Expanded Clinical Use of DXA And Opportunistic CT NOF ISO 19: May 17, 2019 Neil Binkley, M.D. University of Wisconsin School of Medicine and Public Health UW Osteoporosis Clinical Research Program Madison, WI, USA







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Disclosures

- Research support
 - Radius
 - GE Healthcare
- Consultant
 - Amgen

Some of this is my opinion Noted as such by orange font



Perspective

Stop the war on DXA!

E. Michael Lewiecki,¹ Neil Binkley,² and John P. Bilezikian³

Before Expanding DXA Use We Need to Stop Trying to Destroy It

"Rather than waging war on a now underutilized but remarkably useful clinical test, we recommend that DXA be embraced and appropriately encouraged by healthcare professionals, stakeholder societies, payers, and the media."





US DXA Testing, Diagnosis and Hip Fracture Trends



Slide courtesy of E. Michael Lewiecki, MD

Fracture Risk Assessment Includes DXA It is an Excellent Clinical Tool

Personal opinion



But DXA is Often Poorly Performed

22260	BMD	Young-Adult	
Region	(g/cm²)	(%) T-Score	
L1	1.125	100	0.0
LZ	1.145	95	-0.5
L3	1.206	101	0.1
L4	1.221	102	0.2
L1-L2	1.135	97	-0.3
L1-L3	1.162	99	-0.1
L1-L4	1.179	100	0.0
L2-L3	1.178	98	-0.2
L2-L4	1.194	100	0.0
13-14	1.214	101	0.1

L4

232 - CORD-1 Y - TY	BMD	Young-Adult	
Region	(g/cm²)	(%)	T-Score
Neck	0.895	86	-1.0
Wards	0.789	87	-0.9
Troch	0.838	98	-0.1
Shaft	1.266	-	
Total	1.044	104	0.3

That Errors Occur is Recognized in the Radiology Literature

Review

Discrepancy and Error in Radiology: Concepts, Causes and Consequences

Adrian Brady, Risteard Ó Laoide, Peter McCarthy , Ronan McDermott

Error and discrepancy in radiology: inevitable or avoidable?

Adrian P. Brady¹

"Errors and discrepancies in radiology practice are uncomfortably common, with an <u>estimated day-to-day rate of 3-5% of studies</u> <u>reported...</u> The inevitability of imperfection is explained, while the importance of striving to minimise such imperfection is emphasized."

> Brady, et. al., Ulster Med J (2012) 81:3-9 Brady, AP, Insights Imaging (2017) 8:171-182



Major Errors in DXA Reports Are Common 42% in a recent study



Krueger, et. al, J Clin Densitom, 2019, 22:115-124

<u>Major error definition:</u> *"Provision of inaccurate information that could potentially lead to incorrect patient care decisions."*

 Low reimbursement?
 Perception that this is a lab test requiring no overview?
 Ageism??

Other??



A Couple of Examples.....

These are real clinical DXA interpretations



The DXA Data Reported Must Make Physiologic Sense

76 yo female; multiple prior fractures, DXA obtained to monitor teriparatide therapy

"In comparison with the prior, there has been a significant increase in the L1-L4 BMD (13%), in the dual femur neck mean (40%) and the dual femur total mean (69%).





Artifacts Must be Excluded From the Reported DXA Data

"The L1-4 BMD is 1.089 g/cm² consistent with osteopenia."

Region	BMD (g/cm ²)	Young-Adult T-score
L1	1.498	2.8
12	0.989	-2.1
L3	0.929	-2.6
L4	1.061	-1.5
L1-L4	1.089	-1.1





Evidence of Ongoing Competence in DXA is Needed for ANY Reimbursement

Personal opinion

ASSESSMENT:

The BMD measured at Femur Total Left is 0.516 g/cm² with a T-score of -3.9. This patient is considered osteoporotic according to World Health Organization (WHO) criteria. Fracture risk is high. Pharmacological treatment, if not already prescribed, should be started. A follow up bone density test is recommended in one year to monitor response to therapy.

The BMD measured at Femur Troch Left is 0.332 g/cm² with a T-score of -4.5 is severely low. Fracture risk is high. Treatment, if not already being done, should be started. A follow up DXA test is recommended in one year to monitor response to therapy.

World Health Organization (WHO) criteria for post-menopausal, Caucasian Women:

Normal: T-score at or above -1 SD Osteopenia: T-score between -1 and -2.5 SD Osteoporosis: T-score at or below -2.5 SD

2003 NOF Guidelines

RECOMMENDATIONS:

NOF Guidelines recommend treatment for patients with a T-score of -1.5 and below with risk factors or -2.0 and below without risk factors. Effective therapies are available in the form of bisphosphonates (Fosamax and Actonel), Miacalcin, Evista, and Forteo. All patients should ensure an adequate intake of dietary calcium (1200 mg/d) and vitamin D (400-800 IU daily).

Mild to aggressive therapies are available in the form of Hormone replacement therapy (HRT), bisphosphonates, Calcitonin, and SERMs. Additionally, all patients should ensure an adequate intake of dietary calcium (1200 mg/d) and vitamin D (400-800 IU daily).

"reasonable that third party payers reimburse only those DXA practices where evidence of initial training and ongoing competence exists."

Krueger, et. al, J Clin Densitom, 2019, 22:115-124



Bad DXA Reports Will Cause You to Make Bad Patient Care Decisions



You need to personally review the DXA image prior to making treatment decisions

Personal opinion





Take a Standardized Approach to Evaluating DXA Images (PEAR)

- Positioning
 - Is the patient correctly positioned?
 - Is hip internal rotation appropriate?
- Edges
 - Do the bone edges/bone map correctly include only bone?
- Artifacts
 - Are any present? Might they affect the BMD result?
- Regions of interest
 - Check intervertebral markers, vertebral numbering, femoral neck region placement





We Need to Monitor With DXA

"…. treat with pharmacologic therapy for 5 years."

ACP recommends against bone density monitoring during the 5-year pharmacologic treatment period."

> "When prescribing bisphosphonates, clinicians should discuss the importance of adherence."

> > Qaseem, et. al., Ann Int Med. 2017; doi:10.7326/M15-1361

This does not pass the common sense test and is not based on good data

Personal opinion



Common Sense Says We Need to Monitor Something



"I want you to stay on this drug that you've heard a lot of bad things about, because I say it's the right thing to do."

"In summary, we find monitoring BMD to be an essential component of osteoporosis care, directly analogous to monitoring blood pressure or lipid status in patients being treated for hypertension or hyperlipidemia respectively."

Lewiecki, et al., Ann. N.Y. Acad. Sci. 0 (2018) 1-6



ISCD Likely to Recommend Monitoring Monitoring BMD (in combination with other factors) can:

- Be used to determine whether treatment should be started
- Detect bone loss, indicating need for assessing adherence and secondary causes of bone loss
 - Leads to re-evaluation of treatment options
- Be used to monitor individuals following cessation of osteoporosis pharmacologic therapy



Expanding DXA: Trabecular Bone Score (TBS)

- TBS is a DXA software program that estimates bone texture information from a regular PA spine DXA scan
 - Is a derived unitless index, not a direct physical measure
- TBS is associated with bone microarchitecture and fracture risk
- TBS provides fracture risk information that is additive to BMD and clinical risk factors

Silva et al. J Bone Miner Res. 2014 29:518–530



TBS is Not a Direct Measure of Microarchitecture, But is a Surrogate



Slide courtesy of William Leslie, M.D.



Principle of TBS

High TBS



Low TBS



Slide courtesy of Didier Hans, Ph.D.



Can Have Same BMD but Different TBS



Adapted from Silva et al. J Bone Miner Res. 2014, 29:518–530



TBS Results Are Used to Adjust FRAX Lower (bad) TBS increases fracture risk, higher (good) TBS reduces it



McCloskey EV, et. al, Calcif Tissue Int, 2015: 96; 500-509



In Addition to Altering FRAX, I Find the Painting Scaffold Analogy Helpful When Discussing TBS and Treatment Benefit/Risk With Patients

Personal opinion



BMD	TBS
Normal	Normal
T-score ≥ -1	T-score ≥ -1.31
Osteopenia	Partially degraded
-1 < T-score < -2.5	1.23 < TBS < 1.31
Osteoporosis	Degraded
T-score ≤ -2.5	TBS ≤ 1.23

Degenerative Spine Disease is Common: Report TBS From the Vertebrae Used for BMD Reporting

Personal opinion

182 pts; vertebrae excluded on clinical Vertebral exclusion interpretation (NB) generally, but not ■ 80 excluded always lowered TBS BMI, hardware, а 0.100 0.050 BS Difference after all vertebrae Exclusion TBS Effect of Exclusion 0.00 0.940 L1 L1-L4 TBS 1.051 affected, no hips -0.050 0.947 L2 L1-L3 TBS 0.943 -0.100 Mean age 71; L3 0.995 MOF Difference +4% -0.150 **Hip Difference** L4 1.322 +4% lowest T-score -2.8

".....it seems prudent to utilize the vertebrae least affected by degenerative changes for both BMD and TBS determination."



Expanding DXA: VFA Should Be Part of DXA For Appropriate Patients

Vertebral Imaging Should be Performed

- In all women age 70 and older and all men age 80 and older if BMD T-score is < -1.0 at the spine, total hip or femoral neck</p>
- In women age 65 to 69 and men age 70 to 79 if BMD T-score is < -1.5 at the spine, total hip or femoral neck.</p>
- In postmenopausal women and men age 50 and older with
 - Low trauma fracture during adulthood (age 50+)
 - Historical height loss of 1.5 inches or more (4 cm)
 - Prospective height loss of 0.8 inches or more (2 cm)
 - Recent or ongoing long term glucocorticoid treatment

NOF Clinicians Guide



VFA Radiation Dose ~1/200th That of Lateral Spine Radiographs

and VFA Can be Part of the DXA Order in EMR

Accept X Cancel

Reference 1. Pediatric Sedation and Anesthesia Scheduling and Communication Guide Links: Class: Normal O Normal Outside Perform the Appendicular exam per imaging interpreting provider? Yes No

Perform the VFA exam per interpreting provider?

Yes No







Moderate and Severe Fractures (Grade 2 or 3) are Often Easy to Identify

Mild (Grade 1) Fractures are NOT Easy Don't Call "Mild" Fractures on VFA









This is Not Unique to VFA

Even Experts Using Radiographs Have Difficulty Identifying Fractures



Fuerst, et. al, Osteoporos Int, 20:1199-1205, 2009

Any Fractures?







Any Fractures?







Morphometry is Not an Easy Solution to Vertebral Fracture Diagnosis



Seems "objective" but subjectivity remains
May over-diagnose non fracture abnormalities (short height due to degenerative changes)
Need visual assessment to confirm fracture; VSQ

"... quantitative morphometry should not be performed in isolation, without visual assessment to confirm the detected vertebral deformities as fractures."



Genant & Jergas, Osteoporos Int, 2003

A MAJOR Future Direction in "Osteoporosis" Care is Closer **Collaboration With Orthopedics** Need to Expand DXA to Orthopedics **Personal opinion Orthopedic Surgeons Are Increasingly Becoming Interested in Bone Health Optimization Both Pre- and Post-operatively**

Why Is This The Case?



Unassailable Facts

- Bone health is poor in > 50% of elective orthopedic surgical patients
- BMD decreases by 10-20% after arthroplasty surgery
- Bone quality affects outcomes
 - Revisions
 - Subsidence
 - Loosening

There is an epidemic of periprosthetic fractures
Treatment of bone disease mitigates negative effects
Bone health largely ignored at the present time



Periprosthetic Fractures Are Common and Are Osteoporosis-related

- Total knee arthroplasty (TKA) is common
 - ~15% of Americans age 70+ have had a TKA
- Occurs in up to ~5.5% of TKA patients
 - Are "low trauma," generally due to falls
 - Challenging to repair and have devastating consequences

60-80% of patients undergoing TKA have low BMD
 TKA leads to distal femur bone loss (~15%)
 Multiple potential mechanisms

Low BMD + loss increase periprosthetic fracture risk

Koh, et. al., Clin Orthop Rel Res, 2013; 471: 1441-1450



Periprosthetic Fractures are Bad




Periprosthetic Femur Fracture = Hip Fracture

 Retrospective chart review of patients with distal femur periprosthetic fracture

- 87 lateral locking plate
- 53 distal femur replacement



20+% 1 year mortality; only ~half regain prior mobility



Hoellwarth, et. al., Injury 2018; 49: 392-397

Fracture Data Do Not Yet Exist, But Likely That We Can Reduce Post-op Complication Risk

- Bone loss after TKA can be mitigated by pharmacologic treatment (bisphosphonates or teriparatide)
- Osteoporosis associated with subsidence around arthroplasty implants
- A meta-analysis finds bisphosphonate treatment following THA and TKA reduces revision surgery by over 50%
 Shi, et. al., Osteoporos Int, 2018;29(7):1525-1537
- Prospective studies needed





Contents Nats available at ScienceDirect The Journal of Arthroplasty

2017 AAHKS Annual Meeting Symposium

Choices, Compromises, and Controversies in Total Knee and Total Hip Arthroplasty Modifiable Risk Factors: What You Need to Know

Paul K. Edwards, MD ^{*}, Simon C. Mears, MD, PhD, Jeffrey B, Stambough, MD, Sara E. Foster, PA-C, C. Lowry Barnes, MD

Pre-op Health Optimization is Common For Multiple Conditions (Why NOT Bone?)

Pre-operative Bone Health Optimization

- Diagnosis osteoporosis, osteomalacia, hyperpara, etc
- Correct calcium and vitamin D deficiency
- Provide nutritional support (notably protein)
- Falls risk reduction
- Bone active medications (anabolics/bisphosphonates)



Suboptimal Bone Status is Endemic in Patients Referred for Bone Health Optimization: UW 2019

- Retrospective EMR review of 42 patients referred by orthopedic surgeons to UW BHO program
 - 36 spine surgery, 4 THA, 2 TKA
- 36 female/6 male; mean age 66.9 years
- Mean 94 days between BHO and surgery
- Osteoporosis risk factors present in 57%
 - DM, glucocorticoid use, RA, vitamin D deficiency, early menopause, hyperparathyroidism, hyperthyroidism, male hypogonadism
- Prior fragility fracture in 13 (31%)



Suboptimal Bone Status is Endemic in Patients Referred for Bone Health Optimization: UW 2019

DXA BMD Dx Classification





TBS Microarchitecture Status





Karaman, et. al; submitted for presentation at ASBMR 2019



68 yo Female Fell 6 Months After TKA No prior evaluation; subsequent DXA T-score -3.5



Will DXA Expand in Orthopedics?

The Importance of Bone Mineral Density in Hip Arthroplasty: Results of a Survey Asking Orthopaedic Surgeons about Their Opinions and Attitudes Concerning Osteoporosis and Hip Arthroplasty

Gerrit Steffen Maier, Kristina Kolbow, Djordje Lazovic, and Uwe Maus



433 14-question surveys Orthopedic surgeons in Europe and New Zealand



In the situation of known osteoporosis, 100% would use cemented hip prosthesis Currently most are not cemented...

Maier, et. al; Advances Orthopedics; 2016; Article ID 8079354, 5 pages http://dx.doi.org/10.1155/2016/8079354



We Are Moving Toward Routine DXA Prior to Elective Orthopedic Surgery

Probable Forthcoming ISCD Recommendations for pre-op DXA

- □ Women > 65
- □ Men > 70
- Inflammatory arthritis
- Glucocorticoid use (≥ 5mg prednisone/day for 3 mo)
- Diabetic
- H/O Fracture after age 50
- FRAX major osteoporotic fracture risk > 8.4%



Additional ISCD Orthopedic Positions

- Bone health assessment should be considered in patients prior to elective orthopaedic and spine surgery
- When poor bone quality is identified during surgery, bone health assessment including DXA testing is indicated



We Can (and need to) Perform Distal Femur DXA



Need region of interest standardization and automation

Blaty, et. al, Osteoporos Int, 2019; 30(2):383-390



We Can (and need to) Measure BMD Around Prostheses 51 yo female with R hip pain that is limiting her activity



X-ray read As negative; ortho note indicates "Remodeling along the lateral cortex."



Gruen zone BMD (g/cm²) 1: 0.330 2: 1.443 3: 1.942 4: 1.724 5: 2.046 6: 1.412 7: 0.898



We Can, and In Some Clinical Situations Need to, Perform Lateral Distal Femur DXA May be Particularly Relevant for SCI



Need region of interest standardization and automation



Expanding DXA: Measure BMD in Those With Spinal Cord Injury Pending ISCD Recommendations

All adults with spinal cord injury resulting in permanent motor or sensory dysfunction should have a DXA scan of the proximal tibia, distal and proximal femur, as soon as medically stable

Serial DXA assessment of treatment effectiveness should include evaluation at the total hip, distal femur, and proximal tibia



Expanding DXA: Seek Impending AFF Prior to Fracture



В



DXA Can Detect Lateral Cortical Thickening These Were Seen With the Benefit of 20/20 Hindsight



Images courtesy of Fergus McKiernan; presented at RSNA 2013



DXA Full Femur Imaging Works 282 consecutive patients on antiresorptive Rx



- Lateral beaking in 12 (4.3%)
- Confirmed by x-ray in 9
- Positive predictive value of beaking; 83%

"...extended femur scanning by DXA appears to be able to detect incomplete AFF in patients on antiresorptive treatment with negligible radiation exposure and without additional costs when DXA is performed for follow-up evaluation."



Images from: Van de Laarschot, et. al, J Bone Miner Res, 2017; 32;1632-1639

Pending ISCD Recommendations Regarding Full Femur Imaging

 Full-length femur images (FFI) should be used
 Consider bilateral FFI if receiving bisphosphonate or denosumab therapy for ≥ 3 years (or discontinued within the last year) especially if receiving glucocorticoids



Expanding Clinical Opportunistic CT Use We Can Be Using Opportunistic CT Clinically Now

"Opportunistic screening denotes the use of diagnostic CT scans to screen for patients at high (and potentially also for low) fracture risk."

Engelke, et al., J Clin Densitom, 2015; 18: 393-407



LOTS of CT Scans Are Being Done

Growth in # of CT scans per 1,000 Medicare beneficiaries

~ 400 non-head CT
 scans annually per
 1000 Medicare
 beneficiaries

This is not 40% of ALL people, but CT data is often easily available in EMR



MEDPAC: Health care spending and the Medicare Program, June 2016



Opportunistic CT is Virtually Free, Requires NO Additional Testing and NO Additional Radiation Exposure

If it works, why not use it??

What data support using opportunistic CT?



Annals of Internal Medicine

ORIGINAL RESEARCH

Opportunistic Screening for Osteoporosis Using Abdominal Computed Tomography Scans Obtained for Other Indications

Perry J. Pickhardt, MD; B. Dustin Pooler, MD; Travis Lauder, BS; Alejandro Muñoz del Rio, PhD; Richard J. Bruce, MD; and Neil Binkley, MD

Analysis of >2,000 CT-DXA pairs Spine HU correlated w/ central DXA (performed w/in 6 months) T12-L5 ROI's obtained but focus on L1





Pickhardt, et. al., Ann Intern Med . 2013 April 16; 158(8): 588–595.

Evaluation of HU Cutpoint Values

Results using L1 trabecular HU:

- 110 HU threshold >90% specific for osteoporosis
 - Sensitivity = 52%
- 100 HU threshold PPV = 68%
- 200 HU threshold NPV = 99%
- 119 pts with a moderate or severe compression fx
 - 52% (62 pts) had a DXA FN (T-score > -2.5)
 - 97% had an L1 attenuation <145 HU



Examples of L1 ROI Placement and HU Results



Practically; <100 HU ~osteoporosis, <150 HU ~low BMD

Pickhardt, et. al., Ann Intern Med . 2013 April 16; 158(8): 588–595 Images courtesy of P Pickhardt, MD



Those With Vertebral Fracture on CT Likely to Have Low HU (not necessarily low DXA BMD)



Pickhardt, et. al., Ann Intern Med . 2013 April 16; 158(8): 588–595.



Example of Patient with Vertebral Fracture and Low HU and Osteopenic DXA







- Prior to standard sagittal reconstruction fractures missed on (axial) CT in 84% (81 patients)
- 48% (39 of 81 pts) of unreported fx's had a nonosteoporotic T-score (better than -2.5)
- Sagittal evaluation of the spine on CT is important

Carberry, et. al., Radiology 2013 Jul;268(1):120-6 Image courtesy of P Pickhardt, MD



Lowest T-score at FN = -1.9



IV Contrast Increases Lumbar HU

- CT w/o & w/ IV contrast in 157 adults
 - Mean difference post-contrast was +11 HU
 - Overall ROC AUC performance was similar





Pickhardt, et. al., Osteoporos Int, 2016 Jan;27(1):147-52

Opportunistic CT Can Derive "DXA-Equivalent" T-scores and Entered into FRAX Femoral neck BMD evaluation on routine CT



Can/Should Other Skeletal Sites Be Evaluated with Opportunistic CT? 86 year old male with low back pain

- Presents to ER with non-specific low back pain
- No imaging done
- Hx of two falls in past two months
- No personal or FH of osteoporosis
- Non-smoker, non-drinker
- No bone active meds
- Discharged on pain meds
- Returned 3 days later; MRI reveals sacral fracture



Prior CT Available: Obtained Due to Abdominal Pain L1 HU = 100



		HU	
Air		-1000	
Fat		-120 to -90 ^[2]	
Soft tissue on	contrast CT	+100 to +300	
Bone	Cancellous	+300 to +400[3]	
	Cortical	+1800 to +1900 ^[3]	

Min: -60 Max: 23 (HU) Average: 26 60 StdDev: 16 66 (HU)



Clinical Example Using CT Data Now 63 yo white male; s/p lung transplant on prednisone 5 mg daily. T-spine fracture on follow up CXR and started on weekly alendronate 3 months ago



DXA data: FN T-score -2.8 L1-4 T-score -2.2 Chest CT 1 mo previously



While you could argue that his BMD isn't terrible and that he should receive anti-resorptive Rx; given his "awful" HU, I elected anabolic Rx

Conclusions RE: Opportunistic CT

Clinically important bone data available on body CT examinations is currently largely ignored

Opportunistic CT can

- Increase screening
- Detect unsuspected low bone mass and fractures
- Use it clinically now! I see no reason NOT to use data that is readily available
 - Potentially reduce need for DXA screening if normal
- Implementation will ultimately require engagement of body/general Radiologists



Opportunistic CT Likely to be Endorsed by ISCD

Opportunistic CT-based attenuation using Hounsfield Units (HU) can be used to estimate the likelihood of osteoporosis (L1 HU < 100) and normal (L1 HU > 150) bone to guide decisions regarding bone health assessment



Finite Element Analysis Biomechanical Computed Tomography analysis (BCT)

- Analytical technique that relies on imaging data
- Assumes material properties of the bone tissue
- Assigns pixels of an image set as bone or non-bone, and assigns material properties of the tissue to that element
- Creates a "mesh" of the bone pixels
- Imposes modeled loading on the mesh
- Calculates the expected properties of the entire structure from the size and shape of the mesh



Proprietary Approach is Available That Estimates Whole Bone Strength (Newtons) of Spine or Hip Using Existing CT Scans

		Bone Strength			
		ç	STR ≥ 6,000 newtons	Normal	STR ≥ 4,000 newtons
high		ome	4,500 < STR < 6,000	Low	3,000 < STR < 4,000
low		Ň	STR ≤ 4,500	Fragile Bone Strength	STR ≤ 3,000
				1100	
Verifian A		-	STR \geq 8,500 newtons	Normal	STR ≥ 5,000 newtons
AUBINO	Stan 2	Men	6,500 < STR < 8,500	Low	3,500 < STR < 5,000
			STR ≤ 6,500	Fragile Bone Strength	STR ≤ 3,500

"We conclude that biomechanical CT analysis of previously acquired routine abdominal or pelvic CT scans is at least as effective as DXA for identifying patients at high risk of hip fracture."



Adams, et. al., J Bone Miner Res, 2018; 33: 1291-1301

Osteoporosis Clinical Imaging; May 2019

- More DXA scanning is needed; not less
- "We" need to demand quality
- DXA should be done to monitor osteoporosis treatment
- TBS is a valuable addition to DXA
- VFA is an essential component of osteoporosis care
- Expect increased use pre- and post-operatively in orthopedic and spine surgery
- Full length femur scans can be used to seek AFF
- Opportunistic CT is often available and provides additional insight for free



Thank You


HU of ~90-100 Likely Osteoporosis



Graffy, et. al., AJR 2017 September, Vol. 209, No. 3 : pp. 491-496



Clinical Example Using CT Data Now 69 yo white female; known low BMD on bisphosphonate holiday New vertebral fx on CT performed for abdominal pain Should she receive anabolic Rx?



DXA data: FN T-score -2.4 L1-4 T-score -1.3



While you could argue that everyone with vertebral Fx should receive anabolic Rx; given her "good" HU, I elected anti-resorptive Rx