response, 21% vs. 4% with no significant BMD response, and 17% vs. 15% with mixed BMD responses.
Conclusions: In this group at high risk for future fragility fractures, much lower rates of BMD preservation was seen in the Thy+ as compared to the Thy- patients. Overall, AITD and medical thyroid disease was very common (48%) in this cohort of patients with IHC and OP. However, this high rate may be confounded by the selective nature of the specialty clinic population. Further research needs to delineate the impact of AITD and thyroid medication use on the progression and treatment of patients with IHC and OPO.

Bone and Mineral Metabolism
FRACTURE PREVENTION AND TREATMENT

Methadone Maintenance Treatment, Sex Hormones and Low Bone Density in a Population of Injection Drug Users

Leen Wehbeh, MD[1], Jenny Pena Diaz, PhD[1], Kendall Ford Moseley, MD[1], Damani Piggott, MD, PhD[2], Adrian Sandra Dobs, MD, MHS[1], Todd Tarquin Brown, MD, PhD[1].
[1]Johns Hopkins University - Department of Medicine - Division of Endocrinology, Diabetes & Metabolism, Baltimore, MD, USA, [2]Johns Hopkins University - Department of Medicine - Division of Infectious Diseases, Baltimore, MD, USA.

Background: Methadone maintenance treatment (MMT) is associated with low bone mineral density (BMD) in those treated for opioid addiction. However, it is unclear whether observed adverse effects on the skeleton are related to a direct effect of opioids on bone metabolism or mediated by other mechanisms including MMT-induced gonadal dysfunction. We hypothesized that MMT is associated with low BMD in persons with a history of injection drug use (PWID) and that this effect is explained by differences in sex hormones.
Methods: We recruited 280 participants from the AIDS Linked to the Intravenous Experience (ALIVE) study, a long-standing cohort of PWID. All participants had been exposed to hepatitis C virus (HCV antibody positive). In addition to a morning assessment of free testosterone (FT) and estradiol (E2), all participants underwent dual-energy x-ray absorptiometry (DXA) of the lumbar spine (LS) and hip (total hip (TH) and femoral neck (FN)). Multivariable linear regression was used to assess the relationship between MMT and T-score with and without inclusion of E2/FT concentrations. Models were stratified by sex and adjusted for age, BMI, HCV infection, HIV, current alcohol use, current smoking, vitamin D3 level, and current heroin use.
Results: All participants were African American and 37% female. The median (Q1, Q3) age was 57 years (51, 61), median (Q1, Q3) BMI was 26 kg/m^2 (22, 30) and 107 (38%) were receiving MMT. FT and E2 were significantly lower in men receiving MMT vs not ($p < 0.01$ for both). In women, there were no differences in sex hormones based on MMT use. The prevalence of low BMD (defined as LS, TH, or FN T-score ≤ -1) was 25% (23% in men and 29% in women; $p = 0.3$); 12 (4.3%, 2 men and 8 women; $p = 0.09$) had osteoporosis (T-score ≤ -2.5). In men, MMT was associated with -0.7 lower LS-T score (95% CI [-1.3, -0.1], p=0.046) in adjusted models compared to those not receiving MMT. The magnitude of this association was reduced after adjusting for E2 and FT (-0.2, 95% CI [-0.8, 0.5], p=0.665)). In women, MMT was not associated with LS-T score (MD -0.3, 95% CI [-1.3, 0.4], p=0.631). There were no associations between MMT and TH or FN BMD in either men or women.
Conclusion: In this study, MMT was associated with lower lumbar spine BMD in men with a history of IDU, which was potentially mediated by the effect of MMT on sex hormones. More rigorous screening for co-morbidities including hypogonadism and low BMD in men receiving MMT may be warranted.

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Multimorbidity Increases Risk of Osteoporosis Under-Diagnosis and Under-Treatment in Patients at High Fracture Risk: 45 and up a Prospective Population Based-Study

Dana Bliuc, PhD[1], Thach Tran, PhD[1], Dunia Alarkawi, MBBS[1], Weiwen Chen, PhD[1], Robert D. Blank, MBBS, PhD[1], Kristine E. Ensrud, MD, MPH[2], Fiona Blith, PhD[3], Lyn March, PhD[3], Jacqueline Center, MBBS, PhD[4].
[1]Garvan Institute of Medical Research, DARLINGHURST, Australia, [2]UNIVERSITY OF MINNESOTA, Minneapolis, MN, USA, [3]University of Sydney, Sydney, Australia, [4]Garvan Institute of Medical Research, Sydney, Australia.

Background: Management of osteoporosis following fracture is suboptimal. Multimorbidity adds to clinical management complexity in the elderly but its contribution to the osteoporosis treatment gap has never been investigated.
Objectives: To determine the impact of multimorbidity on fracture risk and on osteoporosis investigation and treatment in patients at high fracture risk. **Design and Setting:** The 45 and Up Study is a prospective population-based cohort study in NSW, Australia with questionnaire data linked to hospital records by the Centre for Health Record Linkage (CHeReL) and the Pharmaceutical Benefits Scheme (PBS) and Medicare Benefits Scheme (MBS) data provided by Department of Human Services. Fractures identified from hospital records, comorbidities from questionnaires, hospital and PBS records. Bone mineral density (BMD) investigation obtained from MBS and treatment for osteoporosis from PBS. **Participants:** 16191 women and 9089 men with incident low-trauma fracture (2000 - 2017) classified in a high and low-risk group based on 10-year fracture risk threshold of 20% from the Garvan Fracture Risk Calculator (age, gender, prior fracture and falls). **Main Outcome Measurements:** Association of Charlson comorbidity index (CCI) with fracture. Likelihood of BMD investigation and treatment initiation. Outcomes ascertained by logistic regression and re-fracture risk by Cox models. **Results:** Individuals at high fracture risk were significantly older [women (mean age ±SD) 77 ± 10 vs 57 ±4 for high- vs low risk and men 86±5 vs 65±8 for high vs low risk] and had a higher morbidity burden [women, CCI ≥ 2 40% vs 12% for high- vs low-risk and men 53% vs 26% for high vs low risk]. Being in the high-risk group as well as a higher CCI were independently associated with > 2-fold higher risk of re-fracture. However, in the high-risk group,

only 28% (48% women and 17% men) had a BMD investigation and 31% (24% women and 14% men) received anti-osteoporosis medication post-fracture. A higher CCI was associated with a lower probability of both BMD investigation [CCI 2–3 vs 0–1, RR 0.73 (0.65–0.82) for women, and 0.50 (0.40–0.64) for men and CCI ≥4 vs 0–1, RR 0.50 (0.41-0.62) for women and 0.36 (0.25–0.52) for men] and treatment initiation [CCI 2–3 vs 0–1, RR 0.88 (0.77–0.98) for women and 0.75 (0.60–0.95) for men and CCI ≥4 vs 0–1, RR 0.75 (0.59- 0.95) for women and 0.35 (0.23–0.53) for men]. **Conclusion:** Multimorbidity, despite being associated with the highest fracture risk, significantly lowers the likelihood of osteoporosis investigation and treatment. These findings suggest that fracture risk is either under-estimated or under-prioritized in the context of multimorbidity. Our findings highlight the need for improved delivery of fracture preventive care in this setting. More generally, they also point out the need for a better understanding of how problems are prioritized in complex clinical situations.

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Osteoporosis Care After Hip Fracture: A Regional Healthcare System Experience

Ethan Thonn, BA[1], Darin Ruanpeng, MD[2].
[1]University of Minnesota Duluth, Duluth, MN, USA, [2]St. Luke's Endocrinology Associates, Duluth, MN, USA.

Background: Pharmacologic treatment is recommended to reduce risk of future fractures and possibly reduce mortality in patients with hip fracture. We investigated osteoporosis care after hip fracture at a regional comprehensive healthcare system to identify rates of pharmacologic treatment after hip fracture and barriers to treatment. **Methods:** We identified all patients admitted with a low impact hip fracture between 1/2017-12/2018. Follow-up clinical data was collected for a minimum of 16 months after hip fracture. **Results:** 208 patients were admitted with low impact hip fractures: 130 (62%) were female, mean age was 79.6 (SD 12.6), 24 (12%) were nursing home resident, and 117 (56%) had BMI <25 kg/m^2. At the time of the fracture, 80% had polypharmacy, 42% used mobility aide, 24% had known osteoporosis, 22% had dementia/cognitive impairment, 20% has history of cancer, 20% had history of stroke, 19% had diabetes and 2% were on dialysis. Two hundred (96%) underwent surgery. Forty-three (20%) had vitamin D level checked, of this, 20 (46%) had level <30 ng/mL. Prior to admission prescription of vitamin D was 53% and calcium was 36%. Discharge prescription of vitamin D was 64% and calcium was 50%. Prior to fracture, 18/208 (9%) were prescribed osteoporosis medication and at 1 year following fracture, 26/192 (14%) were prescribed osteoporosis medication (11 new, 15 continuation of medication). For follow up, 114/192 (59%) were seen in orthopedics clinic, 61 (32%) in primary care clinic, 2 (1%) in endocrinology clinic and 99 (52%) in other clinics. Sixteen (8%) patients died during the hospitalization for hip fracture and 47 (22%) died within 1 year. **Conclusions:** Osteoporosis treatment after hip fracture is suboptimal and a model of care is needed to close this care gap.

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Radiofrequency Multi Echographic Spectrometry (REMS) Technology in Patients With Bone Artifacts

Maria Dea Tomai Pitinca, MD, Carla Caffarelli, MD, Stefano Gonnelli, MD.
University of Siena, Siena, Italy.

Introduction: Dual-energy X-ray Absorptiometry (DXA) is considered the gold standard examination for the evaluation of bone mineral density (BMD). However, it is known that some conditions, such as arthrosis, vertebral collapse, or vertebroplasty, result in an overestimation of the BMD measured by DXA. Conversely, Radiofrequency Echographic Multi-Spectrometry (REMS) technology is able to automatically discard signals related to bone artifacts, such as calcifications or osteophytes, thanks to the identification of unexpected spectral features (Diez-Perez et al. 2019). The aim of this work is to assess the performance of REMS technology in patients with bone alterations that could alter the densitometric examination. **Materials:** The bone densitometry exams, both REMS and DXA, of patients with evidences of bone alterations at lumbar vertebrae or femoral neck were analysed. Written patient informed consent was obtained before the scans. **Results:** Eighty-seven patients with spinal artifacts, including 22 patients with vertebroplasty, 26 patients with bone fracture and 38 patients with osteo-arthrosis were considered. At lumbar spine, the mean BMD and T-score values assessed by REMS was lower than the ones measured by DXA. Moreover, the results obtained by the two technologies were not correlated. On the contrary, the BMD and T-score values measured by REMS and DXA at the femoral site were highly correlated ($p<0.01$), as well as BMD and the T-score values measured by DXA at the femoral neck and by REMS at the lumbar spine ($p<0.01$). As concerning artifacts involving femoral site, a patient with an intramedullary gamma nail positioned following a displaced pertrochanteric fracture of the left femur underwent a DXA scan of the right femur and a REMS scan of both femurs. A diagnosis of osteoporosis at the right femur was posed by both technologies. At the left femur with intramedullary gamma nail, REMS only made a diagnosis of osteoporosis highly corresponding with the one performed at right femur. **Conclusions:** The results from the patient series with spinal artifacts and the clinical case with femoral intramedullary gamma nail show the ability of REMS to evaluate anatomical sites that would not be assessable by DXA, such as in case of implanted nails, or that would give unreliable higher BMD values, such as in case of vertebroplasty, osteo-arthrosis and bone fracture. **References:** Diez-Perez et al. Aging Clin Exp Res 2019;31(10):1375–89

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Targeting the Fragility Fracture Prevention Message

Robert Daniel Blank, MD, PhD[1], Yoonah Choi, PhD[2], Hae-Jin Song, PhD[2], Ding-Cheng (Derrick) Chan, MD, PhD, FACP[3], Joon Kiong Lee, MBBS, FRCS, MS Ortho, AM, CCD[4].