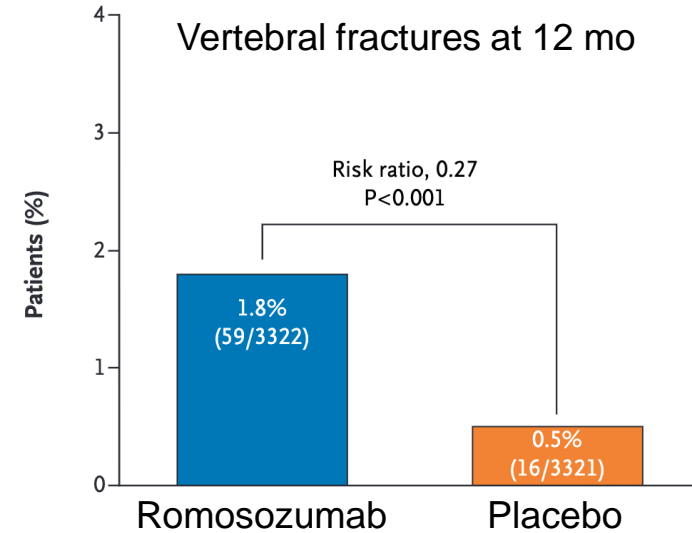
FDA approved in 2019

- Inhibits an inhibitor of bone anabolic pathway
- Mixed anabolic and antiresorptive effects



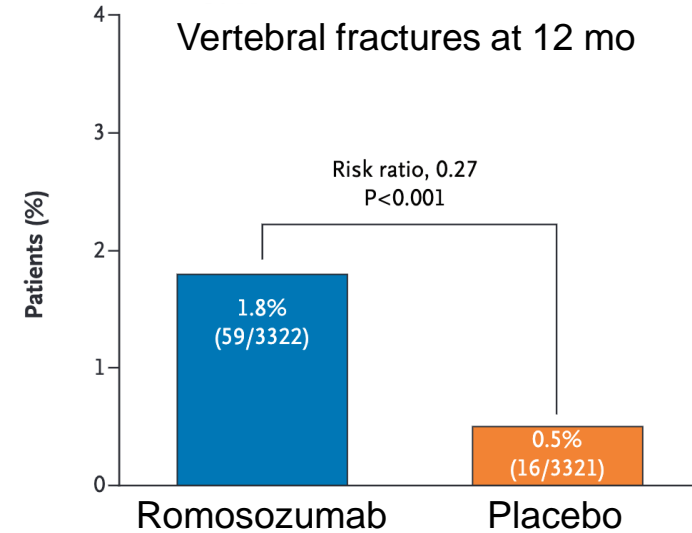
Romosozumab: anti-fracture efficacy

- SC injections once/month for 12 months
- Romo vs. Placebo (n=7180)
 - » 73% lower vertebral fx

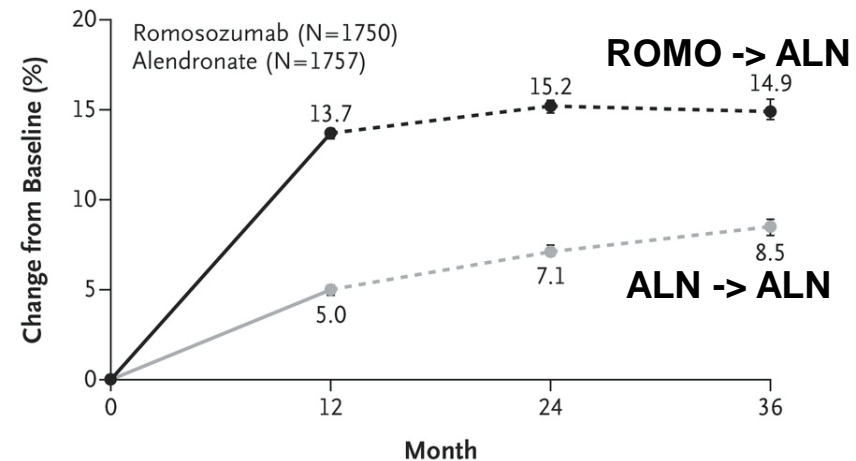


Romozosumab: anti-fracture efficacy

- SC injections once/month for 12 months
- Romo vs. Placebo (n=7180)
 - » 73% lower vertebral fx
- Romo vs. Alendronate (n=4093)
 - » 48% lower vertebral fx
 - » 38% lower hip fx
 - » CV events 2.5% vs 1.9%



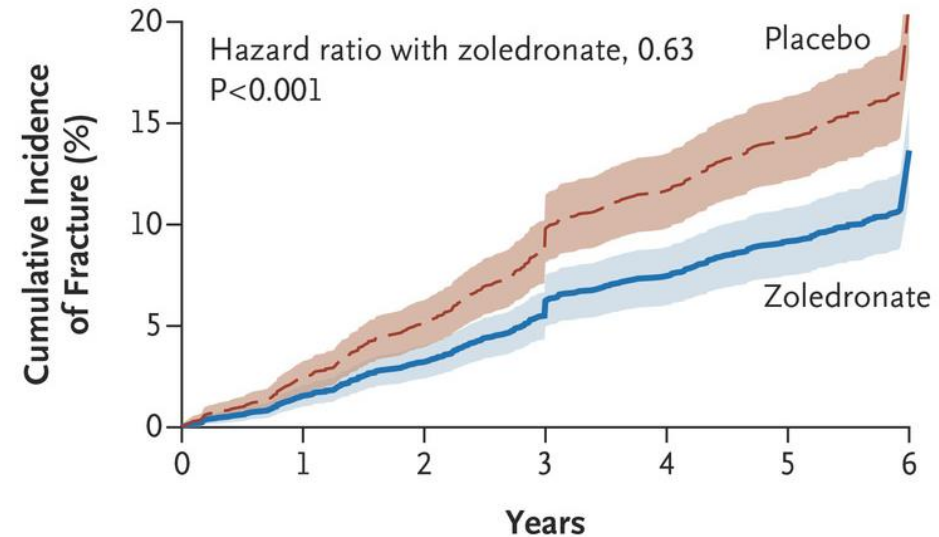
A Change in Bone Mineral Density at the Lumbar Spine



Zoledronate in Women with Osteopenia

- 2,000 osteopenic women, mean age 71 years
- Randomized to zoledronic acid 5 mg or placebo every 18 months for 6 years
- NNT to prevent 1 fracture = 10
- No ONJ or AFF

A First Fragility Fracture



No. at Risk

Placebo	1000	976	928	895	846	804	792
Zoledronate	1000	980	945	916	890	857	844

Hazard Ratio with ZOL

Cancer	0.67	(0.52-0.89)
MI	0.60	(0.36-1.00)
Death	0.65	(0.40-1.06)

If pharmacologic therapy is required, which medication to choose?*

Clinical Situation	Osteoporosis Rx
First-line therapy for most older adults	alendronate
Younger women with perimenopausal symptoms	hormone replacement therapy
Younger postmenopausal women	raloxifene or zoledronate
Recent hip fracture	zoledronate
GERD, gastric bypass	zoledronate
Poor compliance	zoledronate
Renal insufficiency	denosumab
Severe osteoporosis (particularly at the spine), and/or “failure” on standard therapy	teriparatide or abaloparatide or romosozumab

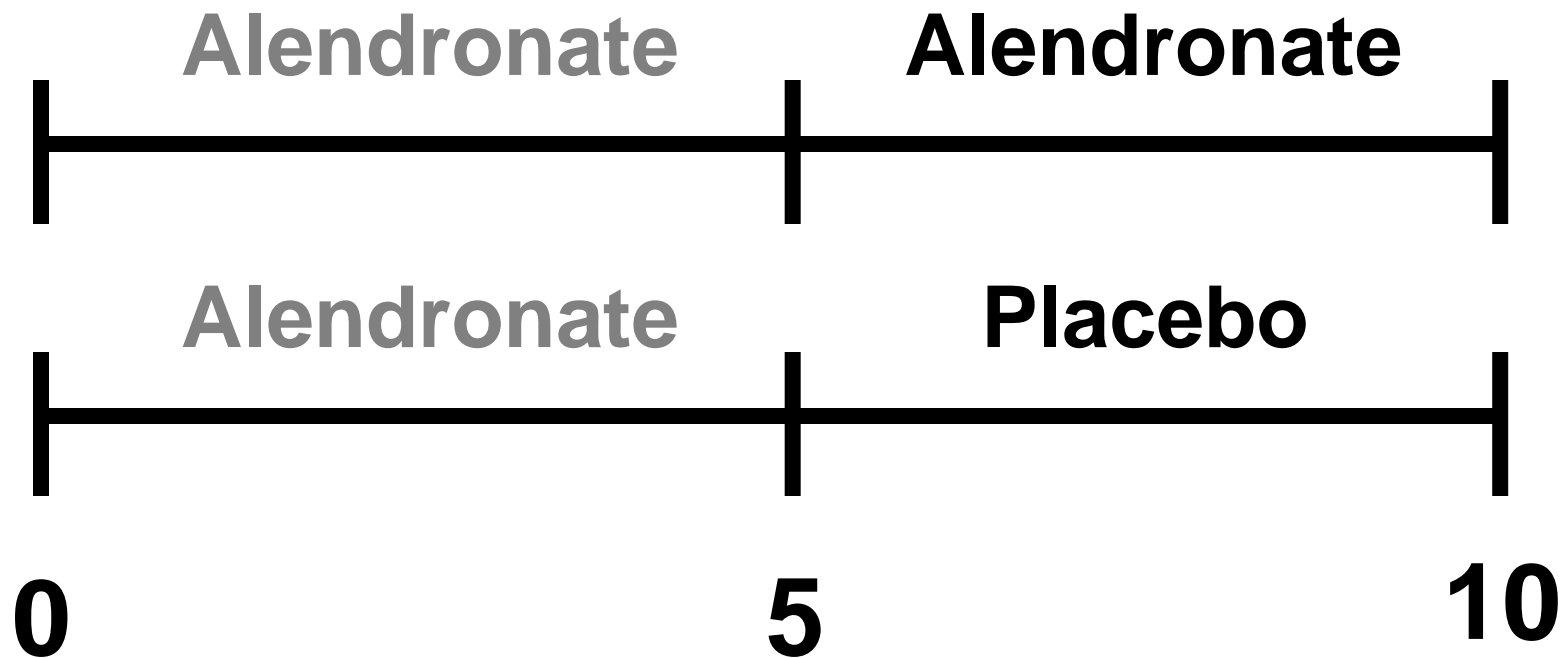
*personal opinion, not based on guidelines

How long to treat for?

- Bisphosphonates have a long half-life (~years) within the skeleton
 - May convey long-term fracture benefit even after stopping medication
 - Concern about long-term suppression of bone remodeling
- Long-term treatment (beyond 3-5 years) may have fracture benefit in high-risk patients

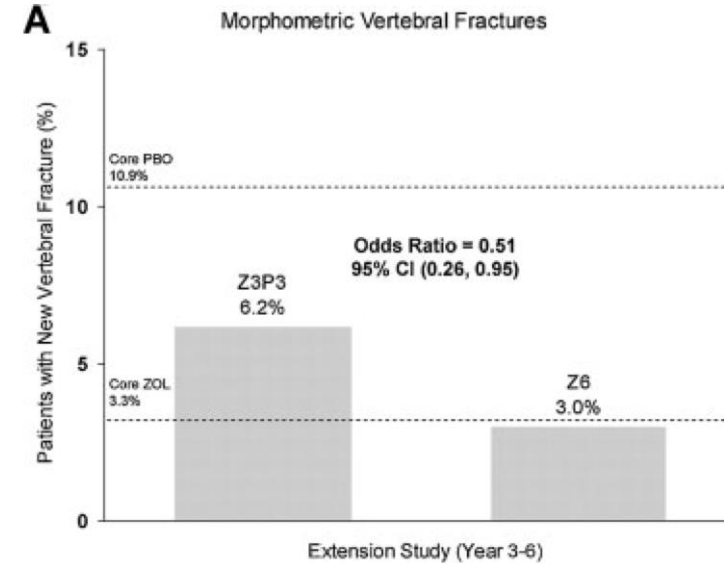
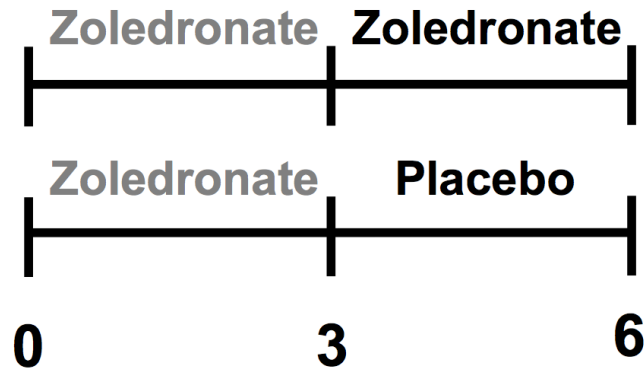
Long-Term Efficacy Data: alendronate (ALN)

- FLEX study: 10 yrs vs 5 yrs of ALN
 - Maintained or increased bone density in 10 yr ALN group
 - Fewer clinical spine fractures in 10 yr ALN group



Long-Term Efficacy Data: ZOL

HORIZON-PFT Extension study
N=1233 osteoporotic women



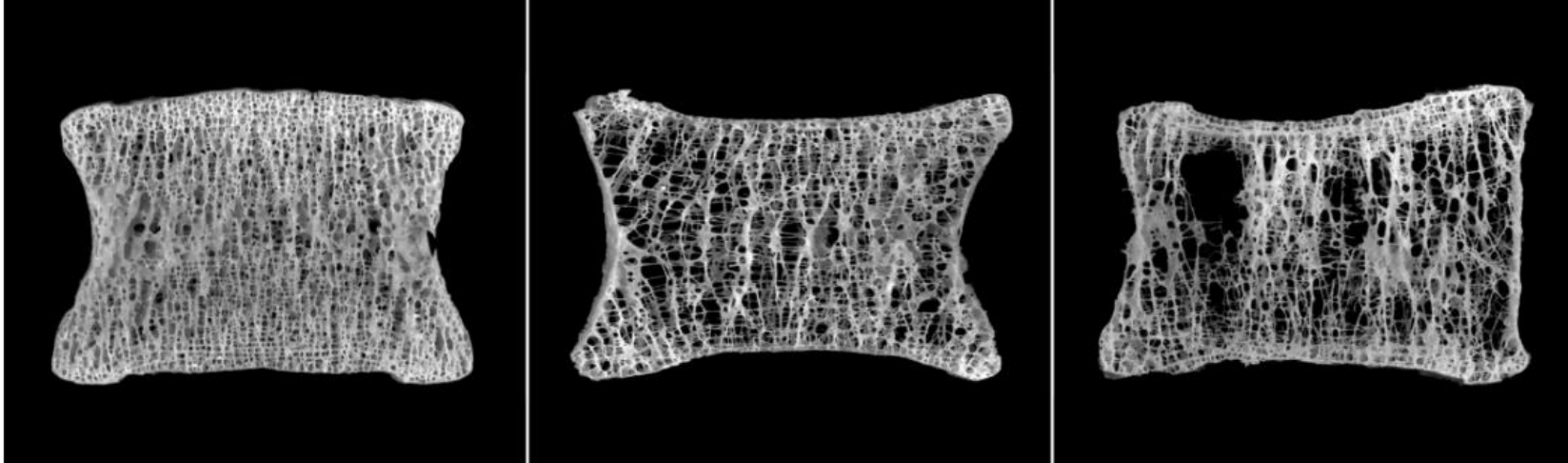
Black et al, JBMR 2012

Long-Term treatment with alendronate (up to 10 years) and zoledronate (up to 6 years) might reduce risk of vertebral fractures, particularly among patients who continue to have osteoporotic bone density

The New York Times

HEALTH

Fearing Drugs' Rare Side Effects, Millions Take Their Chances With Osteoporosis



NYT 6/2/2016

Osteonecrosis of the jaw

- Chronic condition >8 weeks, often with osteomyelitis
- Prevalence in bisphosphonate-treated osteoporosis population is low (1 in 10,000)
- Risk factors:
 - » major dental surgery (extractions/implants), poor underlying dentition, poor-fitting dentures
 - » chronic glucocorticoids, radiation therapy, high-dose bisphosphonate therapy
- American Dental Association does NOT require stopping bisphosphonate prior to procedure
 - » Consider stop ~3 months before elective procedure, restart ~1 month after

Atypical femoral fractures (AFFs)

Major Features: (required)

- Subtrochanteric or diaphyseal
- Minimal trauma
- Key radiologic features

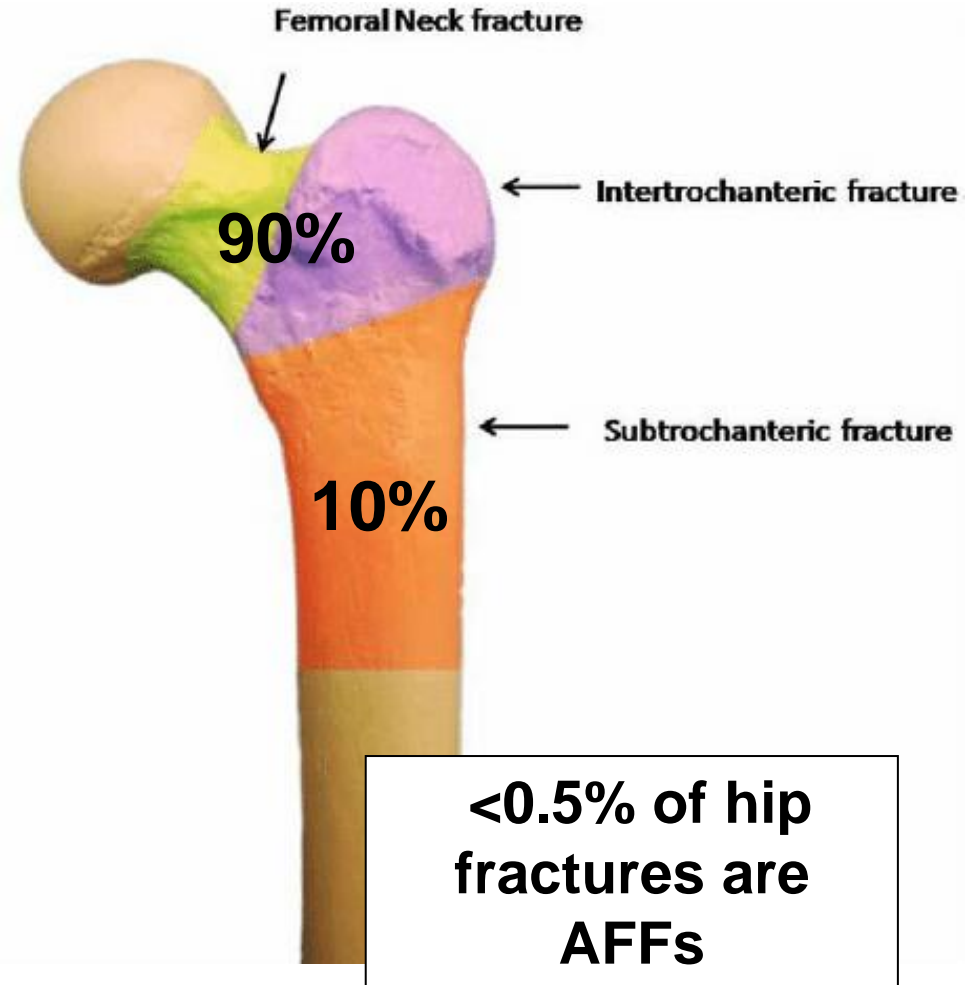
Transverse or short oblique fracture
Originates in lateral cortex
Noncomminuted

Minor Features:

- Frequently bilateral
- Prodromal pain
- Delayed healing
- Other radiologic features

Periosteal reaction / beaking
Increased cortical thickness

Standard Hip Fracture Locations



Atypical Femoral Fractures



Partial AFF



Complete AFF

Atypical femoral fractures

- **Associated with bisphosphonates and denosumab**
 - » Risk increases with longer duration of use
 - » Risk decreases quickly after stopping bisphosphonates
 - 70% decline in risk each year off bisphosphonate
- **Also occur among adults who have never taken antiresorptive medications**
- **Possible risk factors**
 - » Glucocorticoid use, genetics, hypophosphatasia, Asian-American ethnicity, femoral bowing

1200 Fractures prevented

Atypical femoral fractures occur in <0.1% of all patients treated with bisphosphonates

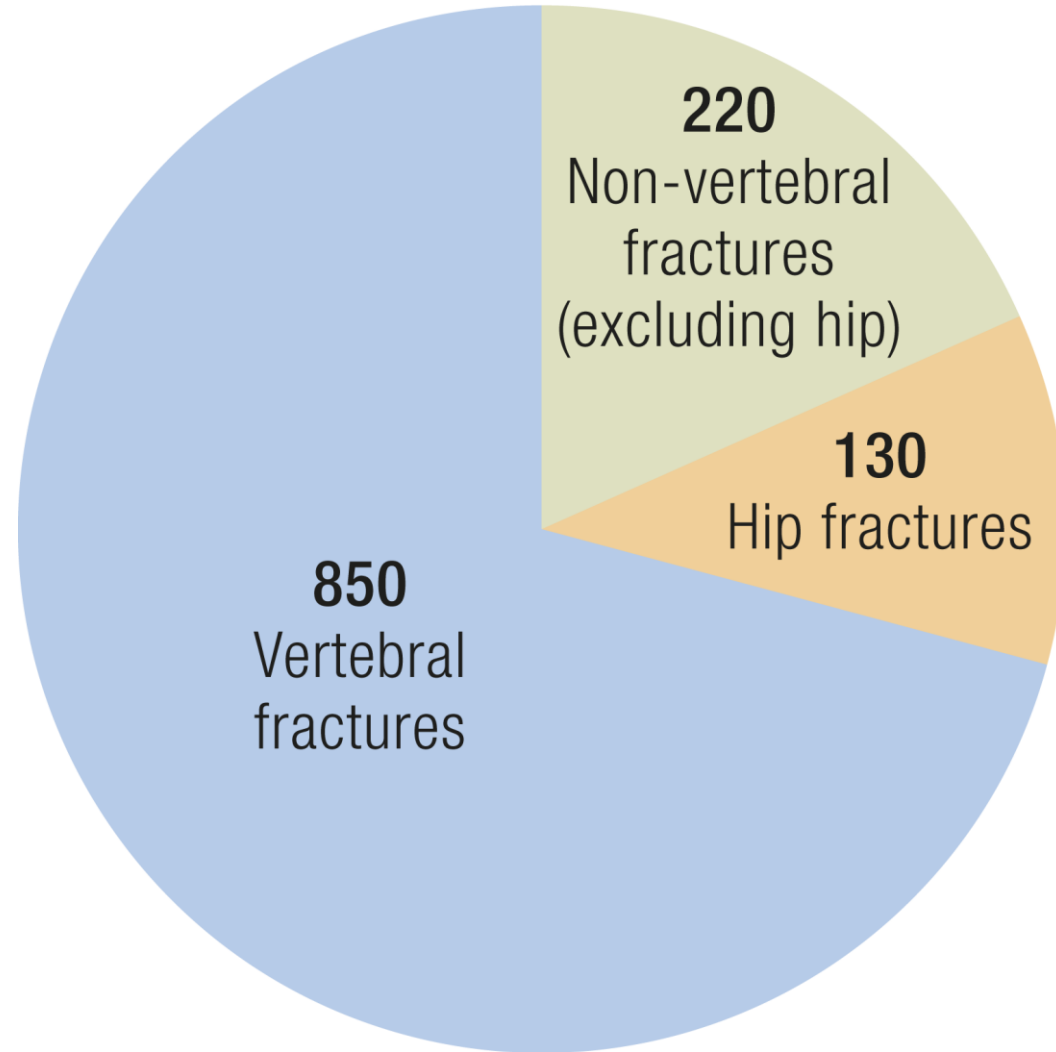
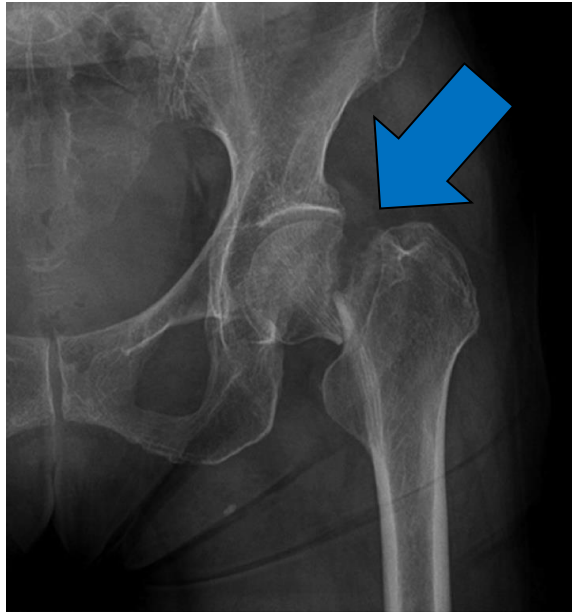


Figure 1. Fractures prevented for one AFF associated with 3 y of BP treatment in osteoporotic women. *Black et al, Endocrine Rev 2019*

Osteoporotic fractures can be prevented!

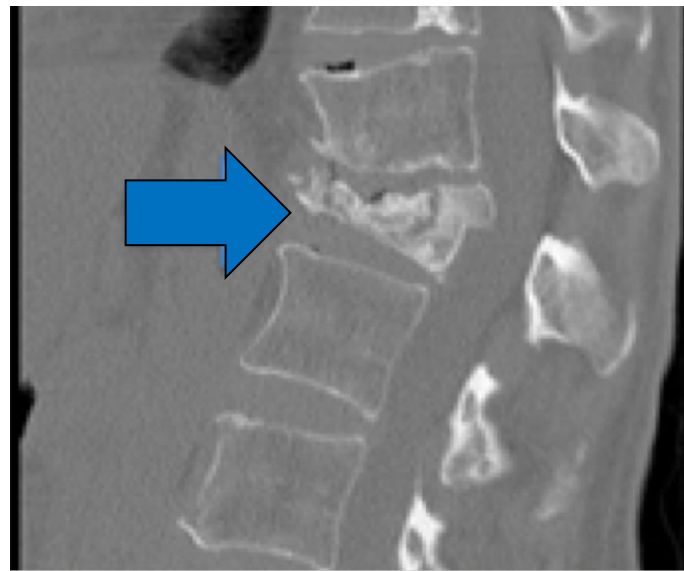


Femoral neck fracture



Wrist fracture

Vertebral compression fracture

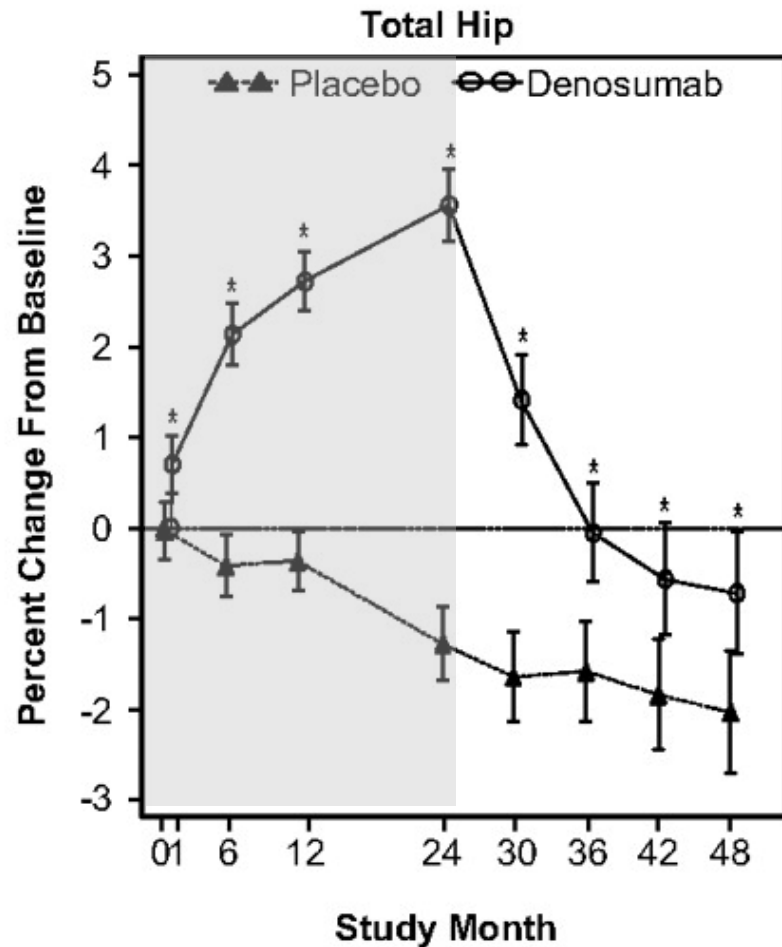


Drug holidays

- **Consider discontinuing antiresorptive therapy after 3-5 years if the patient's BMD and other risk factors no longer meet the criteria for initial treatment.**
 - **Monitor BMD and consider resuming treatment if rapid bone loss ensues**
- **Continue antiresorptive therapy for up to 10 years and/or switch to anabolic agent if the risk of fracture remains high.**
- **IMPORTANT: when stopping denosumab, it is necessary to transition to another osteoporosis agent**

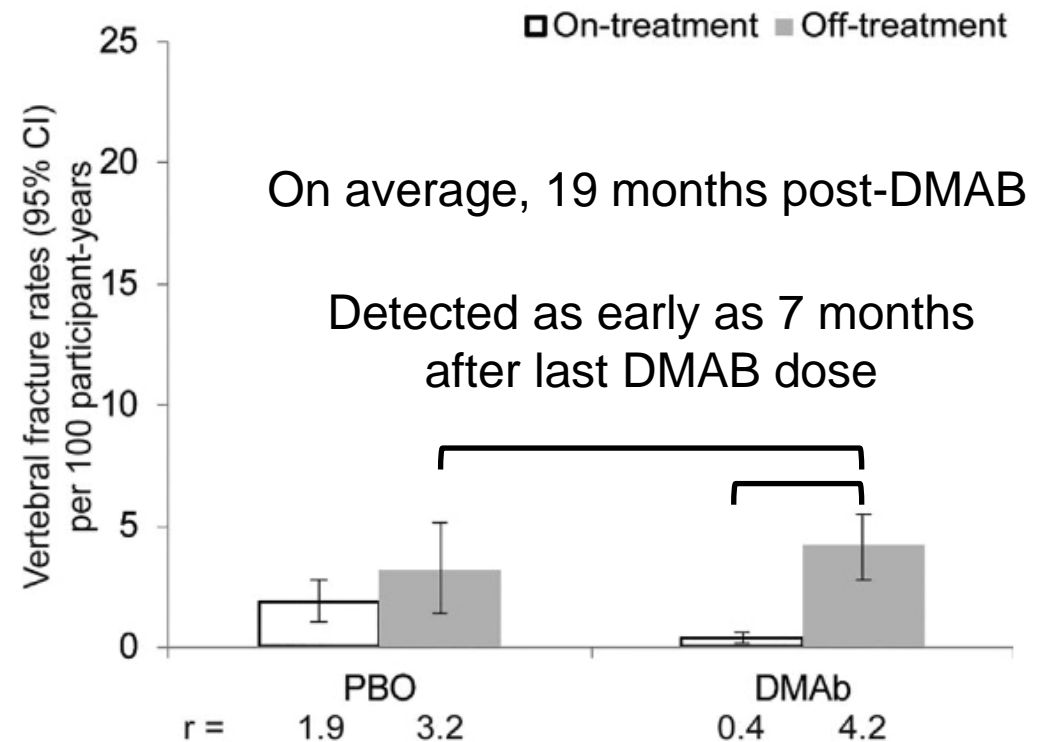
Denosumab Discontinuation

Rapid bone loss



Bone et al. JCEM 2011

Increased risk of rebound vertebral fractures



Cummings et al. JBMR 2018

Denosumab Discontinuation

Denosumab treatment duration	Upon discontinuation, recommend transition to new therapy		Notes
	Option 1	Option 2	
<3 years denosumab	Oral bisphosphonate for 1-2 years	IV bisphosphonate for 1-2 years	Do not skip or delay denosumab injections
3+ years denosumab or high fracture risk	Oral or IV bisphosphonate; may require more frequent IV dosing (e.g. q6 months)	Continue denosumab for up to 10 years	? Consider transition to raloxifene ? Consider transition to romozosumab Avoid direct transition to teriparatide or abaloparatide

Take-home points: Clinical updates

- **Osteoporosis is underdiagnosed and undertreated**
 - » Universal bone density screening of postmenopausal women ≥ 65 is recommended
 - » FRAX can identify patients at high risk of fracture
- **There are many effective osteoporosis treatments**
 - » Benefits far outweigh risks
 - » When stopping denosumab, it's important to transition to another osteoporosis agent to prevent rebound fractures
 - » Abaloparatide and romosozumab are new osteoporosis medications with excellent anti-fracture efficacy
 - » Zoledronate is an excellent option for osteopenic women