

# Osteoporosis Update

**UNM Continuum of Care Project  
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# Disclosure

## Institutional Grant / Research Support

Amgen, Lilly, Merck

## Scientific Advisory Board / Consulting

Amgen, Lilly, Merck, Radius, Alexion, Shire, AbbVie

## Speakers' Bureau

Shire, Alexion



In her 50' s

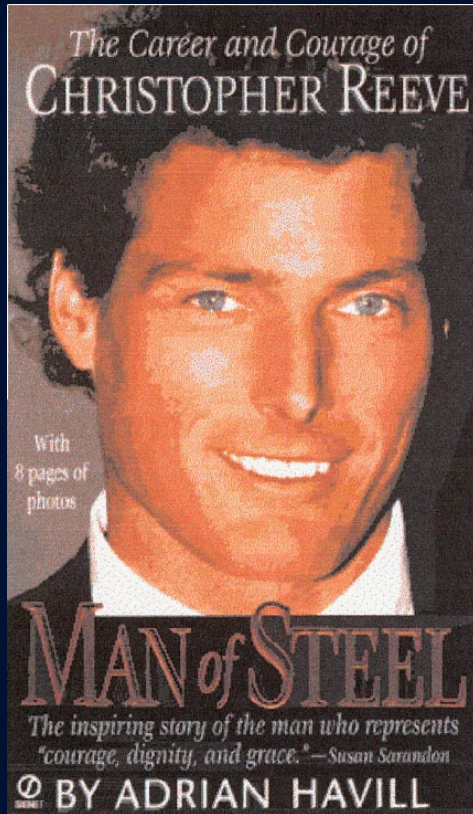


In her 70's

# Men with Osteoporosis



# Disuse Osteoporosis



- 1995 - Quadriplegia
- 1997 - Fx Left Humerus
- 2000 - Fx Left Femur
- 2004 - Died age 52

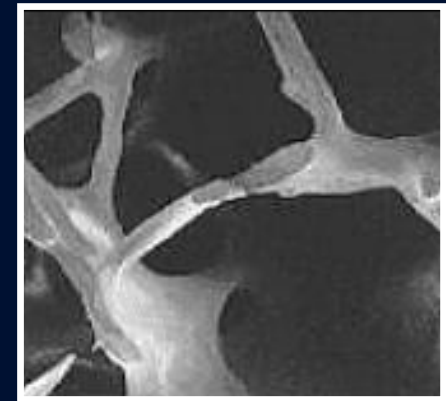
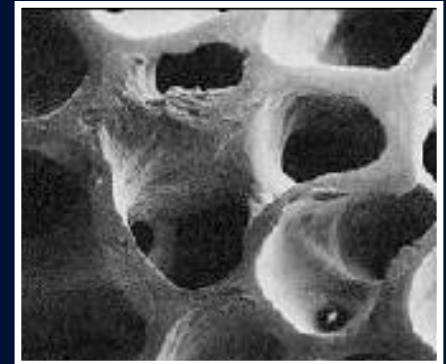


# Femur Fracture in CP Patient



# Osteoporosis

- A skeletal disorder characterized by compromised bone strength predisposing to an increased risk of fracture
- Bone strength reflects the integration of two main features: bone density and bone quality





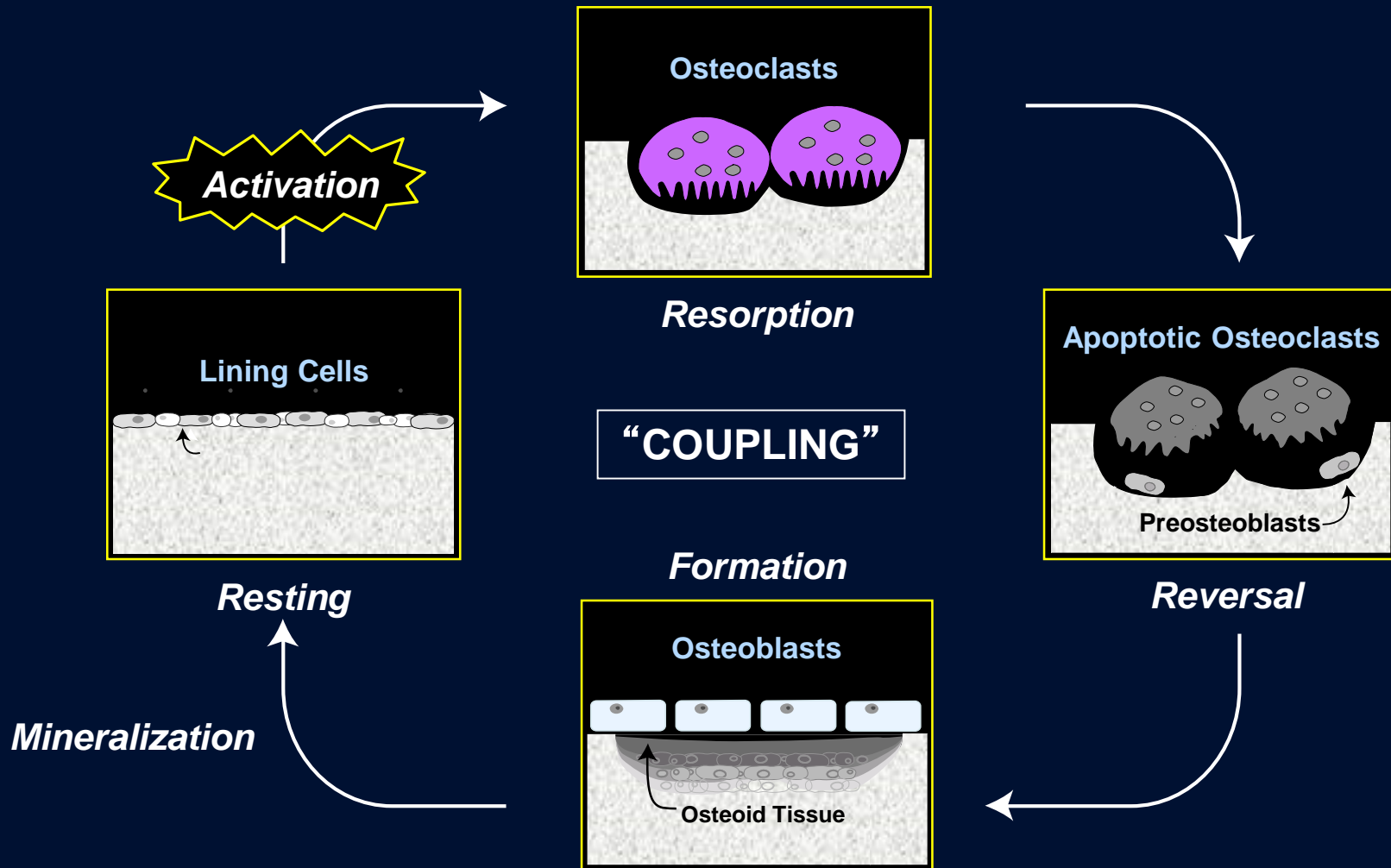
# Osteoporosis in the US

- 30% of women and 16% of men age 50 and older have osteoporosis
- 2 million osteoporotic fractures per year
- About 1 of every 2 Caucasian women and 1 of every 5 men will have an osteoporotic fracture
- Direct healthcare costs about \$19 billion per year

# Consequences of Fractures

- Chronic pain
- Disability
- Death
- Loss of independence
- 20% of hip fracture patients require long-term nursing home care and only 40% regain prefracture level of function
- Loss of height and reduced pulmonary function with vertebral fractures

# Bone Remodeling



# Osteoclast



Zaidi and Chambers, 1987

# Good News

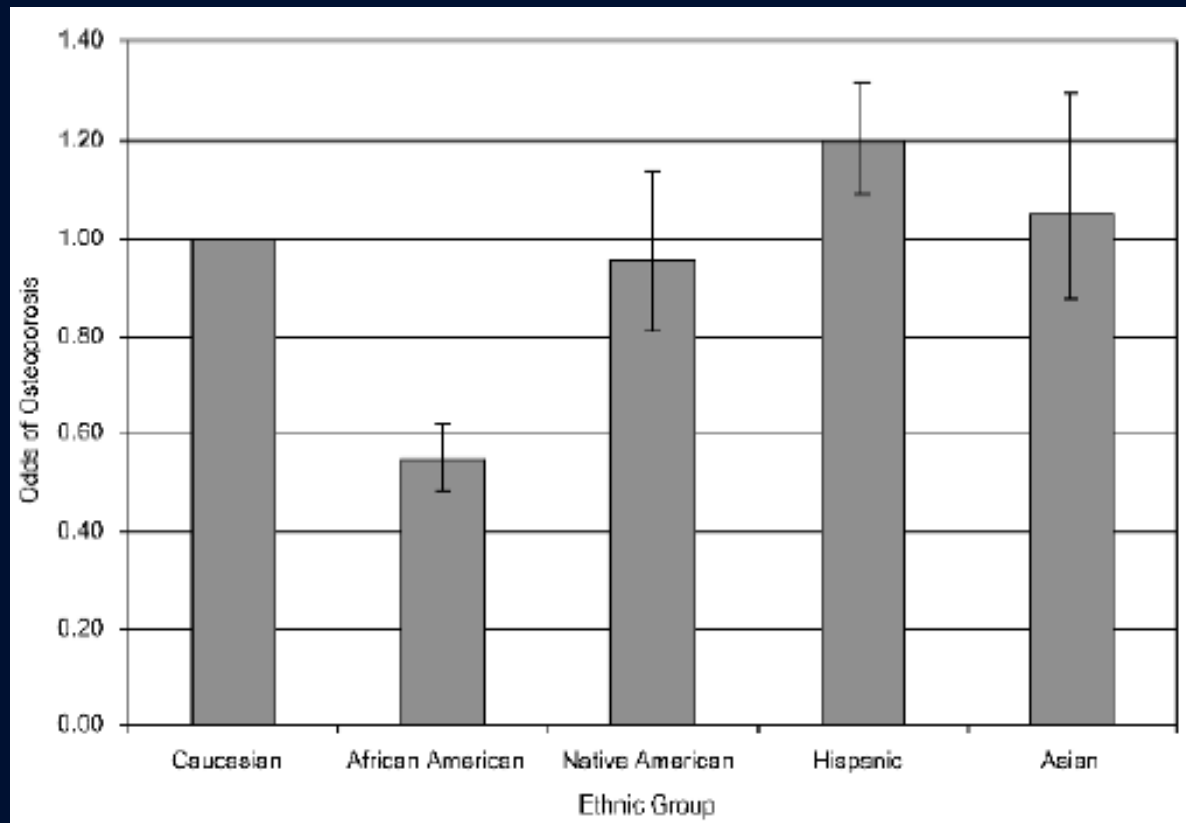
- Improving awareness
- Excellent diagnostic methods
- Validated fracture risk assessment tools  
Effective, safe, inexpensive treatments
- Better understanding of pathogenesis
- Emerging treatments
- Federal initiatives to improve care

# Bad News

- Underdiagnosis
- Undertreatment
- Poor adherence to therapy
- Poor understanding of risk/benefit ratio
- DXA quality suboptimal
- Restrictions on insurance coverage
- Medicare cuts in DXA reimbursement

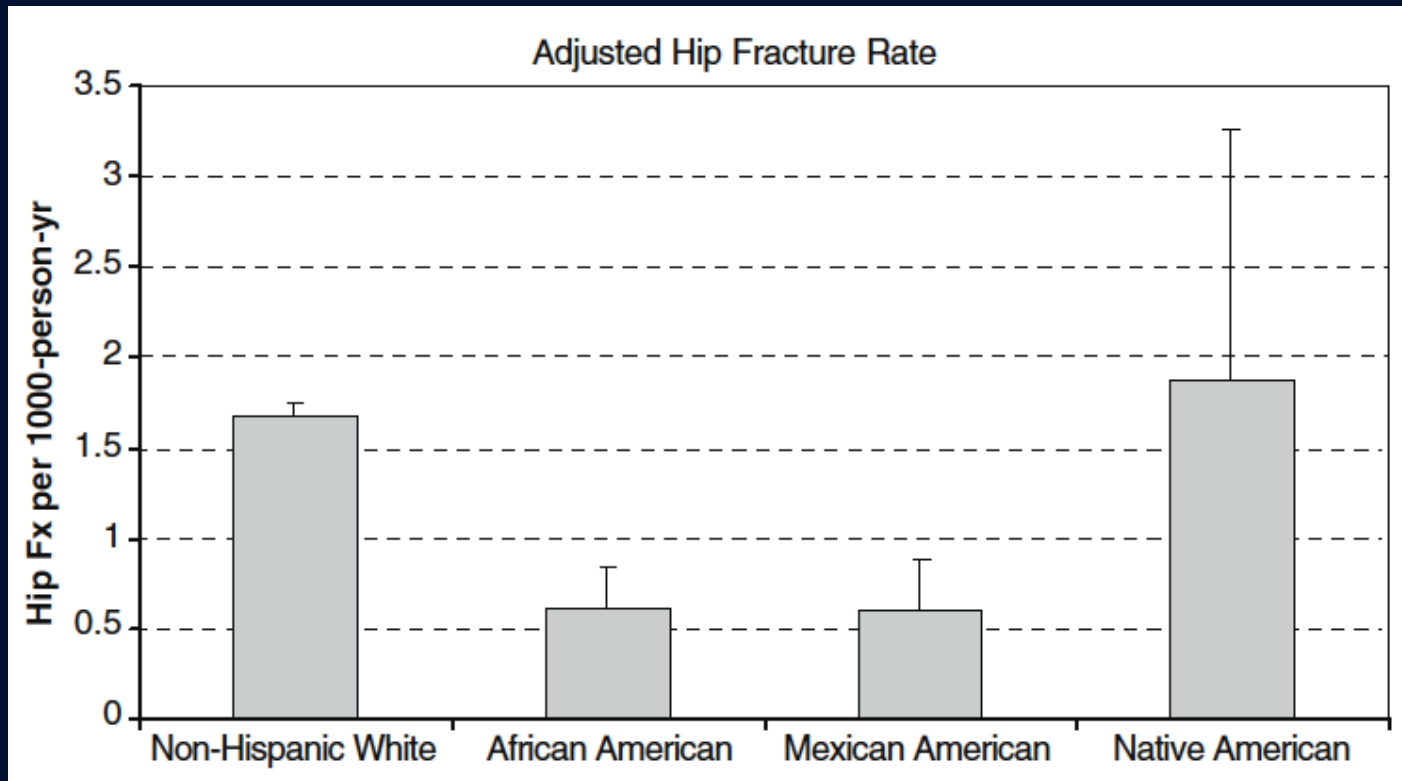
# Odds of Osteoporosis by Ethnicity

NORA Study in 197,848 postmenopausal American women,  
including 1708 Native Americans



# Hip Fracture Rates by Ethnicity

WHI Study in 159,579 postmenopausal American women





# A Real Story

- 76 year-old woman falls and breaks her hip
- ORIF in hospital goes well
- Discharged to rehab facility, then home
- 18 months later she falls, breaking her other hip
- Survives surgery, but eating poorly and ambulating with difficulty using walker
- Discharged to nursing home in poor condition
- Dies 2 months later

# What went wrong?

- No diagnostic tests for factors contributing to skeletal fragility
- No DXA
- No calcium, vitamin D, or medications to reduce fracture risk
- No attention to reducing fall risk

**FRACTURE IS A SENTINEL EVENT**

# Prior Fracture Increases the Risk of Subsequent Fracture

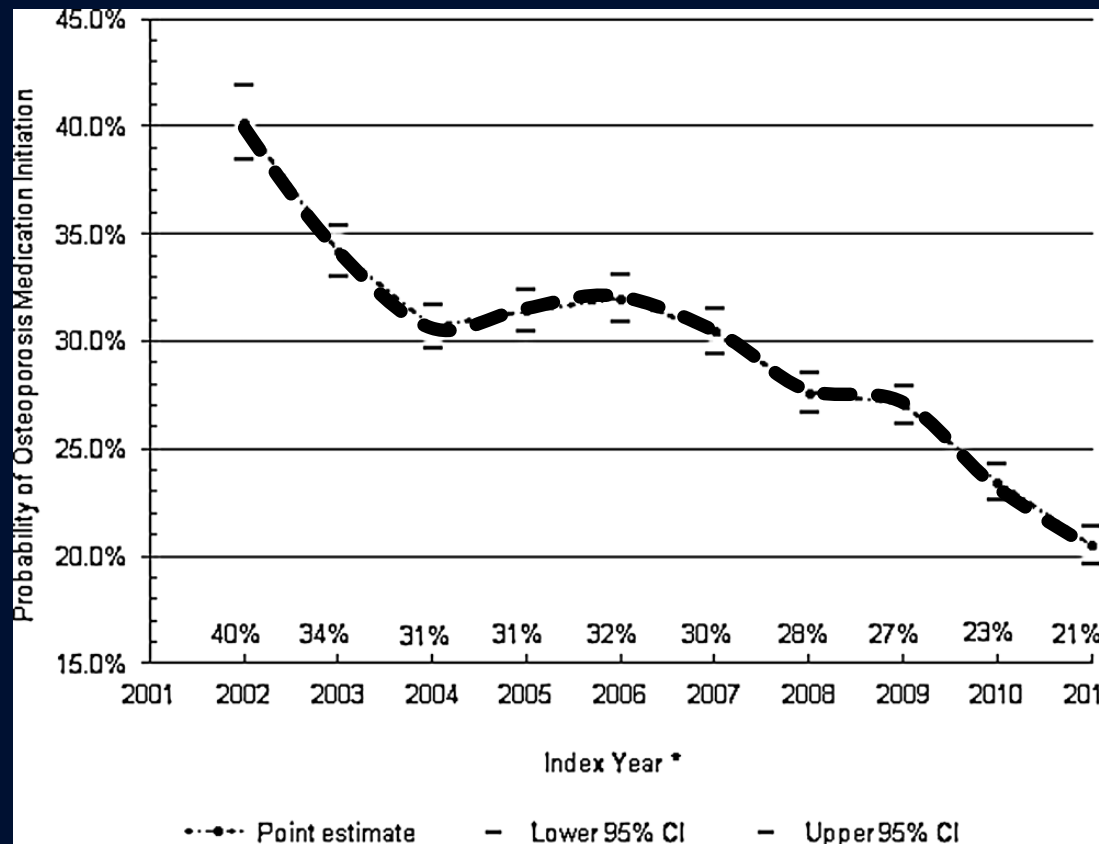
## Site of Subsequent Fracture

Site of Prior Fracture	Site of Subsequent Fracture		
	Wrist	Vertebra	Hip
Wrist	3.3	1.7	1.9
Vertebra	1.4	4.4	2.3
Hip	NA	2.5	2.3

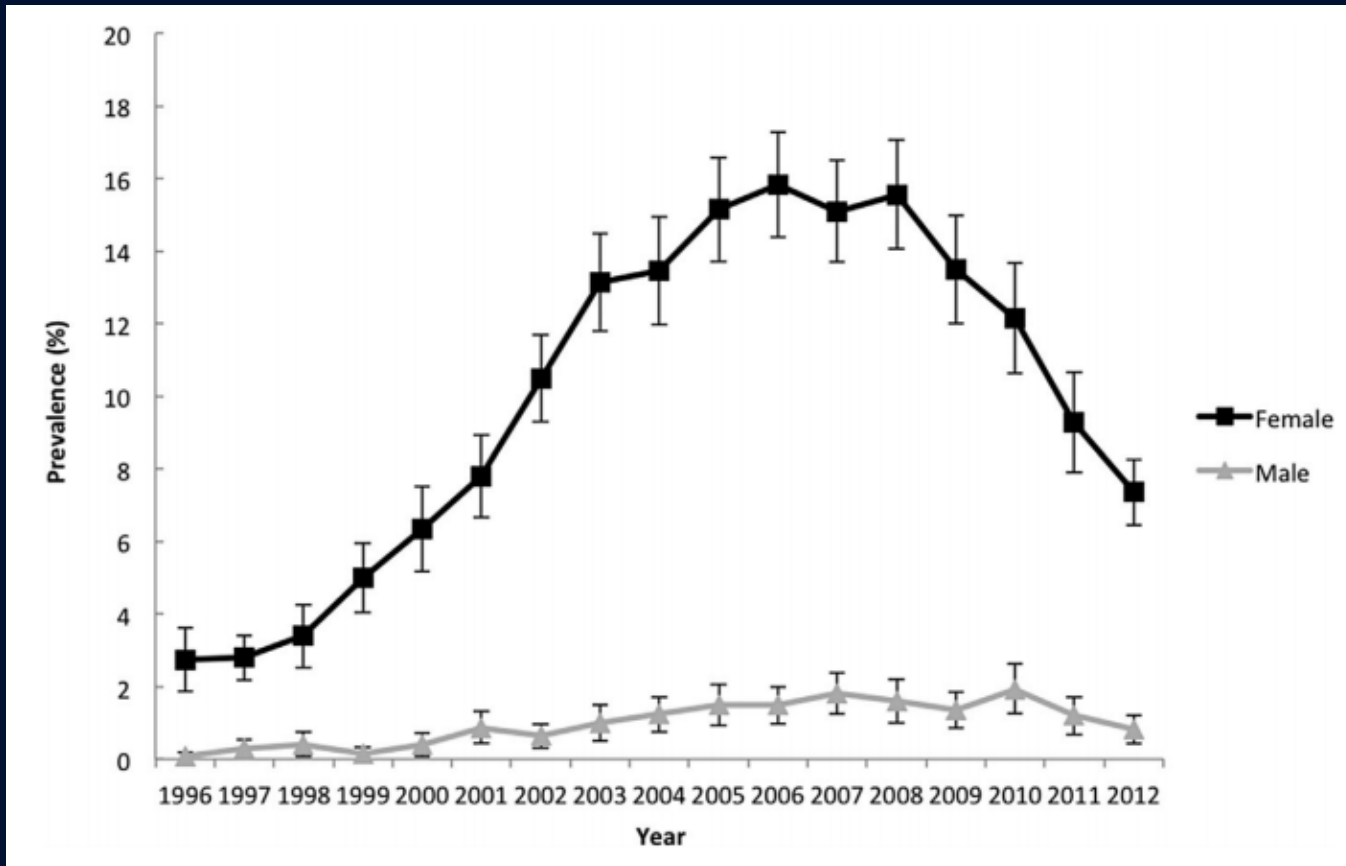
**About 1/2 of hip fractures are preceded by another fracture**

# Osteoporosis Treatment After Hip Fx

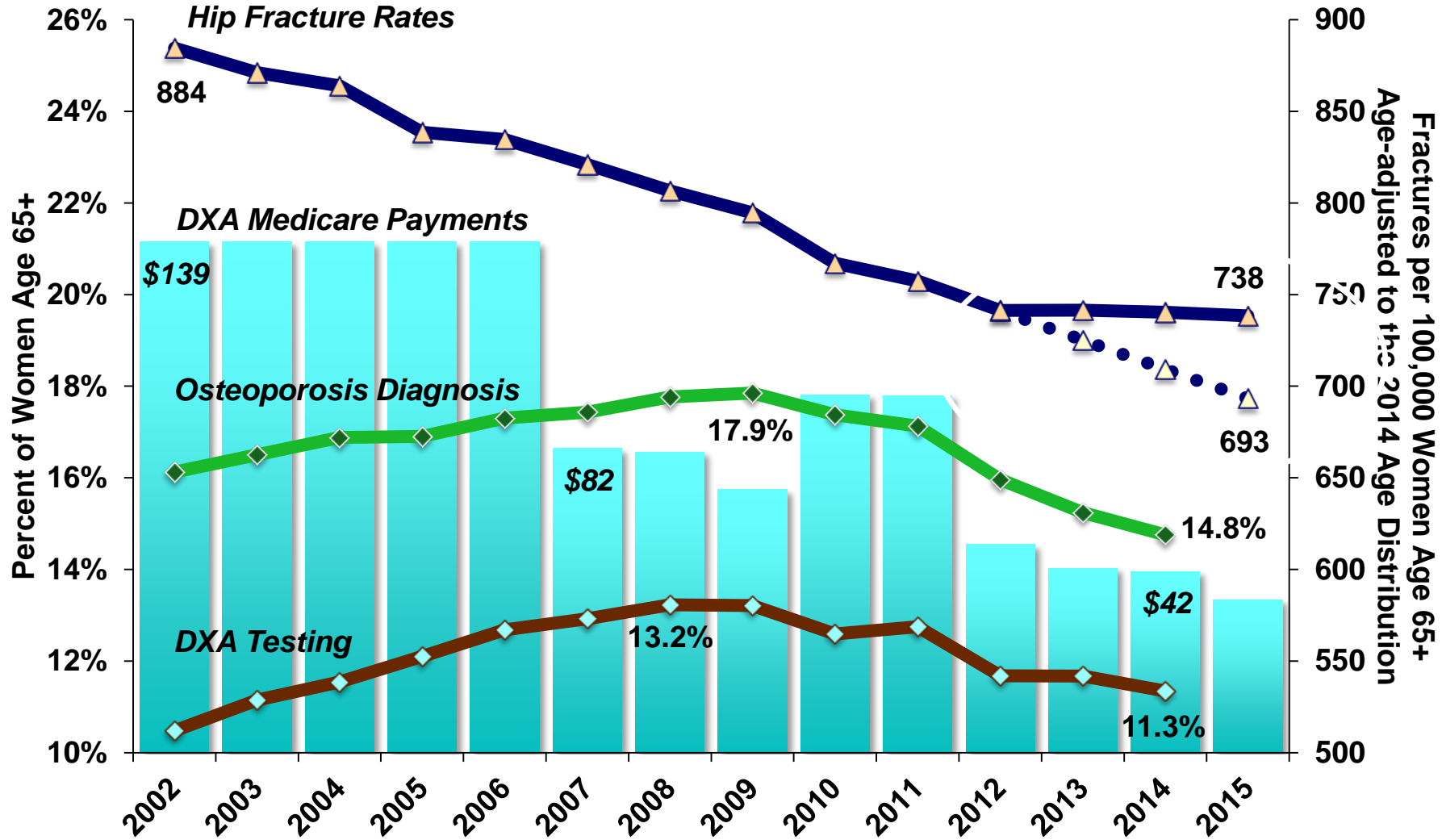
Review of US insurance claims data (commercial + Medicare)  
in 96,887 patients hospitalized with hip fracture, 2002-2011



# Reduced Bisphosphonate Prescription Rates Starting in 2008



# US Hip Fracture Trends 2002-2015



## **A Crisis in the Treatment of Osteoporosis**

“We must find ways to ensure that patients who need appropriate treatment for osteoporosis are not only prescribed effective medications, but are also equipped with the information they need to make an informed choice on taking these medications.”

## **Call to Action to Address the Crisis in the Treatment of Osteoporosis**

# Potential Solutions

- Increased awareness
- Clinical practice guidelines
- Better education
- Improved treatments
- Treat-to-Target (TTT)
- Fracture Liaison Services (FLS)
- Bone Health ECHO



**We can do better**

Reducing the osteoporosis  
treatment gap

**Fracture Risk Assessment**



**Intervention Thresholds**



**Treatment**



**Follow-up**

# Indications for BMD Testing

- Women age 65 and older, men age 70 and older
- Younger postmenopausal women, perimenopausal women, and younger men with risk factors
- Adults with a fragility fracture
- Adults with a disease, condition, or medication associated with bone loss
- Anyone being considered for pharmacologic therapy
- Anyone treated for osteoporosis to monitor treatment effect
- Anyone not being treated when evidence of bone loss would lead to treatment



# DXA Quality Matters

## **Best Practices for Dual-Energy X-ray Absorptiometry Measurement and Reporting: International Society for Clinical Densitometry Guidance**

*E. Michael Lewiecki,<sup>\*1</sup> Neil Binkley,<sup>2</sup> Sarah L. Morgan,<sup>3</sup> Christopher R. Shuhart,<sup>4</sup>  
Bruno Muzzi Camargos,<sup>5</sup> John J. Carey,<sup>6</sup> Catherine M. Gordon,<sup>7</sup>  
Lawrence G. Jankowski,<sup>8</sup> Joon-Kiong Lee,<sup>9</sup> and William D. Leslie<sup>10</sup> on behalf of  
the International Society for Clinical Densitometry*

Open access (free download) at [www.iscd.org](http://www.iscd.org)

# Assessing DXA Quality

- Ask about the following
  - ISCD certification for DXA tech and interpreter
  - ISCD facility accreditation
  - Precision assessment has been done and least significant change is known
- Look at report
  - Make and model of DXA instrument are identified
  - One diagnosis per patient, not different diagnosis for each skeletal site
  - One fracture risk assessment per patient, not different one for each skeletal site

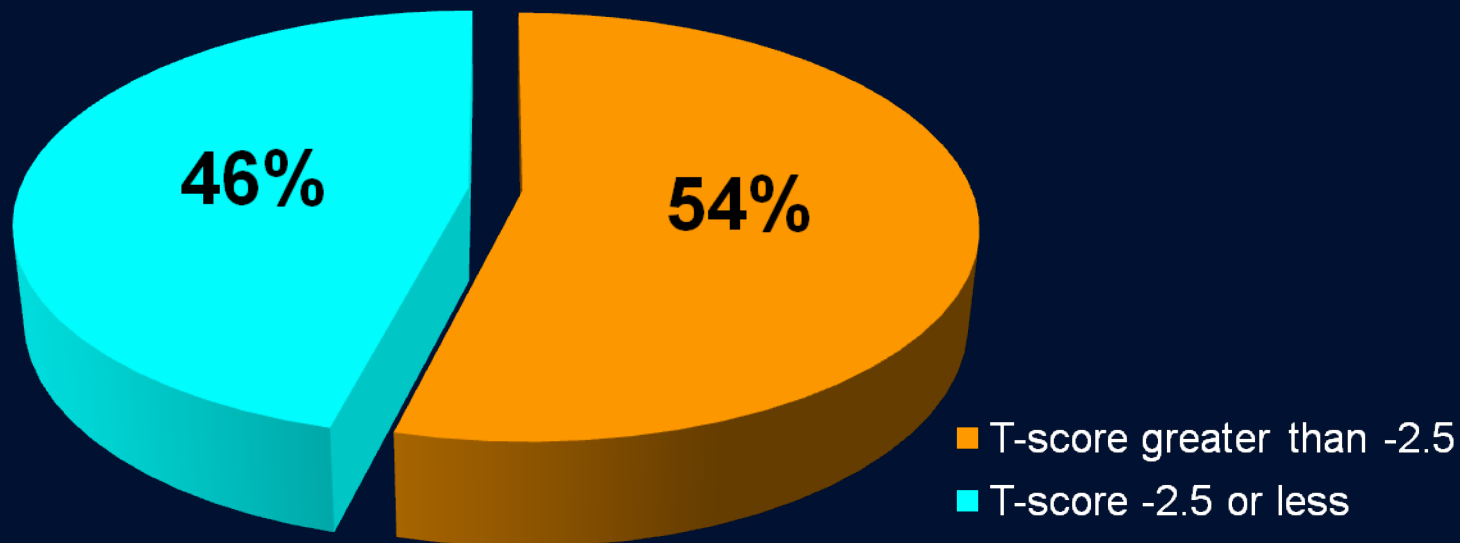
# WHO Classification of BMD

	T-score
Normal	-1.0 or higher
Osteopenia	Between -1.0 and -2.5
Osteoporosis	-2.5 or lower
Severe Osteoporosis	-2.5 or lower + fragility fracture

Reference standard for calculating T-scores  
is Caucasian female NHANES III database

# Most Women with Hip Fractures Do Not have a T-score $\leq -2.5$

243 women with hip fractures in  
Study of Osteoporotic Fractures





# Look for Vertebral Fractures

- VFs are common
- Most VFs are not diagnosed
- VFs have serious consequences
- VFs predict future fractures
- Detection of VFs may change diagnostic classification, assessment of fracture risk, and clinical management\*

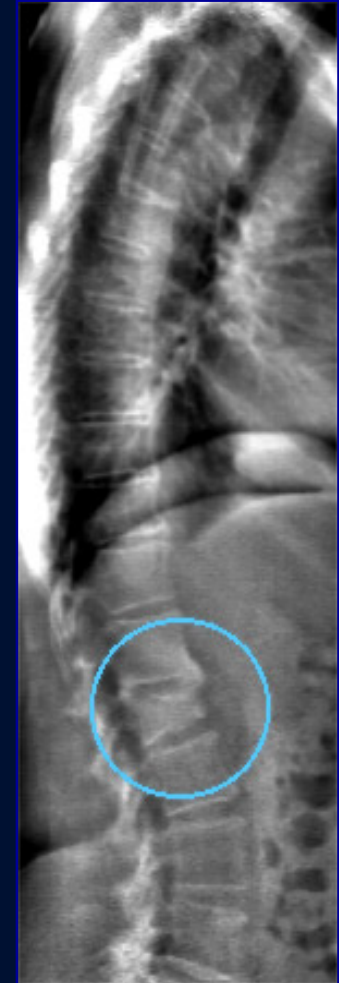
**\*NOF Guide: VF is indication for treatment regardless of BMD**

# Indications for Vertebral Imaging

- All women  $\geq$  age 70 and all men  $\geq$  age 80 with T-score  $\leq$  -1.0
- Women age 65-69 and men age 70-79 with T-score  $\leq$  -1.5
- Postmenopausal women and men  $\geq$  age 50 with risk factors for fracture
  - Prior low trauma fracture
  - HHL  $\geq$  1.5 inches or PHL  $\geq$  0.8 inches
  - Recent or ongoing glucocorticoid treatment

# VFA = Vertebral Fracture Assessment

A non-invasive method of diagnosing vertebral fractures by DXA with greater patient convenience, less cost, and lower radiation exposure than conventional X-ray



Carrier 1:10 PM

FRAX Result

**FRAX Score**  
23.2 BMI • BMD provided • March 24, 2014

**10 year probability of a fracture (%)**

**9.6% MAJOR OSTEOPOROTIC**

**3.4% HIP FRACTURE**

**TEST RESPONSES**

Country of Origin	Malta
Age	74
Sex	Male
Weight	131 Pounds
Height	5 Feet 3 Inches
Previous Fracture	No

**FINISH**

## DXA Results Summary:

Region	Area (cm <sup>2</sup> )	BMC (g)	BMD (g/cm <sup>2</sup> )	T - score	PR (%)	Z - score	AM (%)
Neck	4.54	2.76	0.607	-2.2	72	-0.9	86
<b>Total</b>	<b>26.77</b>	<b>19.35</b>	<b>0.723</b>	<b>-1.8</b>	<b>77</b>	<b>-0.8</b>	<b>88</b>

Total BMD CV 1.0%, ACF = 1.031, BCF = 1.000, TH = 5.207

10-year Fracture Risk<sup>1</sup>

Major Osteoporotic Fracture 17%

Hip Fracture 1.4%

## Reported Risk Factors:

US (Caucasian), Neck BMD=0.607, BMI=20.1, parental fracture

<sup>1</sup> FRAX<sup>®</sup> Version 3.01. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

01441328

Individuals with fracture risk assessed since 1st June 2011

# NBHA Position Statement: Clinical Diagnosis of Osteoporosis

In postmenopausal women and men age 50 years and older, osteoporosis may be diagnosed by....

- T-score  $\leq -2.5$  at the LS, TH, or FN
- Low trauma hip fracture regardless of BMD
- T-score between -1.0 and -2.5 with low trauma vertebral, proximal humerus, pelvis or some distal forearm fractures
- FRAX MOF risk  $\geq 20\%$  or HF risk  $\geq 3\%$

# NOF Treatment Guidelines

For postmenopausal women and men age 50 and older, consider treatment to reduce fracture risk, after appropriate evaluation for secondary causes, when . . .

- T-score  $\leq -2.5$  or less at FN, TH, or LS, or . . .
- Hip or vertebral (clinical or morphometric) fracture, or . . .
- T-score between  $-1.0$  and  $-2.5$  at FN, TH, or LS, and FRAX 10-year probability of hip fracture  $\geq 3\%$  or major osteoporotic fracture  $\geq 20\%$

# Many Causes of Low BMD

## Inherited

Osteogenesis Imp.

Homocystinuria

Marfan's syndrome

## Nutritional

Malabsorption

Chronic Liver Dis.

Alcoholism

Ca<sup>++</sup> deficiency

Vitamin D deficiency

## Endocrine

Hypogonadism

Hyperthyroidism

Cushing's syndrome

Hyperparathyroidism

Eating disorder

## Drugs

Glucocorticoids

Anticonvulsants

Heparin

Excess thyroid

Als

ADT

Chemotherapy

PPIs

Immunosuppressives

Depo-Progesterone

Tobacco

Lithium

Aluminum

## Other

MM

RA

Mastocytosis

Immobilization

# Laboratory Evaluation

- CBC
- Blood chemistries
  - Creatinine
  - Calcium
  - Phosphorus
  - Albumin
  - Alkaline phosphatase
  - Liver enzymes
- 25-OH-vitamin D
- 24-hour urine for calcium, sodium
- TSH
- Celiac antibodies
- Bone turnover markers
- Urinalysis
- sIFE, kappa/lambda light chain ratio
- Intact PTH
- Dexamethasone suppression or urinary free cortisol



# Universal Recommendations

- Calcium 1000-1200 mg/day, ideally from diet
- Vitamin D 800-1000 IU/day, target  $\geq 30$  ng/mL
- Regular weight-bearing and muscle-strengthening exercise
- Fall prevention
- Avoid tobacco use and excess alcohol
- Identification and treatment of risk factors for fracture
- Measure height annually (stadiometer)

# Stadiometer



# Calcium Tips

- Get enough calcium, but not too much
- Most people can get sufficient amount in diet
- Limited benefit and possible harm with calcium intake > 1200-1500 mg/day
- Does calcium supplementation cause cardiovascular disease?
  - Inconsistent findings on observational studies and secondary analyses of clinical trials
  - No conclusive evidence that calcium supplements increase cardiovascular risk
- Follow the guidelines

# Vitamin D Tips

- Measure serum 25-OH-D, NOT 1,25-(OH)<sub>2</sub>-D
- Target of 30-50 ng/ml is reasonable
- Supplemental vitamin D3 1000 IU/day increases serum 25-OH-D by about 6-10 ng/mL
- Pharmacological doses of vitamin D ( $\geq 50,000$  IU per day) rarely necessary except for symptomatic deficiency (eg, osteomalacia, myopathy)
- Non-skeletal benefits of vitamin D include improved balance and reduced falls
- Takes at least 3 months for new steady-state

# Medications for Osteoporosis

Inhibit Bone Resorption	Stimulate Bone Formation
Alendronate (Fosamax, generic)	Teriparatide (Forteo)
Risedronate (Actonel, Atelvia, generic)	
Ibandronate (Boniva, generic)	
Zoledronate (Reclast, generic)	
Denosumab (Prolia)	
Raloxifene (Evista, generic)	
Calcitonin (Miacalcin, Fortical)	
Estrogen (various)	
CE/BZA (Duavee)	

Investigational compounds: abaloparatide, romosozumab

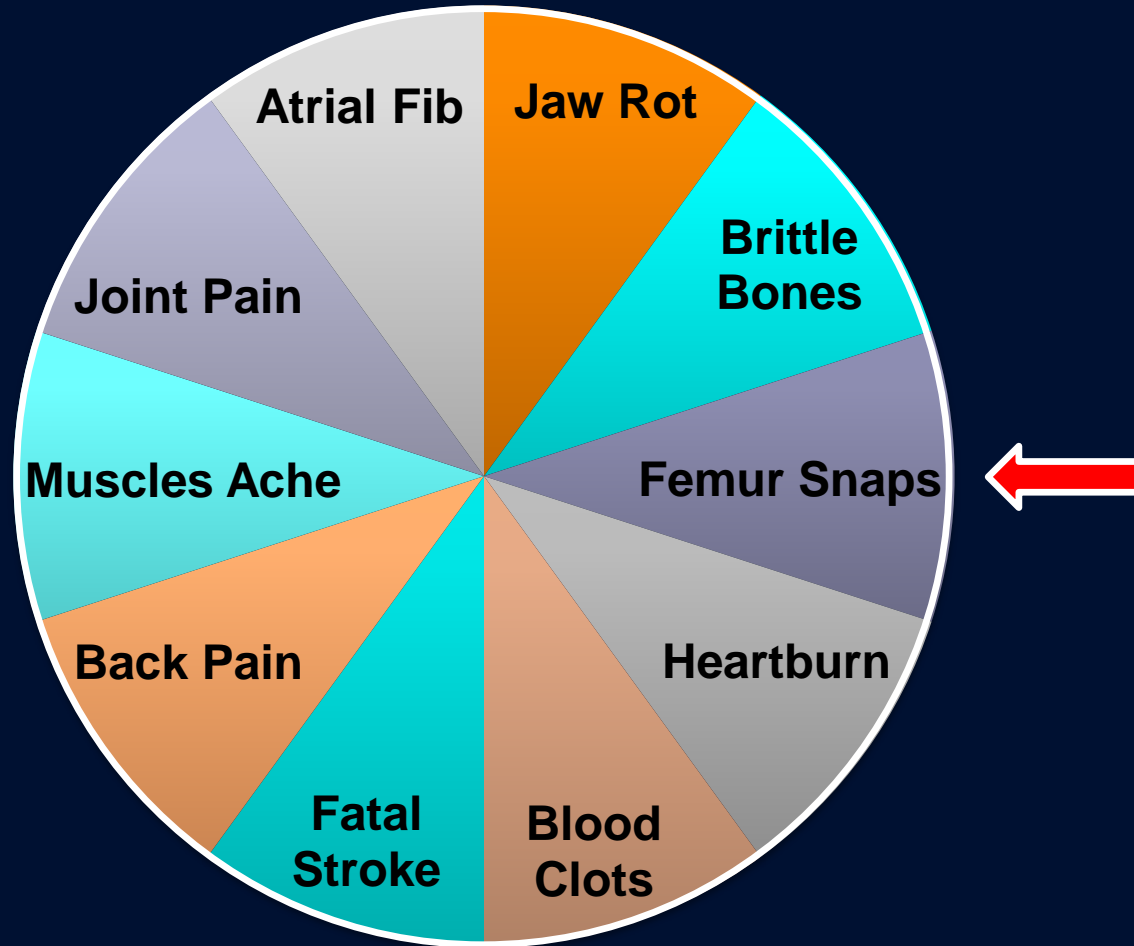
# Initial Choice of Therapy

- For most patients at high risk of fracture
  - Approved agents with efficacy to reduce hip, non-vertebral, and spine fractures are appropriate, including alendronate, risedronate, zoledronic acid, and denosumab
- For patients at especially high fracture risk
  - Consider teriparatide, denosumab, or zoledronic acid for patients unable to use oral therapy
- For patients requiring drugs with spine-specific efficacy
  - Raloxifene or ibandronate may be appropriate, in some cases

# Individualizing Initial Treatment

Agent	Comments
Oral BPs	Pro: inexpensive, work well in many patients Con: GI distress, avoid with low GFR, bad rep in lay press
ZOL	Pro: very long dosing interval, post-hip fracture data Con: acute phase reaction, avoid with low GFR, IV
Dmab	Pro: long dosing interval, greatest BMD increase, SC Con: FDA list of “side effects” (back pain, high cholesterol, etc.)
TPT	Pro: anabolic Con: high cost, daily injection, refrigeration, rat osteosarcoma
RLX	Pro: not a BP, decreases breast cancer risk Con: VTE, hot flashes, no proven hip fracture decrease

# Osteoporosis Wheel of Fear





# Bisphosphonate Safety Issues

## Side Effects

- Short-term
  - GI distress
  - Acute phase reaction
  - Hypocalcemia
  - Renal toxicity
- Long-term
  - Osteonecrosis of the jaw
  - Atypical femur fractures
- Questionable
  - Chronic musculo-skeletal pain
  - Atrial fibrillation
  - Esophageal cancer
  - Impaired fracture healing

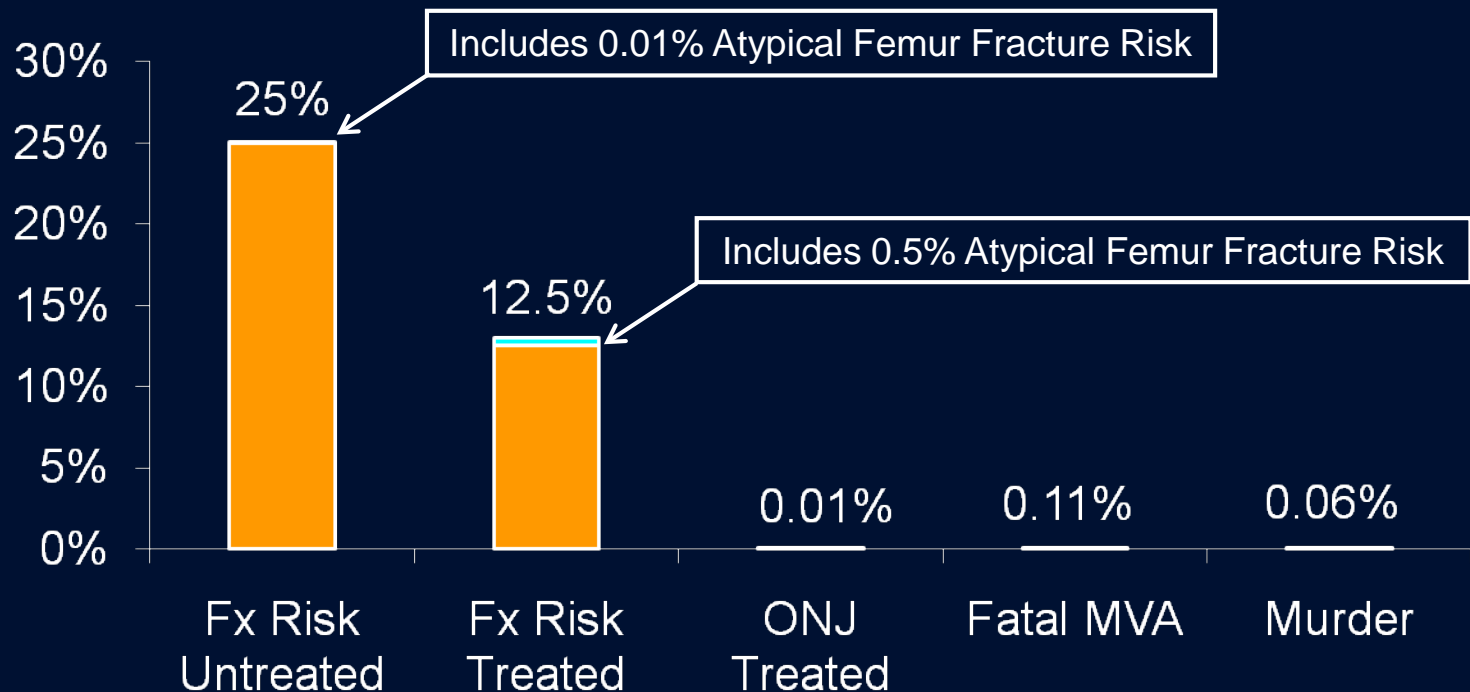
## “Side Benefits”

- Improved implant survival
- ↓ risk of breast cancer
- ↓ risk of endometrial cancer
- ↓ risk of colorectal cancer
- ↓ risk of stroke
- ↓ risk of gastric cancer
- ↓ risk of MI in RA patients
- ↓ risk of type 2 DM
- ↓ mortality

Prieto-Alhambra D et al. *Arthritis Rheum.* 2014;66:3233-3240.  
Chlebowski RT et al. *J Clin Oncol.* 2010;28:3582-3590.  
Newcomb PA et al. *J Clin Oncol.* 2015;33:1186-1190.  
Dreyfuss JH. *CA Cancer J Clin.* 2010;60:343-344.  
Newcomb PA et al. *Br J Cancer.* 2010;102:799-802.  
Rennert G et al. *J Clin Oncol.* 2010;28:3577-3581.  
Vestergaard P et al. *Calcif Tissue Int.* 2011;88:255-262.  
Rennert G et al. *J Clin Oncol.* 2011;9:1146-1150.  
Kang JH et al. *Osteoporos Int.* 2012;23:2551-2557.  
Abrahamsen B et al. *J Bone Miner Res.* 2012;27:679-686.  
Center JR et al. *J Clin Endocrinol Metab.* 2011;96:1006-1014.  
Wolfe F et al. *J Bone Miner Res.* 2013;28:984-991.  
Konstantinos A et al. *J Clin Endocrinol Metab.* 2015;100:1933-1940.  
Sambrook PN et al. *Osteoporos Int.* 2011;22:2551-2556.  
Lee P et al. *J Clin Endocrinol Metab.* 2016;101:1945-1953.

# 10-Year Probabilities

80 year-old woman with FN T-score = -3.3



Untreated probability of major osteoporotic fracture calculated by FRAX. ONJ estimate is ~1/100,000 patient-treatment-years from ASBMR Task Force by Khosla S et al. J Bone Miner Res 2007;22:1479-149. AFF estimate untreated is ~0.01/10,000 and treated is ~5/10,000 patient-years from Schilcher J et al. N Engl J Med. 2011;364:1728-1737. Risk estimates assume long-term bisphosphonate therapy resulting in 50% reduction in fracture risk. MVA and murder data from the CDC at [http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56\\_10.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56_10.pdf). Image copyright © 2011 Lewiecki EM. Slide version.

# How Long to Treat

- Only one drug has a time limit– 24 months with teriparatide
- All drugs except bisphosphonates stop working when stopped
- Bisphosphonates have a persistent antiresorptive effect when withheld after at least 3-5 years of treatment
- Rationale for a bisphosphonate “holiday” is persistence of anti-fracture benefit while possibly reducing long-term risks
  - NOT “drug retirement”
  - NOT “stopping treatment”
  - NOT for non-bisphosphonates
- Consider for patients no longer at high fracture risk
- End drug holiday when fracture risk is again high

# Postmenopausal Women Treated with Oral BP $\geq$ 5 Years or IV BP $\geq$ 3 Years

- **Low fracture risk**

- Definition: hip T-score  $>$  -2.5 and no hip, spine, or multiple osteoporotic fracture before or during therapy
- Suggestion: consider drug holiday of 2-3 years

- **High fracture risk**

- Definition: hip T-score  $\leq$  -2.5 or hip, spine, or multiple osteoporotic fracture before or during therapy
- Suggestion: consider continuing oral BP up to 10 years and IV BP up to 6 years

# Persons with Disabilities

# Risk Factors with IDD

- Malnutrition
- Immobility
- Falls
- Anticonvulsant medication

# Fracture Circumstances

- Up to 73% of fractures are unwitnessed
  - Peabody TD et al. Clin Orthop Rel Res. 1999;366:217-220.
- Cause of fracture cannot be determined in about 58% of cases
  - Lohiya et al. West J Med. 1999;170:203-209.
- More than half of these fractures are in the extremities
  - Tannenbaum TN et al. Am J Ment Retard. 1989;93:444-451.

# Treatment Challenges

- Poor nutrition
  - Adequate Ca and D needed for optimal bone health
- Limited ambulation
  - Treatment effects likely best with weight-bearing
- High fall risk
  - Can overcome benefits of drug therapy
- Disorders of swallowing
  - Contraindication for oral bisphosphonate
- Poor venous access
  - Difficult administration of IV bisphosphonate
- Lack of evidence for fracture risk reduction
  - Randomized clinical trials may never be done



# Low-trauma fractures and bone mineral density testing in adults with and without intellectual and developmental disabilities: a population study

R. Balogh<sup>1,2,3</sup> • J. Wood<sup>4</sup> • K. Dobranowski<sup>1</sup> • E. Lin<sup>2,5</sup> • A. Wilton<sup>2</sup> • S. B. Jaglal<sup>2,3</sup> • M. Gemmill<sup>6</sup> • Y. Lunsky<sup>2,5</sup>

- Review of 9 administrative healthcare databases in Ontario, Canada
- 30,522 adults age 40-64 with IDD diagnosis codes compared with 1.5 million same age adults without IDD diagnosis codes
- Outcome measures: rates of BMD testing and low-trauma fractures

# Results: Low-Trauma Fractures

- Fracture rates ~ 3x higher with IDD across all demographic variables (age, sex, rurality, income)
- For every 10,000 with IDD, 69 had a low-trauma fracture in a 1 year period
- Fracture type not reported

# Results: BMD Testing

- IDD patients with fractures
  - 16.2% had BMD test within 1 year
  - Women 2.6x more likely to have BMD test than men
- Non IDD patients with fractures
  - 21.5% had BMD test within 1 year (NS)
  - Women 3.5x more likely to have BMD test than men

# Severe Developmental Disabilities

- Chart review of 224 persons with DD living in a residential care facility between 1996 and 1999
- Mean age 25 (range 4 to 48)
- 65% with restricted mobility (bed or wheelchair)
- 40 (18%) had 47 low-energy fractures of the appendicular skeleton

# Fracture Types

	<i>Fracture sites</i>
Femur	27 (57%)
Humerus	11 (23%)
Tibia	4 (9%)
Fibula	2 (4%)
Clavicle	1 (2%)
Radius	1 (2%)
Metacarpal	1 (2%)

# Spinal Cord Injuries (SCI)

- Immediate unloading of bone results in increased bone resorption, decreased bone formation, and hypercalciuria
- Severe rapid bone loss below level of lesion over first 12-24 months
- One study showed 27% bone loss at distal femur in first 4 months
- Distal femur and proximal tibia most common sites of fracture
- Fractures typically occur with bending, transfers, and PT

# Treatment to Reduce SCI Bone Loss

- Cyclical muscle contraction with function electrical stimulation (FES) may have bone sparing effect
- Variable skeletal effects reported with bisphosphonates (e.g., IV ZOL) soon after SCI
- Mitigation of risk factors
- More study is needed

# Postpolio Syndrome

- Progressive neurological disorder with onset on new weakness, fatigue, and pain years after years of stability following acute polio
- Increased risk of falls and fractures
- Bisphosphonates appear to increase BMD similar to non-polio patients
- More study is needed



# Major Medical Illnesses

- Parkinson's disease
  - Low BMD, high fall risk, 4x increase risk of hip fracture
- Stroke
  - Low BMD, high fall risk, 2x increase risk of hip fracture
- Dementia
  - 2.6x increase risk of hip fracture
- Congestive heart failure
  - 2.5x increase risk of major osteoporotic fracture
- HIV
  - 1.6x increase risk of all fractures

# Treatment to Reduce Fracture Risk with Major Medical Illnesses

- Fall prevention
  - > 90% of hip fractures result from falls
- Pharmacological therapy
  - According to guidelines
  - Consider competing healthcare priorities

# Review of Osteoporosis Treatments in Persons with Disabilities

- SCI
  - Standing and treadmill walking when appropriate, BP within first 6 weeks may help
- Stroke
  - Early ambulation and BP within 5 weeks may help
- ALS
  - BP may help
- PD
  - BP may help
- Conclusion: many uncertainties, more study needed with fracture as primary outcome

# Denosumab

- Fully human monoclonal antibody to RANKL
- Administered SC Q6M
- Avoids concerns with GI adverse effects of oral BPs and venous access needs for IV BPs
- Potential advantages over BPs for some patients with disabilities, but more expensive and no comparative data



ASSEMBLY  
POSTURE  
INSTRUCTIONS

To

PORTABLE  
BREATHING  
APPARATUS

PORTABLE  
FIRE  
EXTINGUISHER

3

# **Skeletal Health in Long-Duration Astronauts: Nature, Assessment, and Management Recommendations from the NASA Bone Summit**

Eric S Orwoll,<sup>1</sup> Robert A Adler,<sup>2</sup> Shreyasee Amin,<sup>3</sup> Neil Binkley,<sup>4</sup> E Michael Lewiecki,<sup>5</sup>  
Steven M Petak,<sup>6</sup> Sue A Shapses,<sup>7</sup> Mehrsheed Sinaki,<sup>8</sup> Nelson B Watts,<sup>9</sup> and Jean D Sibonga<sup>10</sup>

- Review of data for 35 astronauts with ISS missions of 120-180 days
- Average rate of bone loss 1.0 to 1.5% per month at hip and lumbar spine (typical age-related bone loss is 0.5 to 1.0% per year)
- Variability of BMD recovery with return to earth
- No fractures in space
- Anticipation of Mars mission

# Risk Mitigation Strategies

- Pre-flight
  - Selection standards
  - IV ZOL?
- In-flight
  - ARED (advanced resistive exercise device)
- Post-flight
  - Risk surveillance



# New Strategies to Reduce the Osteoporosis Treatment Gap



# Treat-to-Target

- Treat-to-Goal
- Goal-directed Treatment
- TTT
- T3
- T2T

**Treatment may be fully effective yet fracture risk remain unacceptably high**

**Response to treatment is not the same as achieving an acceptable level of fracture risk**

If a target for achievable and acceptable fracture risk could be identified, then physicians could customize treatment to reaching this target

# Starting Treatment

- Now: first line therapy is usually generic oral bisphosphonate unless contraindicated
- TTT: first line therapy is the agent most likely to result in an acceptable level of fracture risk

# Managing a Treated Patient

- Now: we monitor for response to therapy
  - Good response: BMD stable or increases, or BTM responds as expected ➔ continue treatment
  - Poor response: BMD decreases, BTM fails to change as expected, or fracture ➔ reevaluate, consider change in therapy
  - Bisphosphonate holidays poorly understood and often misused
- TTT: we monitor for achievement of an acceptable level of fracture risk
  - Fracture risk becomes acceptable ➔ continue treatment or consider drug holiday if on bisphosphonate
  - Fracture risk remains high ➔ continue treatment or consider changing to more robust agent

# March 2013

Position Statement

## **Treat-to-target for Osteoporosis: Is Now the Time?**

E. Michael Lewiecki, Steven R. Cummings, and Felicia Cosman

**PERSPECTIVE**

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**JBMR**

## **Goal-Directed Treatment of Osteoporosis**

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Lewiecki EM et al. J Clin Endocrinol Metab. 2013;98  
Cummings SR et al. J Bone Miner Res. 2013;28(3):4

# Summary of Both Papers

- Some patients at low risk for fracture are now being treated longer than necessary, while many at high risk for fracture are not treated or have stopped treatment
- Instead of stopping or changing treatment based on duration of treatment or failure to respond, treatment decisions should be based on achieving a target that is associated with an acceptable level of fracture risk
- Recommendation that a task force be formed to explore the possibility of developing treatment targets for osteoporosis

## Goal-Directed Treatment for Osteoporosis: A Progress Report From the ASBMR-NOF Working Group on Goal-Directed Treatment for Osteoporosis

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The fundamental principle of treat-to-goal for osteoporosis is that treatment should be selected according to having a high likelihood of achieving an acceptable level of fracture risk. This is different than but complementary to the current paradigm of monitoring for response to therapy, usually with bone density testing by DXA or bone turnover markers. A patient may respond to therapy yet continue to have an unacceptably high fracture risk. Response to treatment is essential but not necessarily sufficient in achieving an acceptable level of fracture risk.

# Starting Treatment

- Identify target before starting treatment
  - Stratify risk because baseline fracture risk may influence choice of therapy
  - Consider vertebral imaging
- Initial treatment should provide at least a 50% likelihood of reaching the treatment target within 3 years
- If primary reason for starting treatment is T-score  $\leq -2.5$ , then target should be T-score  $> -2.5$
- If primary reason for starting treatment is fracture risk (eg,  $\geq 20\%$ ), then target should be lower fracture risk (eg,  $< 20\%$ )???



# Target T-score

- Target is T-score  $> -2.5$
- Higher level of confidence if target is T-score  $> -2.0$ 
  - Rationale: based on ISCD Official Positions regarding least significant change with DXA measurements

# FLS and ECHO



- FLS - a systematic strategy for secondary fracture prevention
  - Increasing awareness
  - Software suite
  - Emerging business case



- Bone Health TeleECHO - a systematic strategy for democratizing osteoporosis knowledge through education of FLS coordinators and PCPs
  - Primary fracture prevention
  - Effectiveness of FLS coordinators
  - Expertise in managing osteoporosis

# Fracture Liaison Service (FLS)

- Secondary fracture prevention by systematic identification and management of fracture patients
- Objectives
  - Assess risk of future fractures
  - Evaluate for factors contributing to skeletal fragility
  - Educate about skeletal health
  - Start on treatment to reduce fracture risk if needed
  - Follow to assure that objectives are achieved
- Key person: dedicated coordinator - often a hospital based nurse educator or discharge planner
- Technology: dedicated fracture management software - patient registry, task tracker, quality measures, etc.

**Fracture Prevention Central.** National Bone Health Alliance. Curr Osteoporosis Rep. 2013;11:348-353.  
**Capture the Fracture.** International Osteoporosis Foundation. Osteoporosis Int. 2013;24:2135-2152.  
**Own the Bone.** American Orthopedic Association. J Bone Joint Surg Am. 2008;90:163-173.

# FLS is Cost-effective in Integrated Healthcare Systems

- Kaiser Southern California Healthy Bones Program
  - Identifying and treating high risk patients reduced hip fracture risk by 37%, preventing 935 hip fractures in 2006, saving \$30.8 million
  - Dell R et al. J Bone Joint Surgery Am. 2008;980(Suppl 4):188-194
- Geisinger Health System Osteoporosis Disease Management Program
  - Identifying and treating high risk patients reduced fracture-related expenses by \$7.8 million over 5 years
  - Newman ED et al. Osteoporos Int. 2003;14:146-151

# FLS Challenges

- Most care in the US is provided by profit-centers, not integrated healthcare systems
- Return on investment for hospitals is not well established
- No mechanism for educating FLS coordinators
- PCPs may lack interest, time, or expertise in managing fracture patients



Extension for Community Healthcare Outcomes

# Bone Health TeleECHO



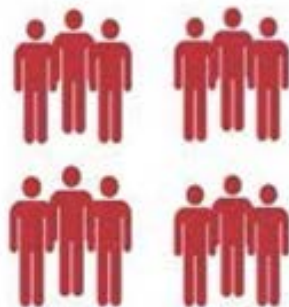
- Launched October 6, 2015
- Strategy of medical education and care management using videoconferencing technology with case-based learning
- Aims to democratize medical knowledge and develop specialty care capacity in underserved communities
- Goal: to reduce the burden of osteoporotic fractures

# ECHO vs. Telemedicine

## TeleECHO Clinic



ECHO Supports  
Community Based  
Primary Care Teams



learners at spoke site



Patients reached with specialty  
knowledge & expertise



## Traditional Telemedicine



Specialist Manages Patient Remotely





# Who Can Benefit from Bone Health ECHO

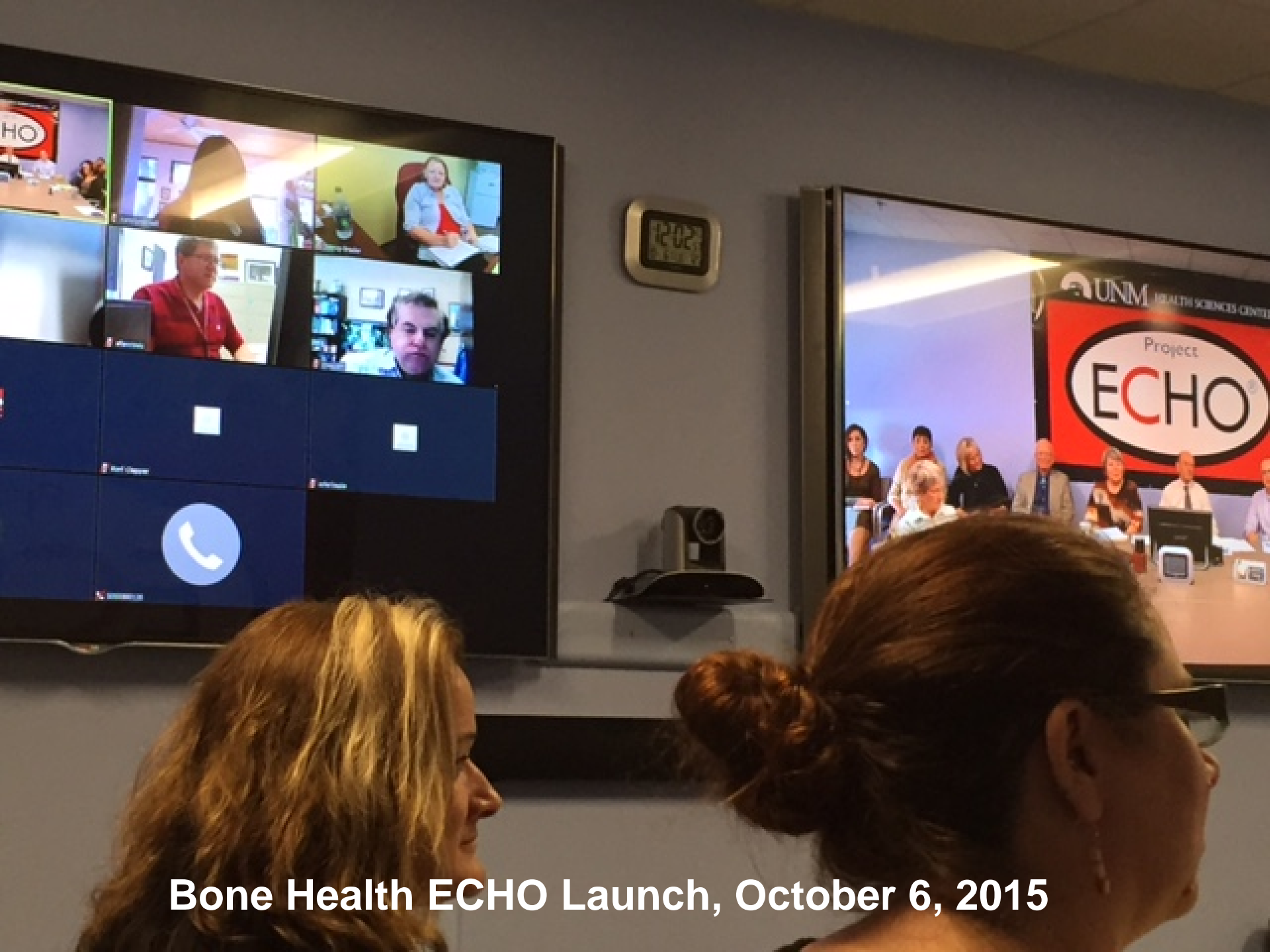
- Physicians, CNPs, and PAs who seek a higher level of expertise in the care of patients with skeletal diseases
  - Case-based learning
  - Free CME
  - Relief of professional isolation in rural areas
  - Collegial relationships with peers
  - Collaboration in patient care
  - Development of community center of excellence
- Residents and fellows at training programs lacking local expertise in bone diseases
- FLS coordinators
- **Most importantly: patients benefit from better care, closer to home, with greater convenience and lower cost**



**UNM ECHO Institute at University of New Mexico, Albuquerque, NM, USA**



**Bone Health ECHO Launch, October 6, 2015**



**Bone Health ECHO Launch, October 6, 2015**

# Benefits to Providers

- Advanced level of expertise in the care of skeletal diseases
- Case-based learning with peers and experts
- No travel, no cost
- Minimal disruption of office routine
- Relief of professional isolation for practitioners in rural communities
- No cost CME

# Benefits to Patients

- Better skeletal care
- Closer to home
- Greater convenience
- Lower cost

# Benefits to Society/Payers

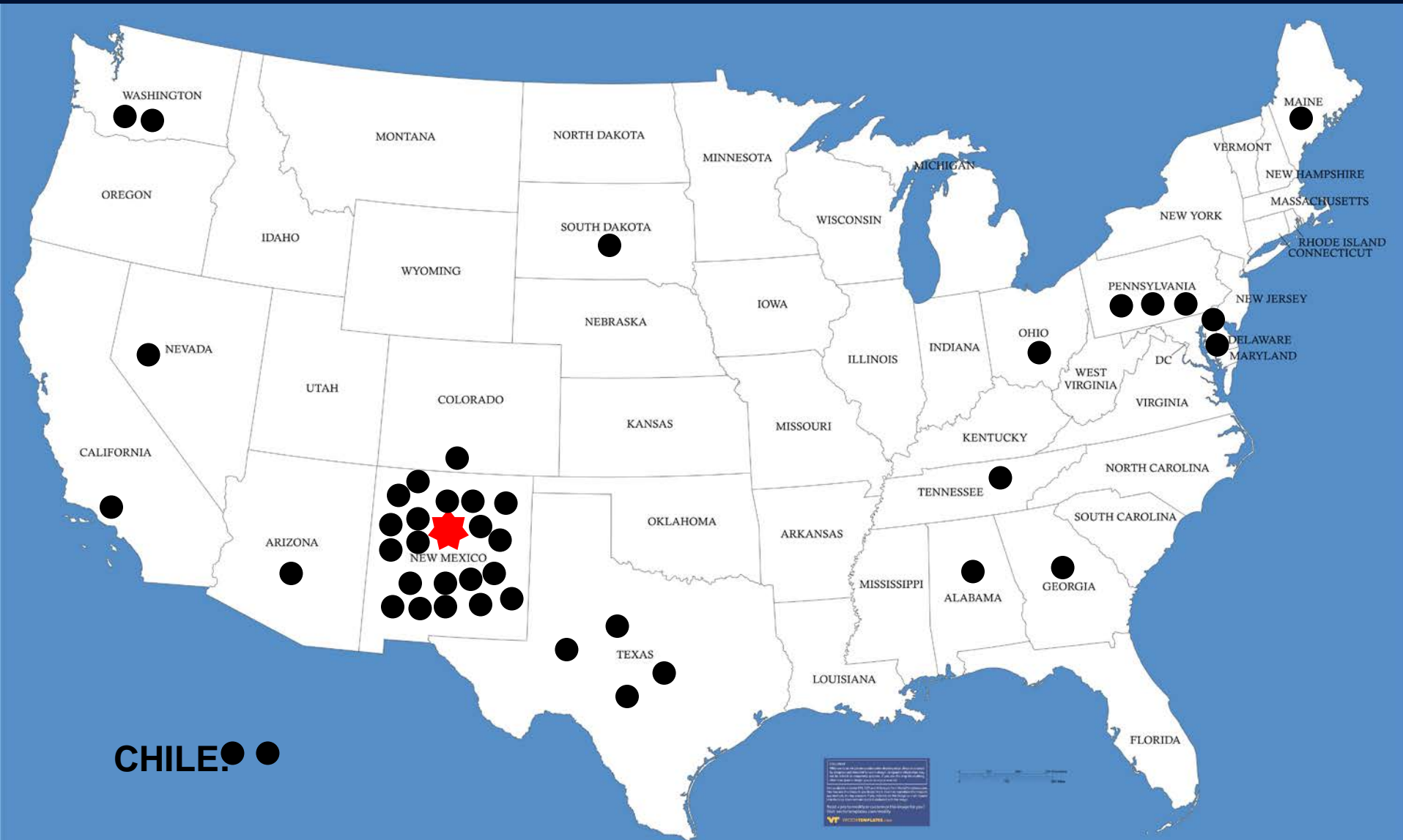
- Moving knowledge not patients
- Force multiplier, especially when replicated in other states and countries
- Preventing fractures saves money
- Reducing the osteoporosis treatment gap

# References

- Lewiecki EM et al. Proceedings of the 2015 Santa Fe Bone Symposium: Clinical Applications of Scientific Advances in Osteoporosis and Metabolic Bone Disease. J Clin Densitom. 2016;19:102-116.
- Lewiecki EM et al. Bone Health ECHO: Telementoring to improve osteoporosis care. Womens Health (Lond Engl). 2016;12:79-81.
- Lewiecki EM et al. Telementoring: A novel approach to reducing the osteoporosis treatment gap. Osteoporos Int. 2017;28:407-411.



# Bone Health ECHO Learners





# Global Vision for Bone Health ECHO



# More on Bone Health ECHO

- To participate in Bone Health ECHO register at [www.ofnm.org](http://www.ofnm.org)
- To find out more about Project ECHO, go to <http://echo.unm.edu/bone-health/>
- For additional information contact me at [mlewiecki@gmail.com](mailto:mlewiecki@gmail.com)
- Or just Google **Bone Health ECHO**



**58 year-old woman with PMO. L1-L4 T-score = -2.6.  
Takes calcium, vitamin D, and a bisphosphonate.**



**95 year-old woman with osteoporosis competes in powerlifting contest: curled 33 lbs, bench pressed 50 lbs, and deadlifted 82 lbs.**

