An Update In The Prevention, Screening, Diagnosis, &Treatment Of **Osteoporosis**

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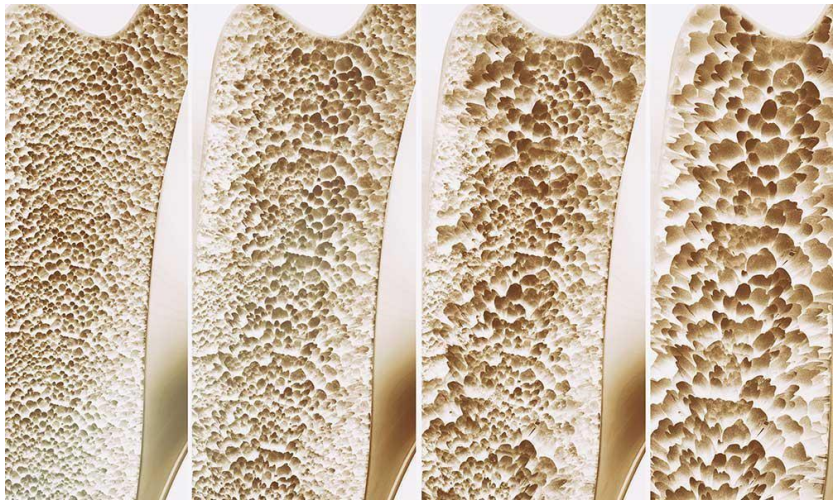
Definition

- Osteoporosis is a systemic skeletal disease, defined by low bone mass and structural damage to bone tissue which Leads to increased bone fragility and high fracture risk.
- Osteoporosis is often referred to as a 'silent disease' because it progresses without symptoms until a fracture occurs. The World Health Organization defines classify osteoporosis as a BMD T-score of -2.5 or lower, indicating substantial fracture risk



1. Bartl, R., Frisch, B., Bartl, R., & Frisch, B. (2004). Definition of osteoporosis. Osteoporosis: Diagnosis, Prevention, Therapy. A Practical Guide for all Physicians—from Pediatrics to Geriatrics, 24-32.
2. **Larijani B**, Mohageri Tehrani MR, Hamidi Z, Soltani A, Pajouhi M. Osteoporosis, prevention, diagnosis and treatment. J Reprod Infertil. 2005

Causes Of Osteoporosis

The imbalance of bone cell activity due to numerous factors can break the dynamic cycle of bone formation and bone resorption, thus affecting bone homeostasis and aggravating the condition of osteoporosis.

- **Heredity/Genetics**

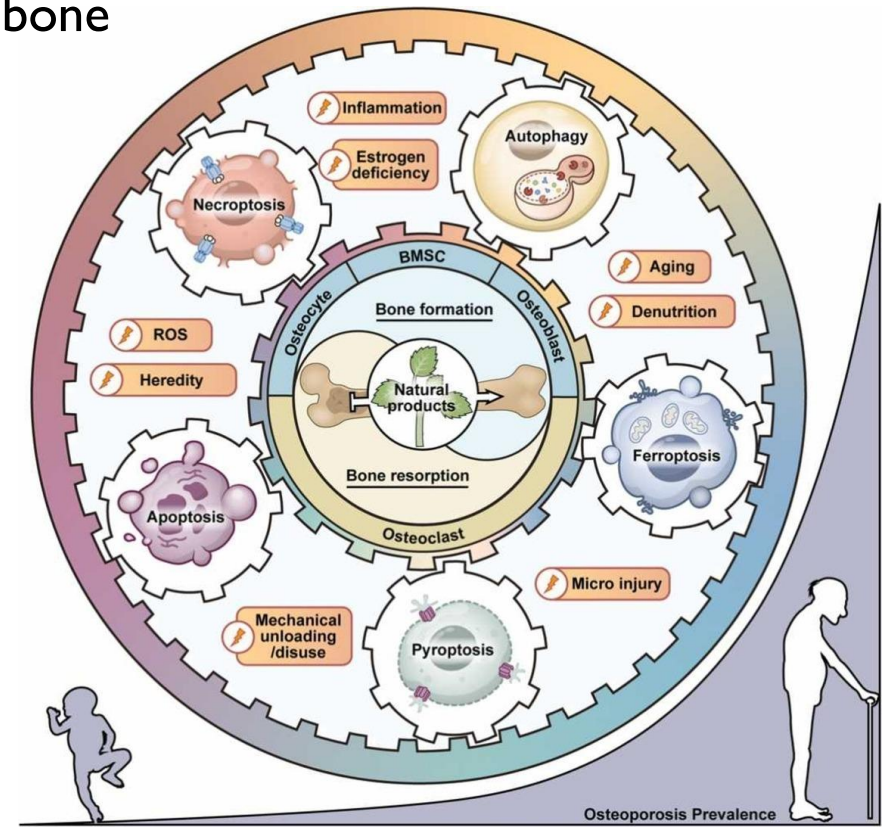
  (~60-80%)

  - Gender
- **Nutrition**
  - Energy intake
  - Protein intake
  - Calcium intake
  - Vitamin D
- **Mechanical factors**
  - Physical activity
  - Body weight
- **Habitual Factors**
  - Smoking
  - Alcohol
- **Endocrine factors**

  Sex steroids

  Calcitriol

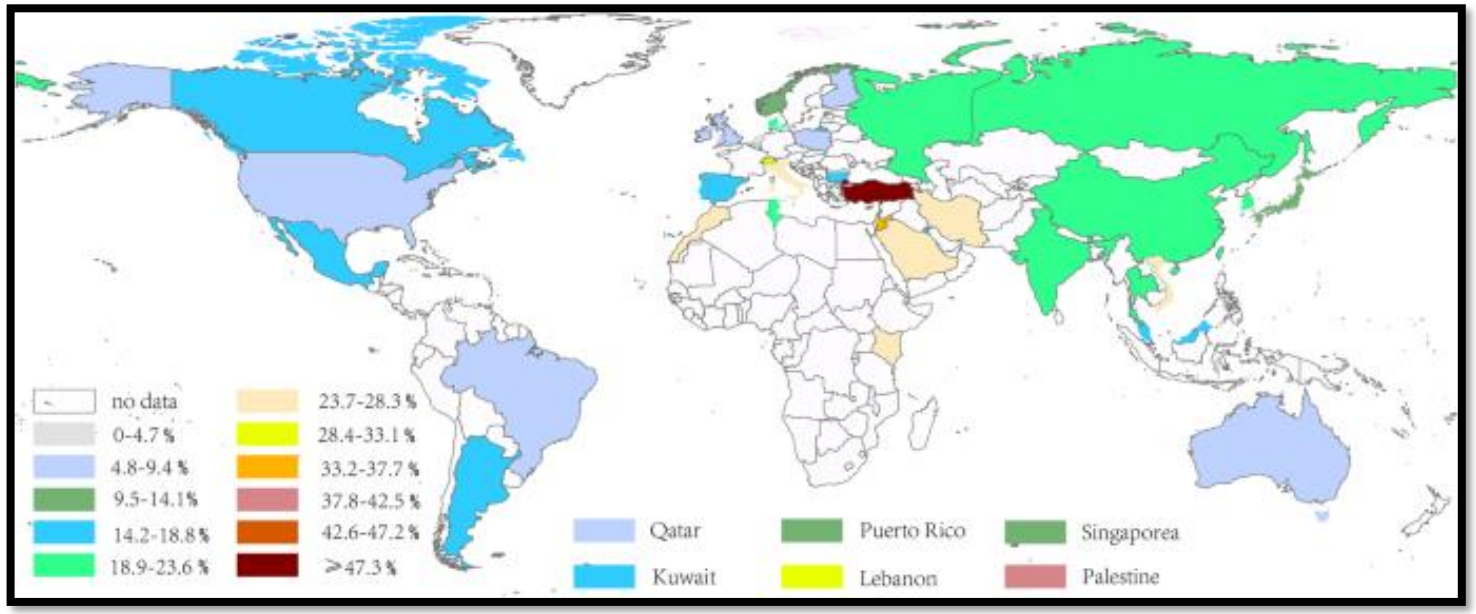
  GH—IGF-1 axis



1. Li Z, Li D…. Cell death regulation: A new way for natural products to treat osteoporosis. Pharmacological Research. 2022 Dec

2. Keramat, A., Patwardhan, B.**, Larijani, B**. et al. The assessment of osteoporosis risk factors in Iranian women compared with Indian women. BMC Musculoskelet Disord 9, 28 (2008).

Global Distribution Of Osteoporosis *June 2022*



The global prevalence of : Osteoporosis: **19.7%**

Osteopenia: **40.4%**

The prevalence was higher in developing countries (**22.1%**) than in developed countries (**14.5%**)

Xiao, P-L., et al. "Global, regional prevalence, and risk factors of osteoporosis according to the World Health Organization diagnostic criteria: a systematic review and meta-analysis." Osteoporosis International (2022)

Prevalence And Burden Of Osteoporosis In MENA

A diverse prevalence rate of OP in the MENA region is obvious (ranged from 10.3-30%) and it is higher than that reported in Europe (20%)

Mortality rates post-hip fracture may be higher in this region than those reported from western populations. While such rates vary between 25-30% in western populations, they are 2-3 fold higher in populations from the Middle East and Africa region.

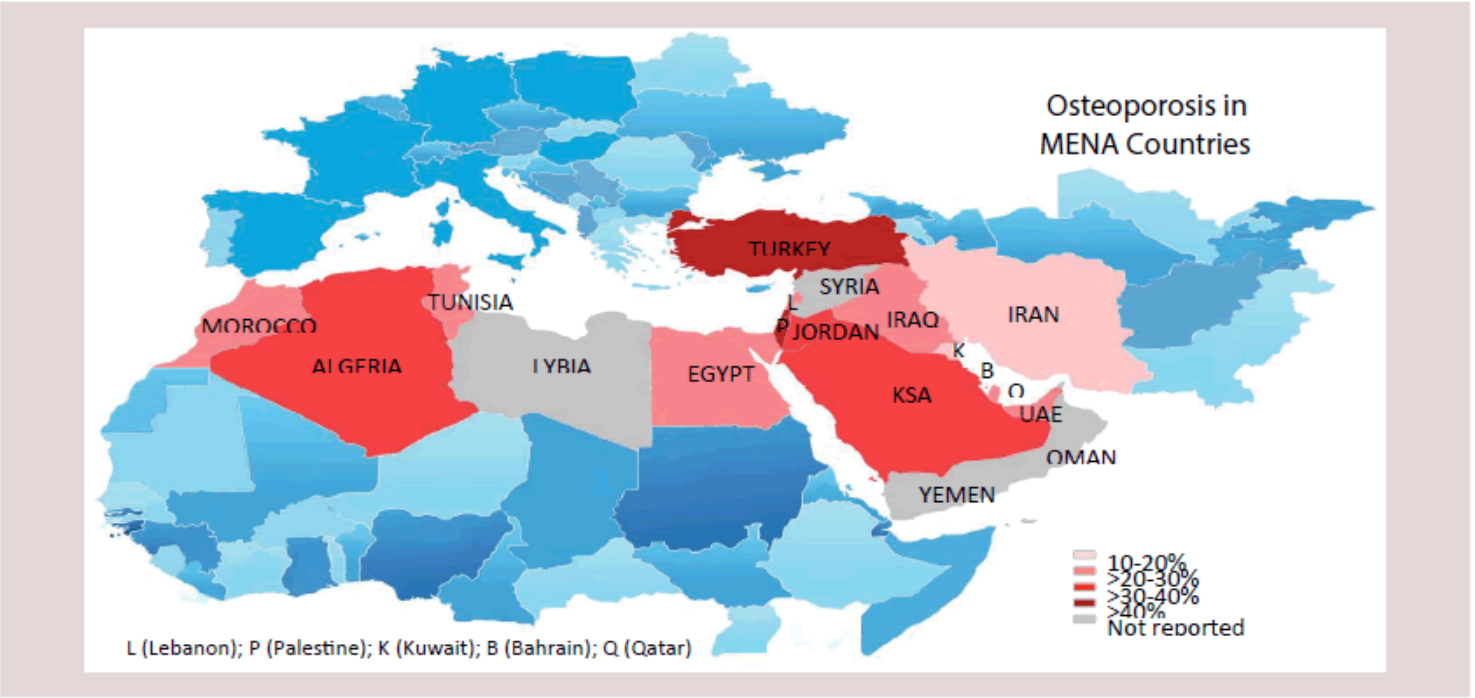


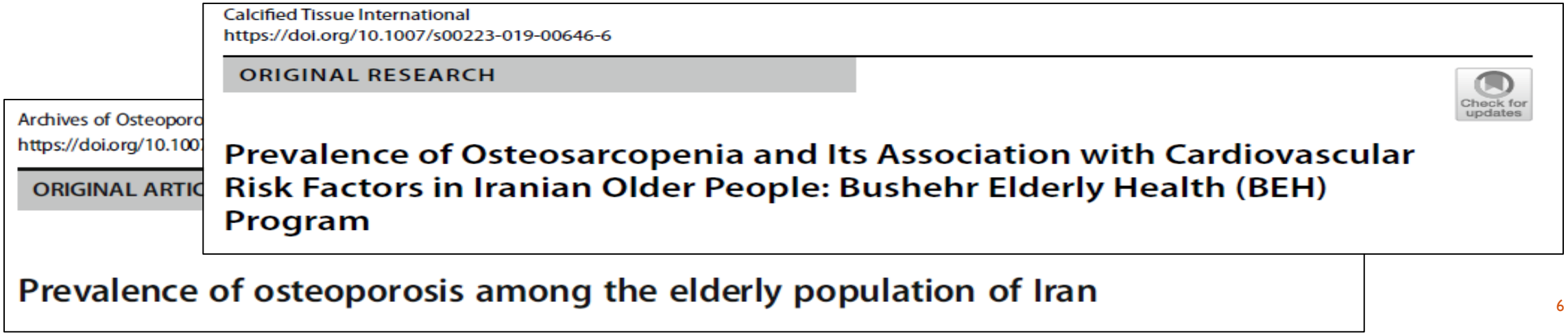
Figure 1. Prevalence of osteoporosis in adult female population in the Middle East and North Africa (MENA) region

1.Gheita TA et al. Epidemiology and awareness of osteoporosis: a viewpoint from the Middle East and North Africa. Int J Clin Rheumatol. 2018
2.Maalouf, G., et al., Middle East and North Africa consensus on osteoporosis. J Musculoskelet Neuronal Interact, 2007

Prevalence Of Osteoporosis And Osteosarcopenia In Iran

Results of a large population-based study in Bushehr showed that:

- The age-standardized prevalence of **osteoporosis** is **41.5%** in population aged ≥ 60 years (24.6% in men and 62.7%in women)
- The age-standardized prevalence of **osteosarcopenia** is **33.8** (95% CI 31.0–36.5) in men and 33.9 (30.9–36.8) in women



Fahimfar, Noushin, **Larijani B**, et al. "Prevalence of osteosarcopenia and its association with cardiovascular risk factors in Iranian older people: Bushehr Elderly Health (BEH) Program." Calcified tissue international (2020)

Iranian Multi-center Osteoporosis Study (IMOS), 2021–2022

Khalagi et al. BMC Geriatrics (2022) 22:818
https://doi.org/10.1186/s12877-022-03532-3

BMC Geriatrics

STUDY PROTOCOL Open Access

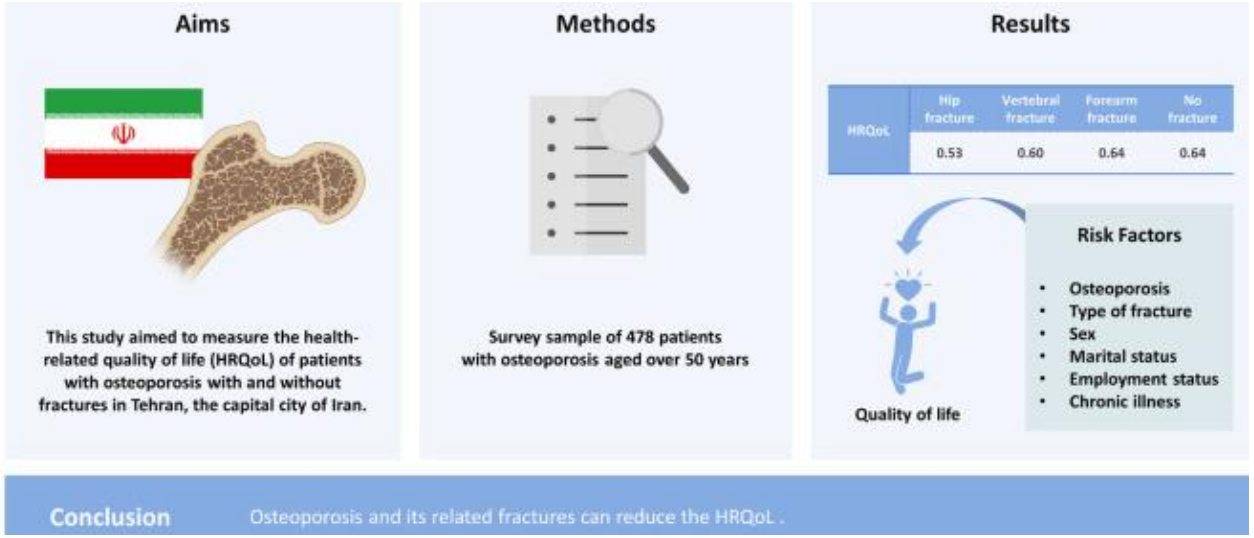
Iranian Multi-center Osteoporosis Study (IMOS), 2021–2022: the study protocol

Kazem Khalagi[1,2], Noushin Fahimfar[1,3], Fatemeh Hajivalizadeh[4], Mahnaz Sanjari[1], Mohammad Javad Mansourzadeh[1,5], Safoora Gharibzadeh[6], Gita Shafiee[7], Koorosh Kamali[8], Farshid Alaeddini[9], Farshad Farzadfar[10], Samaneh Mohseni[11], Nazli Namazi[12], Farideh Razi[13], Kobra Gorgani[1], Katayoun Kateb Saber[4], Nekoo Panahi[14], Ramin Heshmat[7], Alireza Raeisi[15], Bagher Larijani[16] and Afshin Ostovar[1*]

- IMOS will provide valuable information on the prevalence and determinants of osteoporosis and sarcopenia at the national level, and the results can be used in evaluating health system interventions and policymaking in the field of musculoskeletal diseases.
- IMOS is positioned to fill gaps in knowledge regarding osteoporosis and sarcopenia in Iran, building on previous rounds that primarily focused on urban populations. This research is crucial for understanding the national burden of these conditions and developing targeted health strategies.

Khalagi K, …., **Larijani B**, Ostovar A. Iranian Multi-center Osteoporosis Study (IMOS), 2021-2022: the study protocol. BMC Geriatr. 2022 Oct

Quality Of Life And Osteoporosis



- Patients with fractures reported significantly lower HRQoL scores compared to those without fractures. This decline was attributed to increased pain, reduced mobility, and psychological effects such as anxiety and depression.
- The study highlighted that fracture patients experienced limitations in daily activities, contributing to a diminished quality of life.
- The fear of falling and subsequent fractures further exacerbated the decline in HRQoL among those with fractures.

Rajabi M,…, **Larijani B**, Fahimfar N, Daroudi R. Health-Related Quality of Life in Osteoporosis Patients with and without Fractures in Tehran, Iran. J Bone Metab. 2023.

Novel Approaches To Reduce Osteoporosis Burden

- This study emphasizes the importance of novel preventive measures and treatment options for osteoporosis and sarcopenia. It highlights how addressing these conditions can also reduce the risk of other comorbidities in older adults, thereby improving overall health outcomes.
- The role of nutrition, particularly the intake of leucine and protein supplements, is as beneficial for muscle mass and physical function when combined with resistance exercises.
- osteoporosis is often associated with other health issues, such as cardiovascular disease (CVD).
- Resistance and balance training are effective interventions for improving quality of life and reducing fracture risk in patients with osteoporotic vertebral fractures.

Tabatabaei-Malazy, O., Tootee, A., Heshmat, R., Ostovar, A., Pan, A., Quyyumi, A. A., ... & **Larijani, B**. (2022). Reducing the Burden of Age-related Disease in relation to Osteoporosis, Sarcopenia and Osteosarcopenia. Frontiers in Medicine

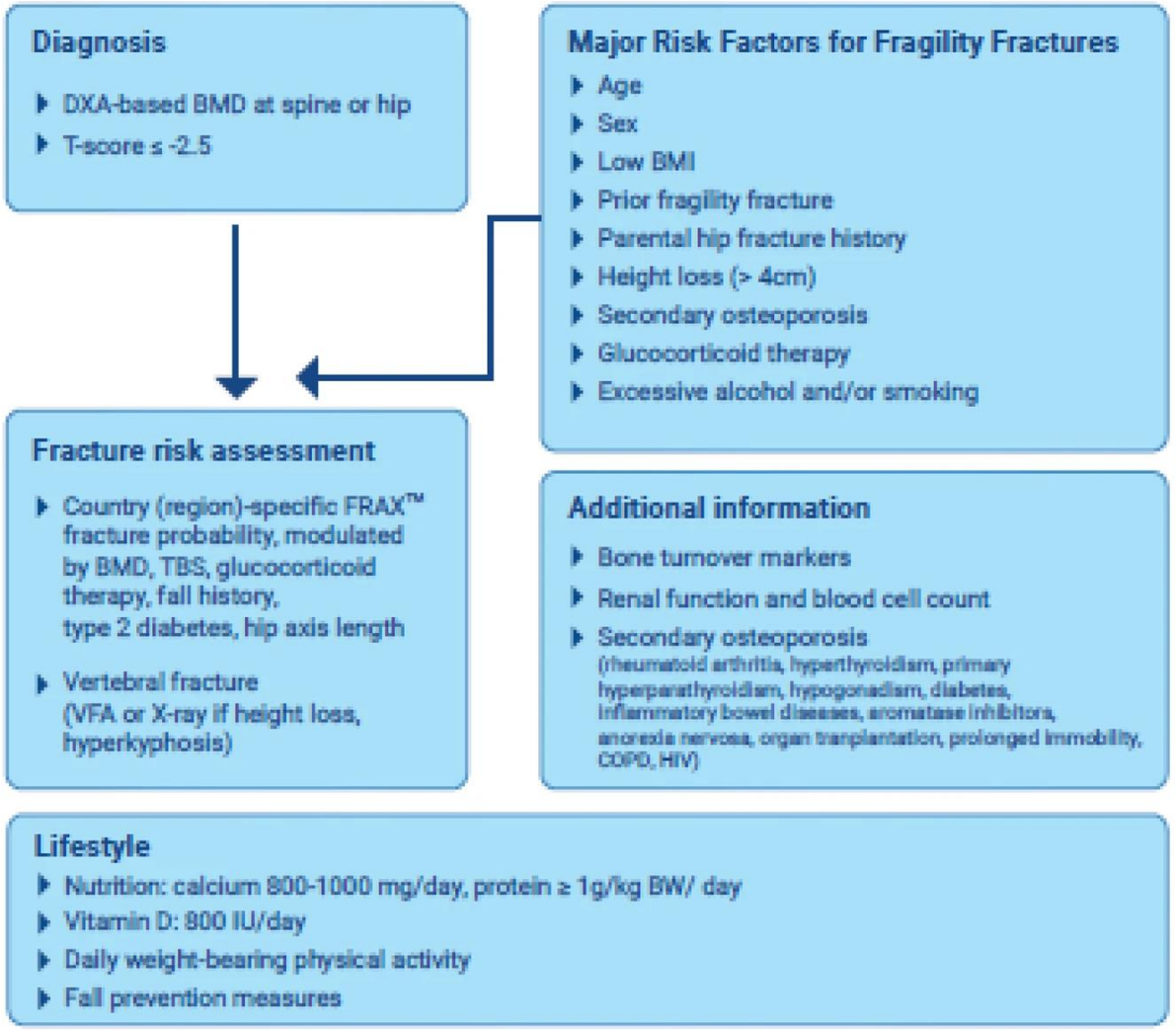
Projected Trends

- The burden of osteoporosis and fragility fractures is projected to increase at a dramatic pace in the next decade taking in consideration the effect of the aging of the population alone.
- Of concern, there are individual and environmental factors that can further augment this trend. As an example, obesity and diabetes, which have increased in prevalence worldwide, have been largely associated with higher risk of fracture independently from bone mineral density (BMD).
- Sedentary lifestyle in younger individuals has also been associated with increased risk of osteoporosis later in life.
- Moreover, environmental air pollution, a well-known issue for present and future generations, has been linked with a substantial increase in the risk of osteoporosis and fractures.

Adami G, Fassio A, Gatti D, Viapiana O, Benini C, Danila MI, Saag KG, Rossini M. Osteoporosis in 10 years time: a glimpse into the future of osteoporosis. Ther Adv Musculoskelet Dis. 2022 Mar 20;14:1759720X221083541. doi: 10.1177/1759720X221083541. PMID: 35342458; PMCID: PMC8941690.

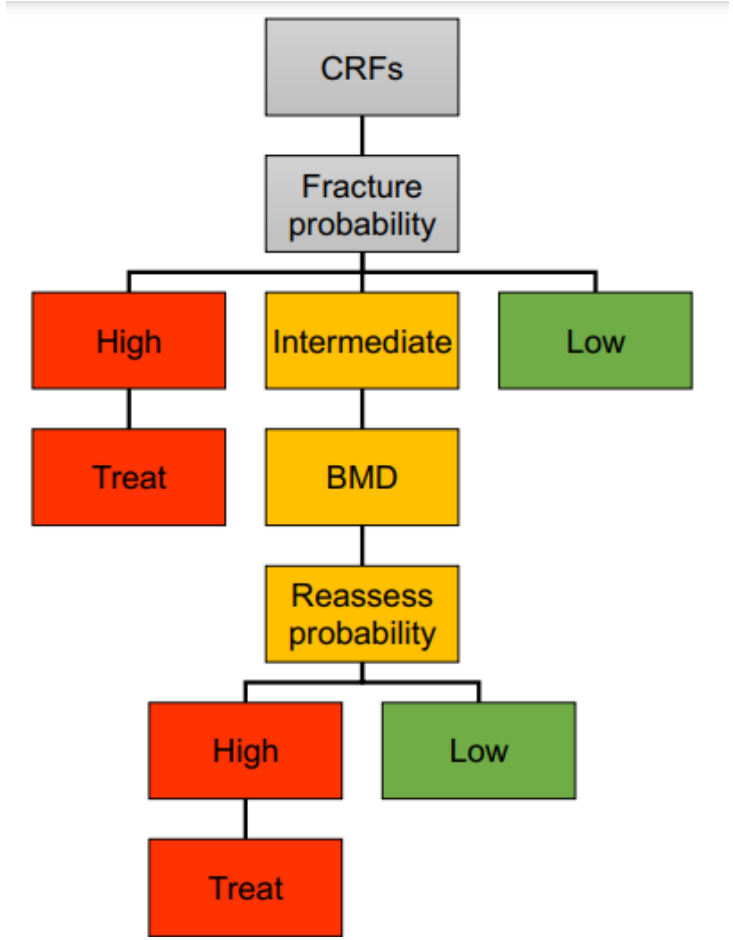
Advances In Diagnosis And Assessment

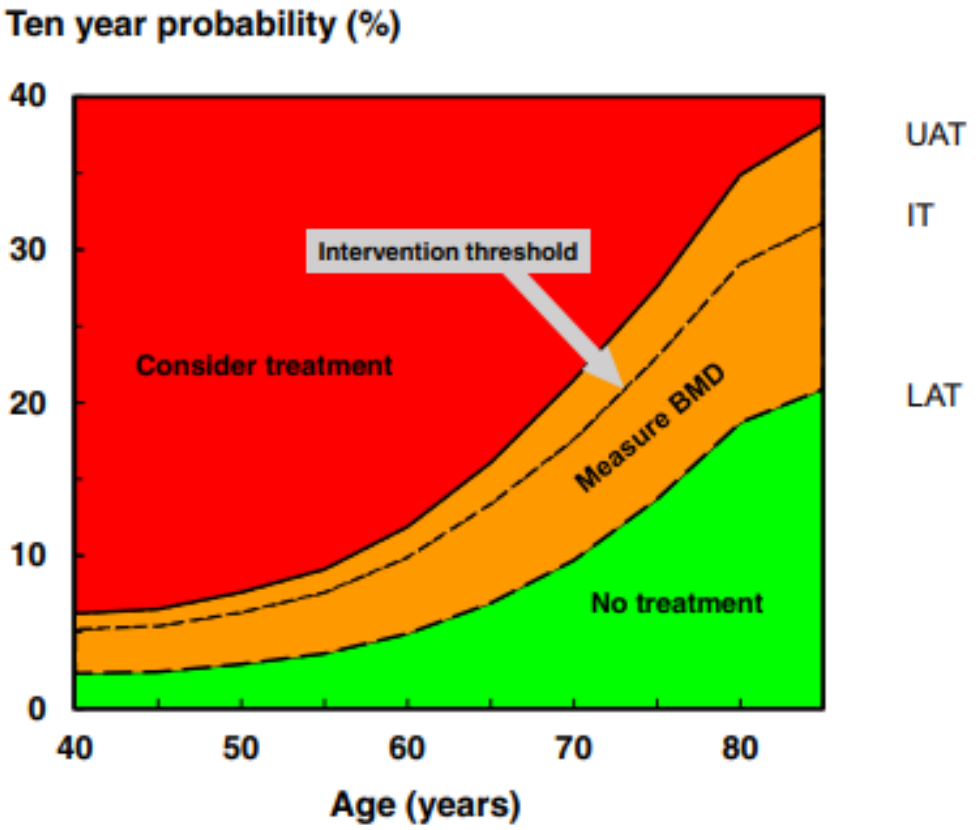
IOF Executive Summary Of The European Guidance For The Diagnosis And Management Of Osteoporosis In Postmenopausal Women



Kanis, J.A., Cooper, C., Rizzoli, R. et al. Executive summary of the European guidance for the diagnosis and management of osteoporosis in postmenopausal women. Calcif Tissue Int 104, 235–238 (2019).

Guidance For The Diagnosis And Management Of Osteoporosis





Kanis, J., Cooper, C., Rizzoli, R. et al. European guidance for the diagnosis and management of osteoporosis in postmenopausal women. Osteoporos Int 30, 3–44 (2019). https://doi.org/10.1007/s00198-018-4704-5

Diagnostic Tools

1. Bone Mineral Density (BMD) Testing
   - Dual-Energy X-ray Absorptiometry (DXA): This is the most widely used method for diagnosing osteoporosis. It measures bone density at critical sites like the hip and spine, providing T-scores that indicate bone health relative to a young adult population. A T-score of -2.5 or lower indicates osteoporosis.
   - Quantitative Computed Tomography (QCT): This technique provides a three-dimensional assessment of bone density, particularly useful for evaluating the spine. However, it is less commonly used due to higher radiation exposure compared to DXA.
   - Peripheral Quantitative Computed Tomography (pQCT): This method measures bone density in peripheral sites like the forearm or tibia, but its clinical utility is limited compared to central measurements like DXA
2. Additional Imaging Techniques
   - Vertebral Fracture Assessment (VFA): Often performed alongside DXA, this technique uses low-dose X-rays to identify vertebral fractures, which can indicate osteoporosis2.
   - Magnetic Resonance Imaging (MRI): MRI can be used to evaluate vertebral fractures and assess underlying conditions like cancer that may affect bone health1.

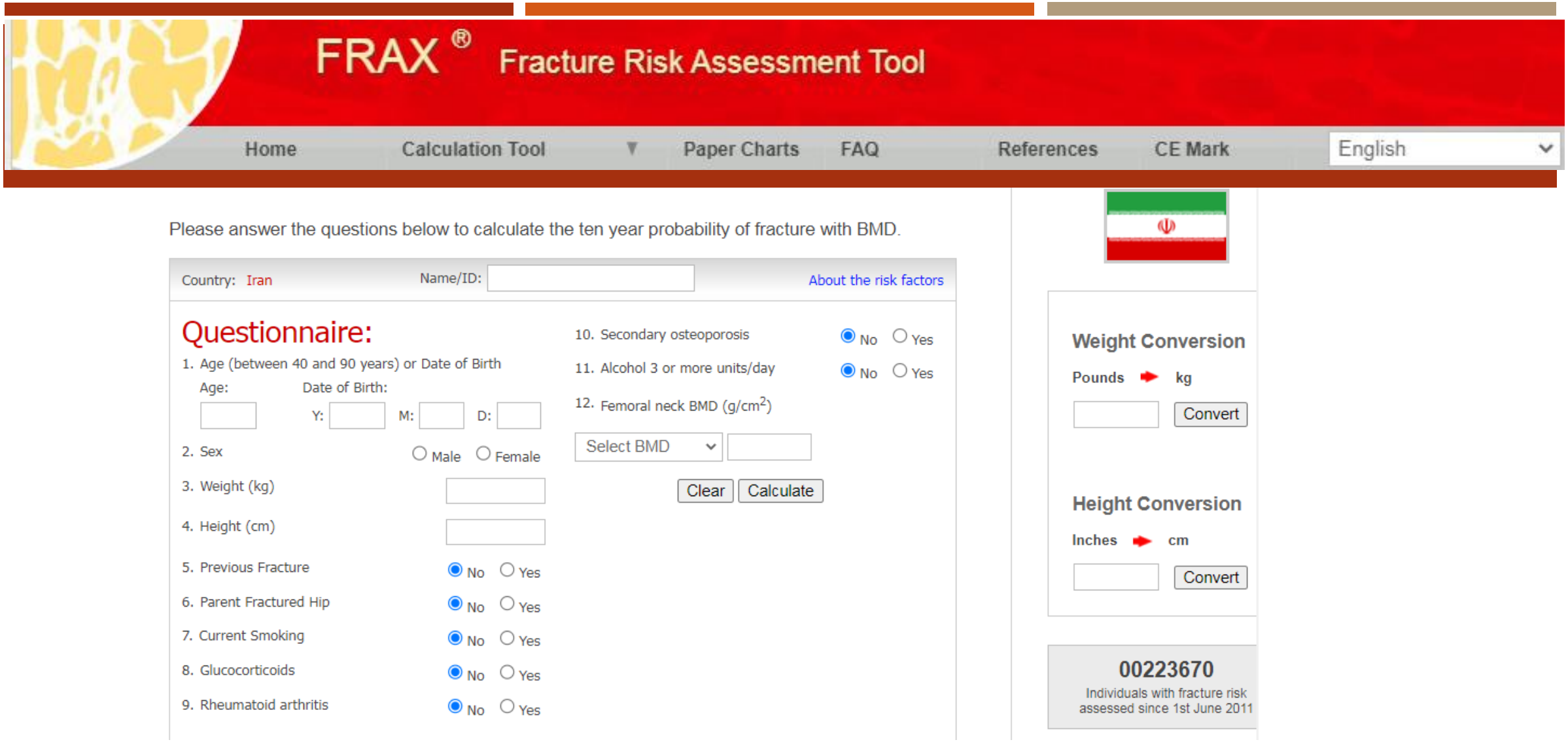
Lewiecki EM. Osteoporosis: Clinical Evaluation. [Updated 2021 Jun 7]. In: Feingold KR, Anawalt B, Blackman MR, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK279049/

Diagnostic Tools

3. Bone Turnover Markers (BTM)
   - These markers can be measured in blood or urine samples and provide insights into bone metabolism. While they are useful in research settings, their diagnostic value for osteoporosis is limited; they cannot confirm or rule out the condition but may help monitor treatment efficacy
4. Fracture Risk Assessment Tools
   - FRAX®: Developed by the World Health Organization, this tool estimates the 10-year probability of major osteoporotic fractures based on clinical risk factors and BMD measurements. It helps in identifying individuals who may benefit from treatment236.

DXA remains the gold standard for measuring bone mineral density, while tools like FRAX® assist in evaluating fracture risk based on individual patient profiles. Additional methods such as BTMs and QUS provide supplementary information but are not substitutes for comprehensive BMD assessments.

Lewiecki EM. Osteoporosis: Clinical Evaluation. [Updated 2021 Jun 7]. In: Feingold KR, Anawalt B, Blackman MR, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK279049/



- In 2008, Sheffield university in the UK invented FRAX® as a fracture risk assessment tool for estimating the individualized 10-year probability of osteoporotic fractures.

Explanations & Notes On Risk Factors

Age	The model accepts ages between 40 and 90 years. If ages below or above are entered, the programme will compute probabilities at 40 and 90 year, respectively.
Sex	Male or female. Enter as appropriate.
Weight	This should be entered in kg.
Height	This should be entered in cm.
Previous fracture	A previous fracture denotes more accurately a previous fracture in adult life occurring spontaneously, or a fracture arising from trauma which, in a healthy individual, would not have resulted in a fracture. Enter yes or no (see also notes on risk factors).
Parent fractured hip	This enquires for a history of hip fracture in the patient's mother or father. Enter yes or no.
Current smoking	Enter yes or no depending on whether the patient currently smokes tobacco (see also notes on risk factors).
Glucocorticoids	Enter yes if the patient is currently exposed to oral glucocorticoids or has been exposed to oral glucocorticoids for more than 3 months at a dose of prednisolone of 5mg daily or more (or equivalent doses of other glucocorticoids) (see also notes on risk factors).
Rheumatoid arthritis	Enter yes where the patient has a confirmed diagnosis of rheumatoid arthritis. Otherwise enter no (see also notes on risk factors).
Secondary osteoporosis	Enter yes if the patient has a disorder strongly associated with osteoporosis. These include type I (insulin dependent) diabetes, osteogenesis imperfecta in adults, untreated long-standing hyperthyroidism, hypogonadism or premature menopause (<45 years), chronic malnutrition, or malabsorption and chronic liver disease
Alcohol 3 or more units/day	Enter yes if the patient takes 3 or more units of alcohol daily. A unit of alcohol varies slightly in different countries from 8-10g of alcohol. This is equivalent to a standard glass of beer (285ml), a single measure of spirits (30ml), a medium-sized glass of wine (120ml), or 1 measure of an aperitif (60ml) (see also notes on risk factors).
Bone mineral density (BMD)	(BMD) Please select the make of DXA scanning equipment used and then enter the actual femoral neck BMD (in g/cm2). Alternatively, enter the T-score based on the NHANES III female reference data. In patients without a BMD test, the field should be left blank (see also notes on risk factors) (provided by Oregon Osteoporosis Center).

The following adjustments are currently available on FRAXplus®:

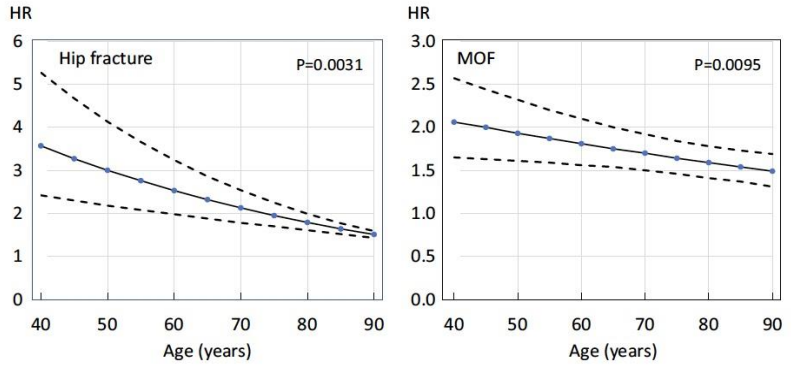
- Recency of osteoporotic fracture
- High exposure to oral glucocorticoids
- Type 2 diabetes mellitus
- Information on Trabecular Bone Score (TBS)
- Falls history
- Hip axis length (HAL)
- Concurrent data on Lumbar Spine BMD

NEW FRAXplus® Fracture Risk Assessment Tool beta

Previous Fracture And Subsequent Fracture Risk: A Meta-analysis To Update FRAX

- This study aimed to quantify the fracture risk linked to previous fractures globally
- The analysis included data from 665,971 men and 1,438,535 women across 64 cohorts in 32 countries, totaling 19.5 million person-years of follow-up.
- Findings indicated that individuals with a history of fractures had a significantly higher risk for future fractures
- The risk ratios were consistent across genders. Although low BMD contributed to some fracture risks (14% for clinical fractures, 17% for osteoporotic fractures, and 33% for hip fractures), the majority of the increased risk was independent of BMD.
- Additionally, the risk associated with prior fractures decreased when adjusted for age and time since the baseline examination.

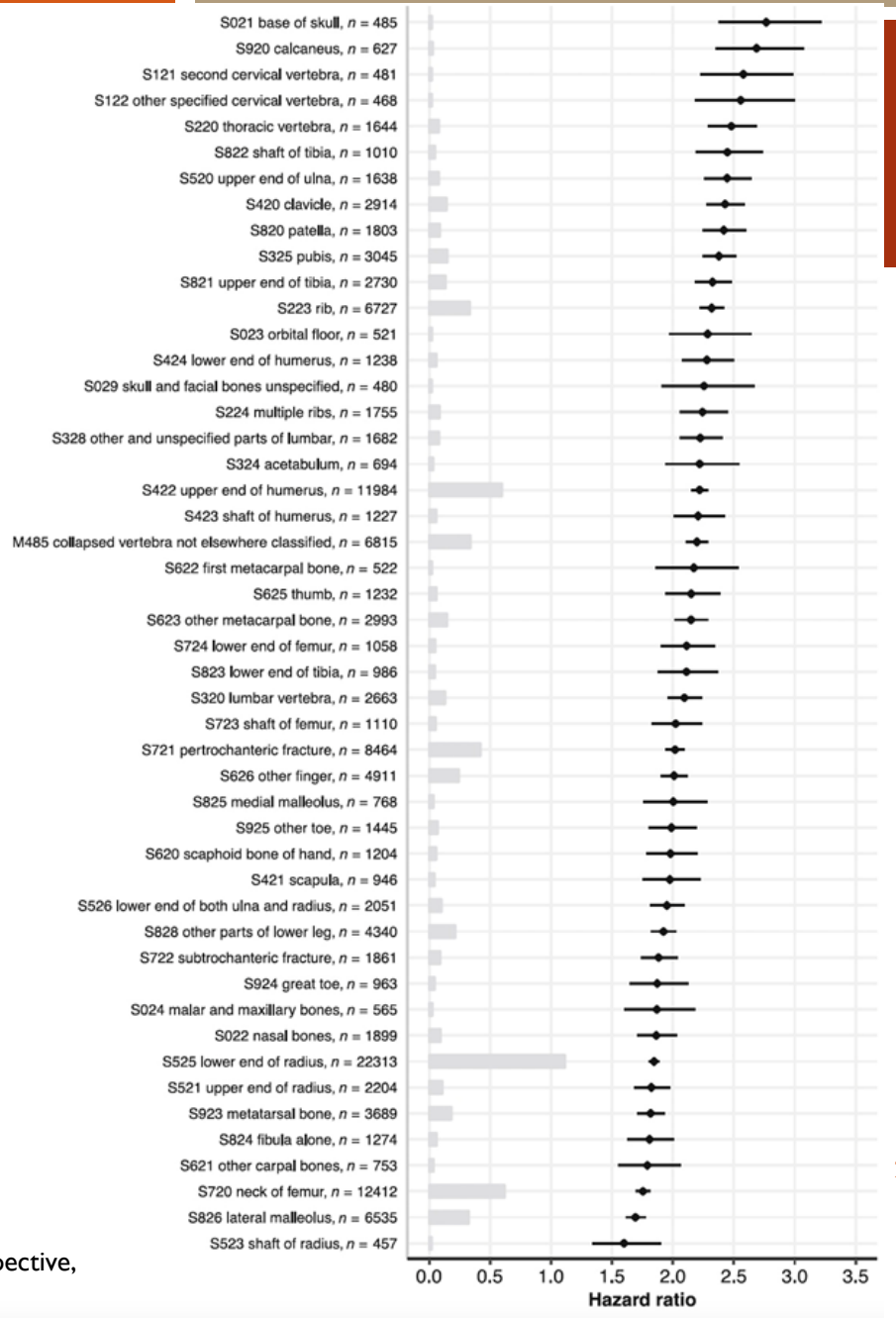
	Outcome fracture	Number of cohorts	I^2 (%)	HR	95% CI
Women					
	Any	56	94	1.84	1.72–1.97
	Hip	51	81	1.71	1.57–1.86
	MOF	50	94	1.77	1.63–1.93
	MOF without hip fracture	45	91	1.80	1.65–1.95
	Osteoporotic	51	94	1.82	1.70–1.96
Men					
	Any	34	97	1.92	1.56–2.34
	Hip	29	91	1.99	1.53–2.59
	MOF	31	96	1.90	1.51–2.39
	MOF without hip fracture	30	94	1.79	1.43–2.25
	Osteoporotic	31	97	1.92	1.55–2.38
Men and women					
	Any	62	98	1.85	1.69–2.02
	Hip	56	92	1.77	1.59–1.98
	MOF	55	97	1.80	1.61–2.01
	MOF without hip fracture	51	96	1.80	1.62–2.01
	Osteoporotic	56	98	1.84	1.68–2.03



Kanis JA, Johansson H, McCloskey EV, et al. Previous fracture and subsequent fracture risk: a meta-analysis to update FRAX. Osteoporos Int. 2023;34(12):2027-2045. doi:10.1007/s00198-023-06870-z

The Importance Of Recent Prevalent Fracture Site For Imminent Risk Of Fracture

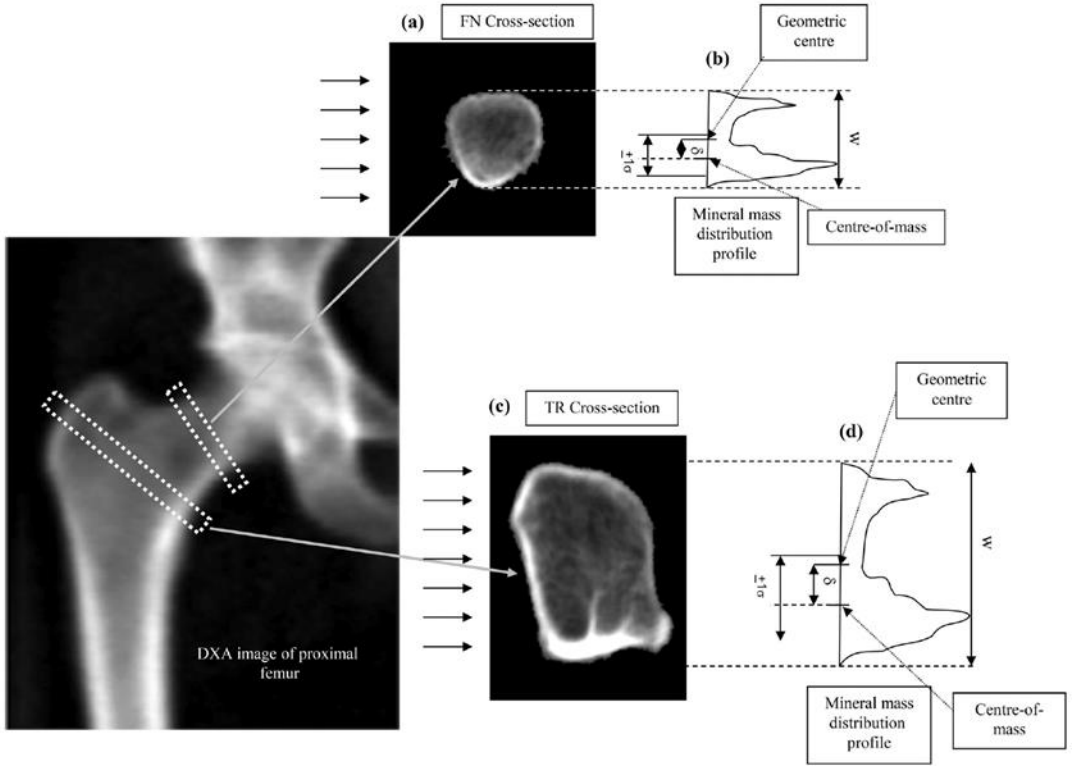
- The object of this study was to assess how the site of a recent fracture influences the risk of future fractures in individuals aged 50 and older.
- Individuals with recent fractures (both MOF and non-MOF) had a significantly higher risk of subsequent fractures:
  - Recent MOF: HR = 2.11 (95% CI: 2.08-2.14)
  - Recent Non-MOF: HR = 2.24 (95% CI: 2.21-2.27)
  - Old Fractures: HR = 1.77 (95% CI: 1.76-1.78)
- The research highlights that All recent fractures, MOFs, and non-MOFs, as well as older fractures, increase the risk of subsequent fracture, suggesting that all recent fractures should be included in fracture liaison services and that case-finding strategies for those with older fractures may be warranted to prevent subsequent fractures.



Axelsson KF, Litsne H, Lorentzon M. The Importance of Recent Prevalent Fracture Site for Imminent Risk of Fracture - A Retrospective, Nationwide Cohort Study of Older Swedish Men and Women. J Bone Miner Res. 2023;38(6):851-859.

Differences In Femoral Neck And Trochanteric Structure In Elderly Women Prior To Hip Fracture: Role In Hip Fracture Prediction

- The object of this study was to analyze the structural characteristics of the femoral neck and trochanteric area in older women to improve predictions of hip fracture risk.
- Structural Differences: Significant differences were identified in the geometric and mechanical properties of the femoral neck and trochanteric regions between the two groups.
- Women who later fractured exhibited reduced cortical thickness and altered trabecular microarchitecture.
- Predictive Value: The study found that specific structural characteristics in these areas could serve as predictive markers for hip fracture risk, emphasizing the importance of targeted assessments in clinical settings.



Prince, Richard et al. "Differences in Femoral Neck and Trochanteric Structure in Elderly Women Prior to Hip Fracture: Role in Hip Fracture Prediction." Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research vol. 38,6 (2023): 869-875.

Risk Of Falls And Fractures In Individuals With Cataract, Age-related Macular Degeneration, Or Glaucoma

- This study showed that individuals with cataract, AMD, or glaucoma have a significantly higher risk of both falls and fractures compared to those without these conditions. It emphasizes the need for enhanced awareness and preventive measures for falls among this population.

A Cataract cohort

Source	No. of events: Individuals with cataract	Control individuals	HR (95% CI)
Primary outcome			
Incident falls	121 855	283 274	1.36 (1.35-1.38)
Incident fractures	58 954	67 715	1.28 (1.27-1.30)
Secondary outcome (incident fractures by body site)			
Hip	11 933	52 332	1.28 (1.27-1.30)
Spine	7478	15 257	1.39 (1.34-1.44)
Forearm/wrist	7571	20 084	1.34 (1.30-1.39)
Skull/facial bones	1604	5843	1.11 (1.03-1.19)
Pelvis	3121	11 401	1.10 (1.05-1.16)
Ribs/sternum	2994	8938	1.18 (1.12-1.25)
Lower limb	9628	22 988	1.46 (1.41-1.51)

B Age-related macular degeneration cohort

Source	No. of events: Individuals with AMD	Control individuals	HR (95% CI)
Primary outcome			
Incident falls	121 855	283 274	1.25 (1.23-1.27)
Incident fractures	58 954	67 715	1.18 (1.15-1.21)
Secondary outcome (incident fractures by body site)			
Hip	11933	52 332	1.06 (1.04-1.09)
Spine	7478	15 257	1.26 (1.18-1.35)
Forearm/wrist	7571	20 084	1.27 (1.19-1.36)
Skull/facial bones	1604	5843	1.19 (1.03-1.37)
Pelvis	3121	11 401	1.13 (1.03-1.24)
Ribs/sternum	2994	8938	1.10 (0.99-1.23)
Lower limb	9628	22 988	1.25 (1.17-1.34)

C Glaucoma cohort

Source	No. of events: Individuals with glaucoma	Control individuals	HR (95% CI)
Primary outcome			
Incident falls	22 553	57 531	1.38 (1.36-1.41)
Incident fractures	11 032	32 898	1.31 (1.27-1.35)
Secondary outcome (incident fractures by body site)			
Hip	2012	9383	1.00 (0.94-1.07)
Spine	1217	3142	1.25 (1.14-1.37)
Forearm/wrist	1459	3976	1.44 (1.33-1.56)
Skull/facial bones	293	1131	0.97 (0.82-1.15)
Pelvis	550	2071	1.06 (0.93-1.21)
Ribs/sternum	575	1859	1.26 (1.11-1.44)
Lower limb	2026	4982	1.49 (1.38-1.61)

Tsang, Jung Yin et al. "Risk of Falls and Fractures in Individuals With Cataract, Age-Related Macular Degeneration, or Glaucoma." JAMA ophthalmology vol. 142,2 (2024): 96-106.

Updates on Osteoporosis Treatment Strategies

Overview Of Medicines For Prevention And Treatment

Antiresorptive Agents

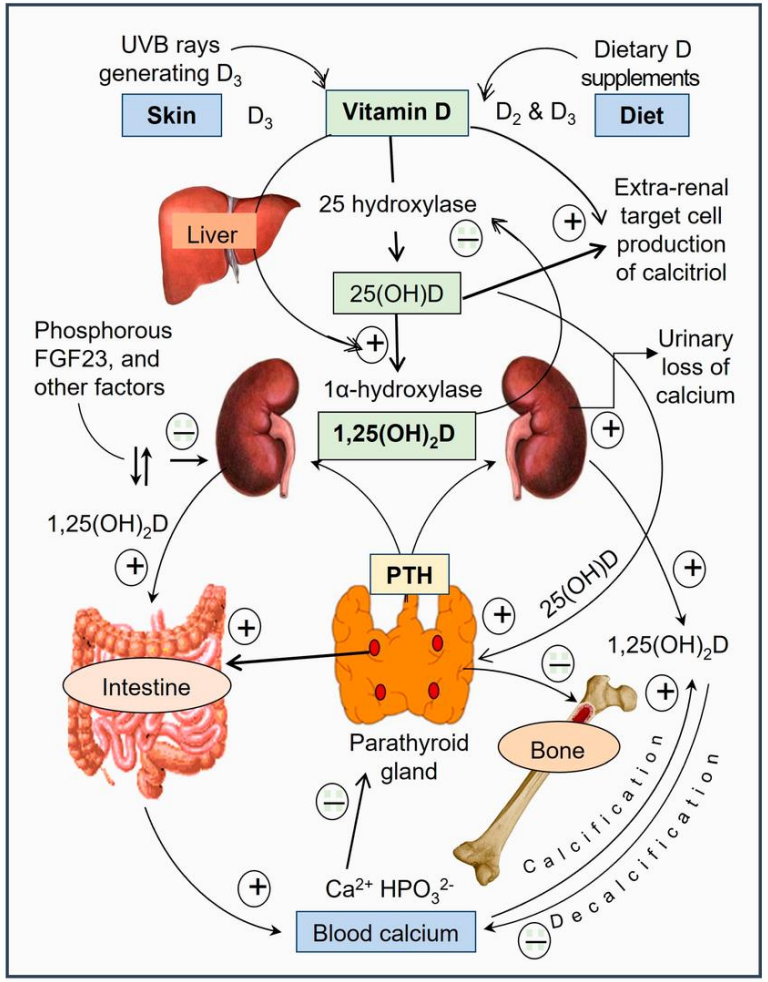
Bisphosphonates				
Alendronate	Fosamax®, Fosamax Plus D™	Oral (tablet, solution)	Daily/Weekly	Women & Men
Alendronate	Binosto®	Oral (effervescent tablet)	Weekly	Women & Men
Ibandronate	Boniva®	Oral (tablet)	Monthly	Women
Ibandronate	Boniva®	Intravenous (IV) injection	Every 3 months	Women
Risedronate	Actonel®	Oral (tablet)	Daily/Weekly/Monthly	Women & Men
Risedronate	Atelvia™	Oral (tablet)	Weekly	Women
Zoledronic Acid	Reclast®	Intravenous (IV) infusion	One Time per Year/Once every two years	Women & Men
RANK ligand (RANKL) inhibitor				
Denosumab	Prolia®	Injection	Every 6 Months	Women & Men
Estrogen* (Hormone Therapy)				
Estrogen	Multiple Brands	Oral (tablet)	Daily	Women
Estrogen	Multiple Brands	Transdermal (skin patch)	Twice Weekly/Weekly	Women
Estrogen Agonists/Antagonists also called selective estrogen receptor modulators (SERMs)				
Raloxifene	Evista®	Oral (tablet)	Daily	Women
Tissue Specific Estrogen Complex (TSEC)				
Estrogen/Bazodoxifene	Duavee®	Oral (tablet)	Daily	Women

Anabolic Agents

Sclerostin Inhibitor				
Romosozumab-aqqg	Evenity®	Injection	2 injections once monthly for 12 months	Women
Parathyroid Hormone (PTH) Analog				
Teriparatide	Forteo®	Injection	Daily	Women & Men
Teriparatide	Bonsity®	Injection	Daily	Women & Men
Parathyroid Hormone-Related Protein (PTHrp) Analog				
Abaloparatide	Tymlos®	Injection	Daily	Women & Men

Antiresorptive Agents: Calcium And Vitamin D

- Calcium and vitamin D play distinct parts in bone physiology
- Different combinations of these two treatments and the relative effect of each is not clear
- Calcium supplementation alone does not provide any beneficial effects on bone mineral density
- Vitamin D supplementation is only beneficial in patients with low vitamin D concentrations



Ebrahimi M, Khashayar P, Keshtkar A, Etemad K, Dini M, Mohammadi Z, Ebrahimi H, Chaman R, **Larijani B**. Prevalence of vitamin D deficiency among Iranian adolescents. Journal of Pediatric Endocrinology and Metabolism. 2014 Jul 1;27(7-8):595-602.

Effectiveness Of Calcium Supplementation

Supplementation

- Calcium Supplements:
  - Recommended for individuals unable to meet dietary needs. However, excessive supplementation may lead to side effects such as constipation or kidney stones.
- Vitamin D Supplements:
  - Beneficial for those with low levels, particularly in populations with limited sun exposure. Recommended dosages typically range from 400 to 800 IU per day.
- Combined Supplements:
  - Many products combine calcium and vitamin D to support bone health effectively.

Lifestyle Factors

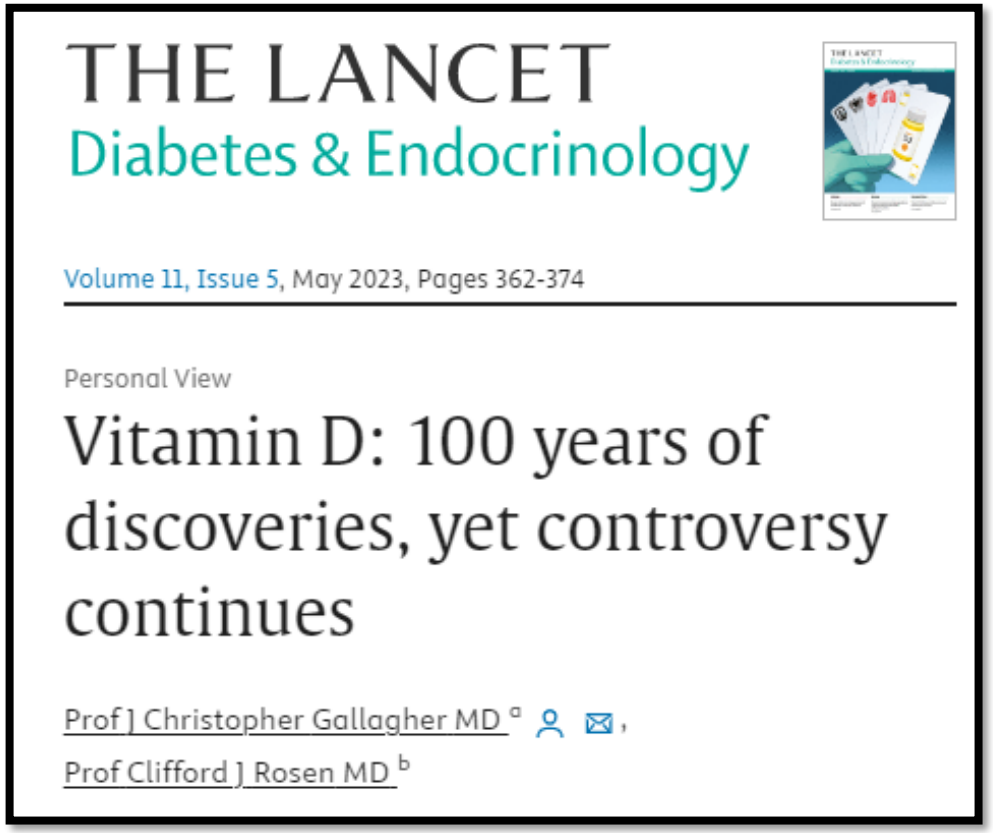
- Regular weight-bearing and resistance exercises are emphasized as vital for maintaining bone density.
- A balanced diet rich in calcium and vitamin D is crucial for optimal bone health.

Reid, I. R. "Bone-friendly lifestyle and the role of calcium or vitamin D supplementation." Climacteric (2022)

Effectiveness Of Vitamin D Supplementation

- some trials from the past 5 years have had new and unexpected adverse events. These adverse events include increased fractures, falls, and hospitalizations in older people (aged >65 years) include increased fractures after annual injections of 300 000 IU and after annual bolus oral doses of 500 000 IU; increased falls after 500 000 IU annually

- more attention should be paid to the safety of high doses of vitamin D supplementation, particularly in older people



Gallagher, J Christopher, and Clifford J Rosen. "Vitamin D: 100 years of discoveries, yet controversy continues." The lancet. Diabetes & endocrinology vol. 11,5 (2023): 362-374.

The Journal of Clinical Endocrinology & Metabolism, 2024, **109**, 1907–1947
https://doi.org/10.1210/clinem/dgae290
Advance access publication 3 June 2024
Clinical Practice Guideline

Vitamin D for the Prevention of Disease: An Endocrine Society Clinical Practice Guideline

Recommendation 1

In children and adolescents aged 1 to 18 years, we suggest empiric vitamin D supplementation to prevent nutritional rickets and potentially lower the risk of respiratory tract infections. (2 | ⊕⊕◯◯)

Recommendation 2

In the general adult population younger than age 50 years, we suggest against empiric vitamin D supplementation. (2 | ⊕◯◯◯)

Recommendation 3

In the general adult population younger than age 50 years, we suggest against routine 25(OH)D testing. (2 | ⊕◯◯◯)

Recommendation 4

In the general population aged 50 to 74 years, we suggest against routine vitamin D supplementation. (2 | ⊕⊕⊕◯)

Recommendation 5

In the general population aged 50 to 74 years, we suggest against routine 25(OH)D testing. (2 | ⊕◯◯◯)

Recommendation 6

In the general population aged 75 years and older, we suggest empiric vitamin D supplementation because of the potential to lower the risk of mortality. (2 | ⊕⊕⊕◯)

Recommendation 7

In the general population aged 75 years and older, we suggest against routine testing for 25(OH)D levels. (2 | ⊕◯◯◯)

Recommendation 8

We suggest empiric vitamin D supplementation during pregnancy, given its potential to lower risk of preeclampsia, intra-uterine mortality, preterm birth, small-for-gestational-age (SGA) birth, and neonatal mortality. (2 | ⊕⊕◯◯)

Recommendation 9

During pregnancy, we suggest against routine 25(OH)D testing. (2 | ⊕◯◯◯)

Recommendation 10

For adults with high-risk prediabetes, in addition to lifestyle modification, we suggest empiric vitamin D supplementation to reduce the risk of progression to diabetes. (2 | ⊕⊕⊕◯)

Recommendation 11

In adults aged 50 years and older who have indications for vitamin D supplementation or treatment, we suggest daily, lower-dose vitamin D instead of nondaily, higher-dose vitamin D. (2 | ⊕⊕◯◯)

Recommendation 12

In healthy adults, we suggest against routine screening for 25(OH)D levels. (2 | ⊕◯◯◯)

Recommendation 13

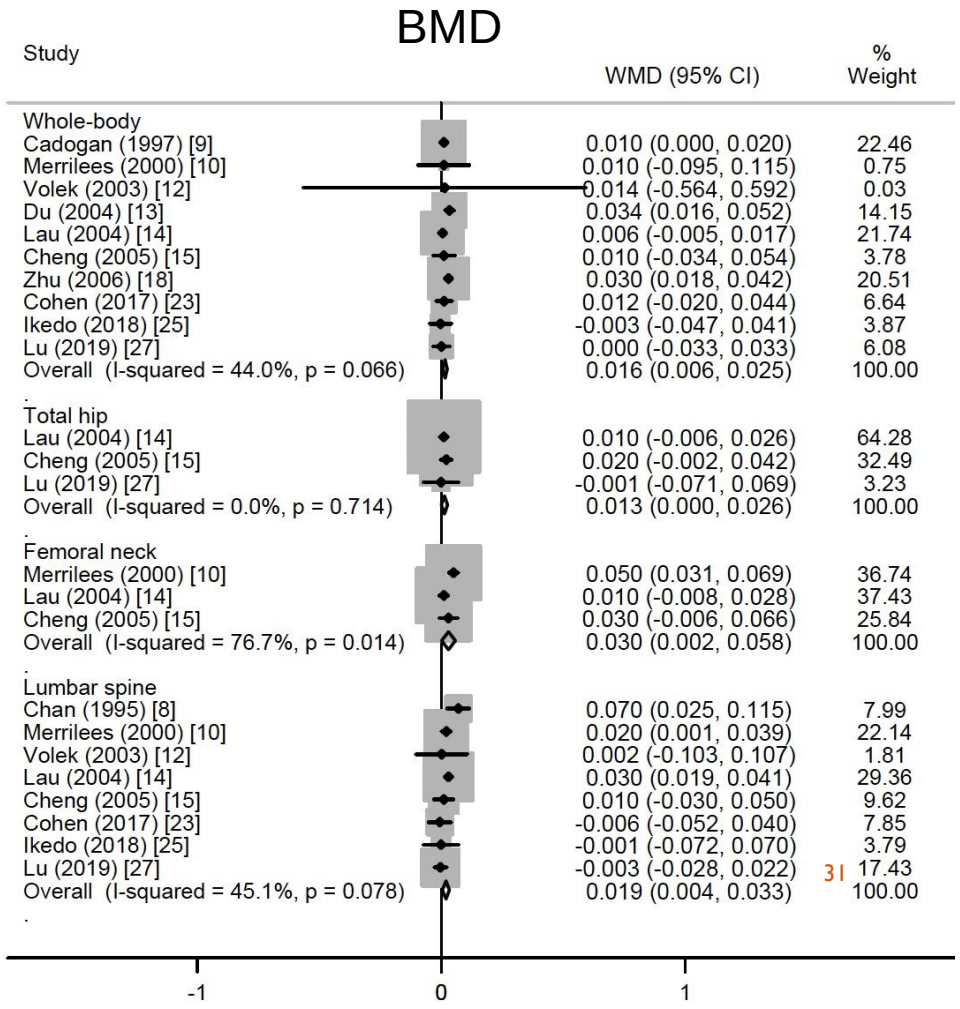
In adults with dark complexion, we suggest against routine screening for 25(OH)D levels. (2 | ⊕◯◯◯)

Recommendation 14

In adults with obesity, we suggest against routine screening for 25(OH)D levels. (2 | ⊕◯◯◯)

The Effects Of Dairy Product Supplementation On Bone Health Indices In Children Aged 3 To 18 Years: A Meta-analysis Of Randomized Controlled Trials

- Dairy supplementation significantly increased:
  - Whole-body bone mineral content (BMC) by +25.37 g, Areal BMD by +0.016 g/cm², Height by +0.21 cm
  - Total hip BMC by +0.49 g and aBMD by +0.013 g/cm², Femoral neck BMC by +0.06 g and aBMD by +0.030 g/cm², Lumbar spine BMC by +0.85 g and aBMD by +0.019 g/cm²
- This study showed that dairy product supplementation during growth leads to small but significant increases in bone mineral mass parameters and height in children and adolescents. These findings are consistent across various subgroups based on sex, geographical region, baseline calcium intake, and other factors.



Hidayat K, Zhang LL, Rizzoli R, Guo YX, Zhou Y, Shi YJ, Su HW, Liu B, Qin LQ. The Effects of Dairy Product Supplementation on Bone Health Indices in Children Aged 3 to 18 Years: A Meta-Analysis of Randomized Controlled Trials. Adv Nutr. 2023 Sep;14(5):1187-1196.

Milk Intake And Hip Fracture Incidence In Community-dwelling Old Icelandic Adults

- The study included 4,614 subjects with a mean age of 76 years, recruited between 2002 and 2006. Information on hip fractures was obtained from hospital records during follow-up until 2012.
- Higher milk intake was positively correlated with greater volumetric bone mineral density, showing an adjusted difference of 8.95 mg/cm³ between the highest and lowest intake categories.
- During the follow-up period, 7.4% of participants experienced a hip fracture.
- The analysis revealed a decreased risk of hip fractures in those with the highest milk intake, with a hazard ratio of 0.69 (95% CI: 0.47-0.99) compared to those with the lowest intake.

	Frequency of milk consumption/day	Participants/cases	HR (95% confidence interval)	*P*-value
Model 1	<0.5	*n*=651/55	Ref	Ref
	0.5–0.9	*n*=622/54	0.99 (0.68–1.43)	0.936
	1.0–1.4	*n*=1438/109	0.83 (0.60–1.14)	0.250
	1.5–1.9	*n*=874/61	0.76 (0.53–1.10)	0.144
	≥2	*n*=1029/63	0.63 (0.44–0.91)	0.013
Model 2	<0.5		Ref	Ref
	0.5–0.9		0.98 (0.67–1.43)	0.914
	1.0–1.4		0.84 (0.60–1.16)	0.288
	1.5–1.9		0.78 (0.54–1.13)	0.186
	≥2		0.63 (0.44–0.90)	0.012
Model 3	<0.5		Ref	Ref
	0.5–0.9		1.02 (0.69–1.49)	0.940
	1.0–1.4		0.89 (0.64–1.24)	0.488
	1.5–1.9		0.89 (0.62–1.30)	0.550
	≥2		0.69 (0.47–0.99)	0.045

*Based on Cox regression; *P*-value for linear trend (based on group medians) for model 1, $P=0.004$; for model 2, $P=0.004$; and for model 3, $P=0.025$

Model 1, corrected for age and sex; model 2, additionally corrected for education, marital status, smoking, alcohol, physical activity, number of medications, TUG, balance; model 3, additionally corrected for 25(OH)D and vBMD of femoral neck

Skuladottir SS, Hjaltadottir I, Launer L, Cotch MF, Siggeirsdottir K, Gudnason V, Sigurdsson G, Steingrimsdottir L, Halldorsson T, Ramel A. Milk intake and hip fracture incidence in community-dwelling old Icelandic adults. Osteoporos Int. 2023 Nov;34(11):1951-1959.

Types Of Dairy Foods And Risk Of Fragility Fracture In The Prospective Nurses' Health Study Cohort

- Consuming two or more servings of total dairy per day was associated with a significantly lower fracture risk (hazard ratio [HR]: 0.74) compared to those consuming less than one serving per day.
- Milk Consumption: More than two servings of milk per day also correlated with reduced fracture risk (HR: 0.85).
- Yogurt Intake: No significant association was found between yogurt consumption and fracture risk.
- Cheese Intake: A weak association was observed, with one or more servings of cheese per day linked to lower fracture risk (HR: 0.89).

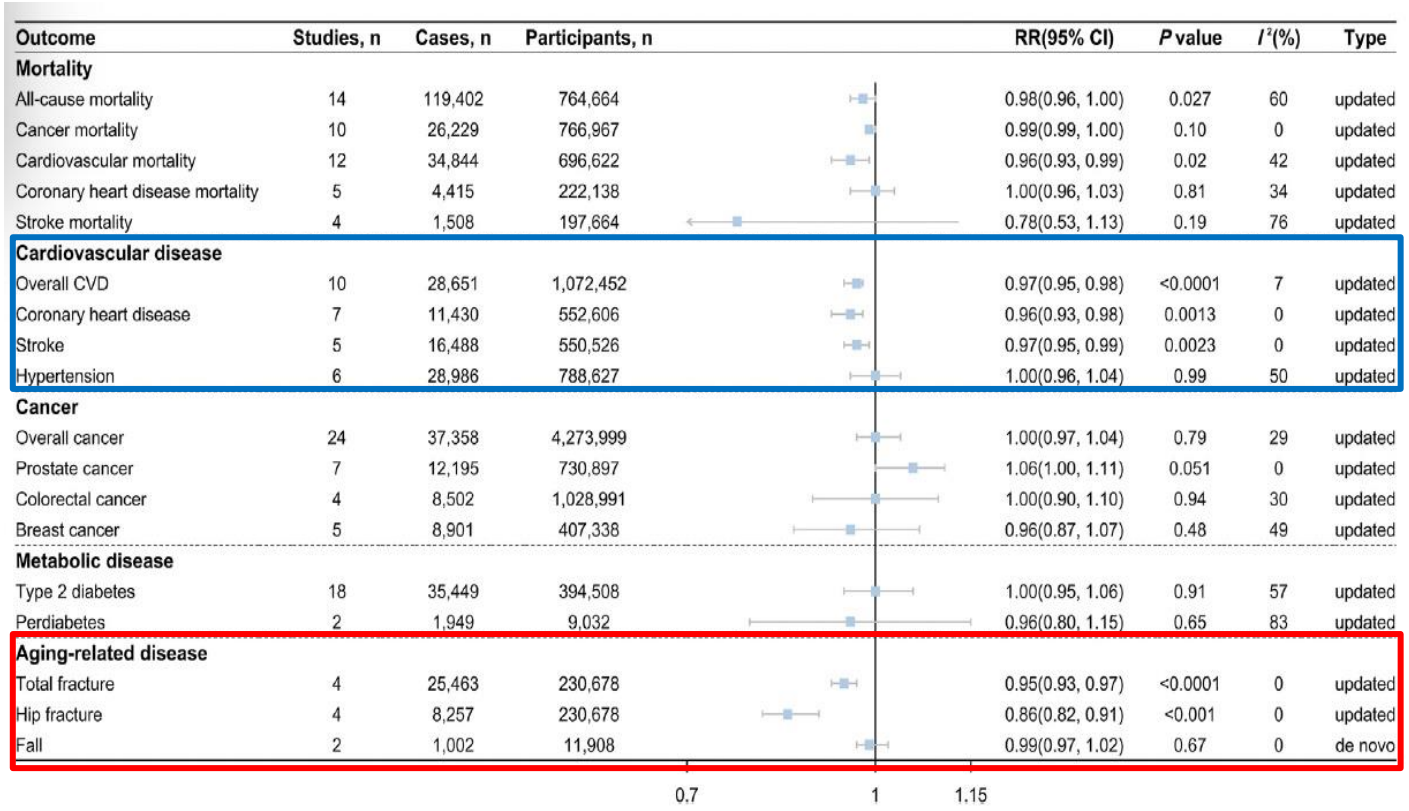
Possible effect modification of dairy foods intakes by other dietary factors on fracture risk in women[1]

	Total dairy intake			
	<1 servings/d	≥1 servings/d	<1 servings/d	≥1 servings/d
	Cases		HR (95% CI)[2]	
N-D calcium				
Low (<500 mg/d)	1244	2039	1.00 (Ref)	0.87 (0.81, 0.94)
High (≥500 mg/d)	703	1509	0.96 (0.87, 1.05)	0.87 (0.80, 0.94)
N-D Vit D				
Low (<6 μg/d)	1188	1881	1.00 (Ref)	0.88 (0.81, 0.94)
High (≥6 μg/d)	759	1667	1.00 (0.91, 1.09)	0.89 (0.82, 0.97)
N-D protein				
Low (<60 g/d)	1197	1617	1.00 (Ref)	0.88 (0.81, 0.95)
High (≥60 g/d)	750	1931	1.01 (0.91, 1.12)	0.91 (0.83, 1.00)
AHEI scores				
Low (<50)	1010	1850	1.00 (Ref)	0.90 (0.83, 0.97)
High (≥50)	937	1698	1.02 (0.93, 1.12)	0.88 (0.81, 0.96)

Yuan M, Hu FB, Li Y, Cabral HJ, Das SK, Deeney JT, Zhou X, Paik JM, Moore LL. Types of dairy foods and risk of fragility fracture in the prospective Nurses' Health Study cohort. Am J Clin Nutr. 2023 Dec;118(6):1172-1181.

Cheese Consumption And Multiple Health Outcomes: An Umbrella Review And Updated Meta-analysis Of Prospective Studies

- The study concludes that cheese consumption may offer neutral to moderate health benefits, particularly in reducing risks related to mortality, cardiovascular diseases, fractures, and certain cancers. The evidence quality was rated as moderate according to the NutriGrade scoring system.
- Overall, this umbrella review highlights the potential positive impacts of cheese on various health outcomes while suggesting further research is needed for conclusive evidence on specific conditions.



Outcome	Studies, n	Cases, n	Participants, n	RR(95% CI)	*P* value	I^2(%)	Type
Mortality							
All-cause mortality	14	119,402	764,664	0.98(0.96, 1.00)	0.027	60	updated
Cancer mortality	10	26,229	766,967	0.99(0.99, 1.00)	0.10	0	updated
Cardiovascular mortality	12	34,844	696,622	0.96(0.93, 0.99)	0.02	42	updated
Coronary heart disease mortality	5	4,415	222,138	1.00(0.96, 1.03)	0.81	34	updated
Stroke mortality	4	1,508	197,664	0.78(0.53, 1.13)	0.19	76	updated
Cardiovascular disease							
Overall CVD	10	28,651	1,072,452	0.97(0.95, 0.98)	<0.0001	7	updated
Coronary heart disease	7	11,430	552,606	0.96(0.93, 0.98)	0.0013	0	updated
Stroke	5	16,488	550,526	0.97(0.95, 0.99)	0.0023	0	updated
Hypertension	6	28,986	788,627	1.00(0.96, 1.04)	0.99	50	updated
Cancer							
Overall cancer	24	37,358	4,273,999	1.00(0.97, 1.04)	0.79	29	updated
Prostate cancer	7	12,195	730,897	1.06(1.00, 1.11)	0.051	0	updated
Colorectal cancer	4	8,502	1,028,991	1.00(0.90, 1.10)	0.94	30	updated
Breast cancer	5	8,901	407,338	0.96(0.87, 1.07)	0.48	49	updated
Metabolic disease							
Type 2 diabetes	18	35,449	394,508	1.00(0.95, 1.06)	0.91	57	updated
Perdiabetes	2	1,949	9,032	0.96(0.80, 1.15)	0.65	83	updated
Aging-related disease							
Total fracture	4	25,463	230,678	0.95(0.93, 0.97)	<0.0001	0	updated
Hip fracture	4	8,257	230,678	0.86(0.82, 0.91)	<0.001	0	updated
Fall	2	1,002	11,908	0.99(0.97, 1.02)	0.67	0	de novo

FIGURE 4. Association between cheese consumption (per 30-g/d intake level) and mortality and multiple disease incidence.

Zhang M, Dong X, Huang Z, et al. Cheese consumption and multiple health outcomes: an umbrella review and updated meta-analysis of prospective studies. Adv Nutr. 2023;14(5):1170-1186.

Vitamin D Supplementation And Muscle Power, Strength And Physical Performance In Older Adults: A Randomized Controlled Trial

- The vitamin D group showed a significant increase in 25(OH)D levels from a baseline of approximately 19.4 ng/mL to 28.6 ng/mL after 12 months, compared to minimal change in the placebo group.
- Despite the increase in vitamin D levels, there were no significant improvements in leg power, strength, SPPB scores, TUG times, or other measures of physical performance between the vitamin D and placebo groups over the study period.
- There were also no notable changes in muscle fiber composition or contractile properties after supplementation.
- These findings suggest that while vitamin D is important for overall health, its supplementation alone may not enhance muscle function in this population.

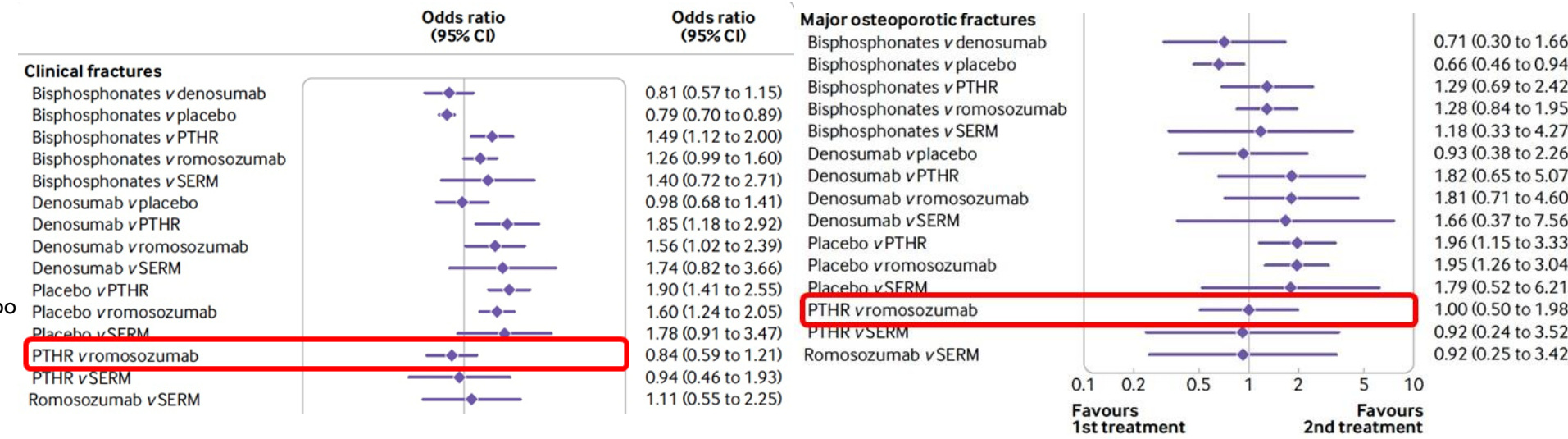
Adjusted change in muscle power and strength and physical performance over 12 mo by intervention group and the difference in 12-mo change between intervention groups[1]

	Vitamin D		Placebo		Difference in change (vitamin D – placebo)	*P* value for difference in change by group
	N[2]	LS Means ± SE	*N*[2]	LS Means ± SE	LS Means ± SE	
Muscle power and strength						
Leg power, watts	61	–11.96 ± 3.75	61	–7.97 ± 3.77	–4.00 ± 5.26	0.45
Leg power quality, watts/kg	61	–0.13 ± 0.04	61	–0.10 ± 0.04	–0.03 ± 0.06	0.63
Knee extensor strength, Nm	45	–8.09 ± 1.75	50	–3.84 ± 1.66	–4.25 ± 2.37	0.08
Knee extensor quality, Nm/kg	45	–0.09 ± 0.02	50	–0.04 ± 0.02	–0.04 ± 0.03	0.15
Grip strength, kg	56	–1.54 ± 0.50	64	–1.39 ± 0.48	–0.15 ± 0.69	0.82
Physical performance						
SPPB score (0–12)	60	1.64 ± 0.22	63	1.83 ± 0.22	–0.18 ± 0.29	0.53
Health ABC PPB score (0–4)	54	0.19 ± 0.04	51	0.17 ± 0.04	0.02 ± 0.06	0.75
Balance time, s	59	1.32 ± 1.98	57	3.06 ± 2.02	–1.74 ± 2.58	0.50
4-meter usual gait speed, meters/s	60	0.07 ± 0.02	61	0.08 ± 0.02	0.00 ± 0.02	0.83
Chair stand times, s	56	–3.12 ± 0.53	54	–3.04 ± 0.53	–0.08 ± 0.59	0.89
Timed Up and Go, s	58	1.01 ± 0.21	59	0.98 ± 0.21	0.03 ± 0.27	0.92
4 stair climb, s	60	0.41 ± 0.07	61	0.32 ± 0.07	0.09 ± 0.10	0.35

Houston, Denise K et al. "Vitamin D Supplementation and Muscle Power, Strength and Physical Performance in Older Adults: A Randomized Controlled Trial." The American journal of clinical nutrition vol. 117,6 (2023): 1086-1095.

Fracture Risk Reduction And Safety By Osteoporosis Treatment compared With Placebo Or Active Comparator In Postmenopausal Women

- The results of this study showed: Bone anabolic treatments (e.g., romosozumab and parathyroid hormone receptor agonists) demonstrated superior efficacy compared to bisphosphonates in preventing clinical and vertebral fractures.
- Compared to placebo, all treatments showed significant protective effects against clinical fractures.
- Denosumab was less effective than parathyroid hormone receptor agonists and romosozumab for reducing clinical fractures.
- The effectiveness of antiresorptive treatments increased with the age of participants.

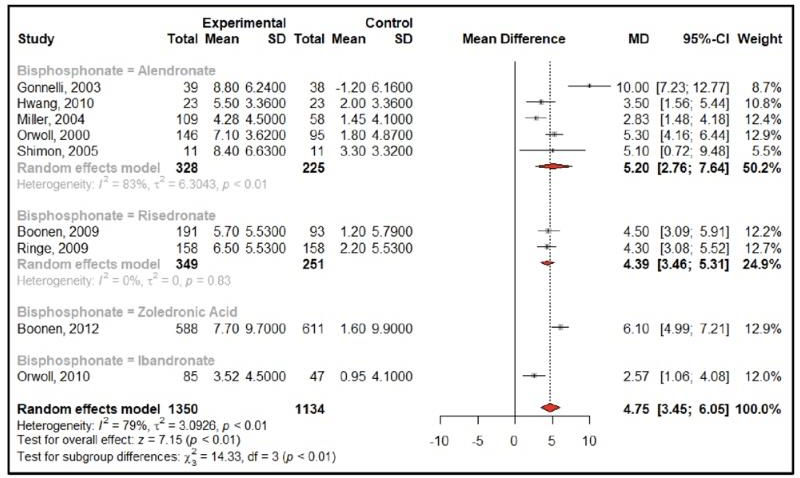


Händel, Mina Nicole et al. "Fracture risk reduction and safety by osteoporosis treatment compared with placebo or active comparator in postmenopausal women: systematic review, network meta-analysis, and meta-regression analysis of randomised clinical trials." BMJ (Clinical research ed.) vol. 381 e068033. 2 May. 2023

Efficacy Of Osteoporosis Pharmacological Treatments In Men: A Systematic Review And Meta-analysis

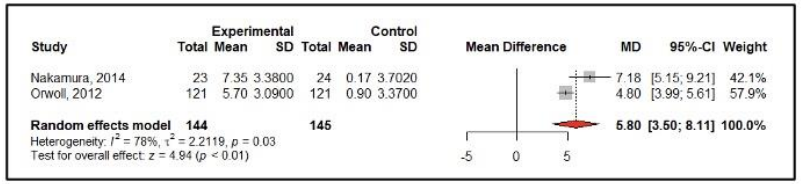
- The findings of this study indicate that pharmacological treatments for osteoporosis are effective in increasing BMD and reducing fracture risk in men, similar to their benefits observed in women. The authors suggest that management algorithms for osteoporosis in men could align closely with those recommended for women.

Bisphosphonates

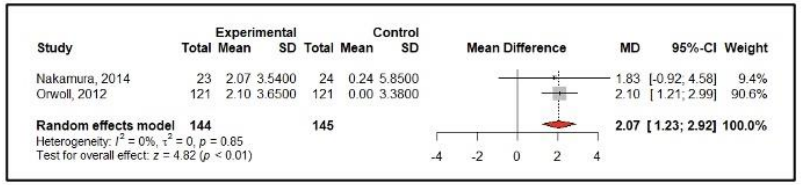


(A)

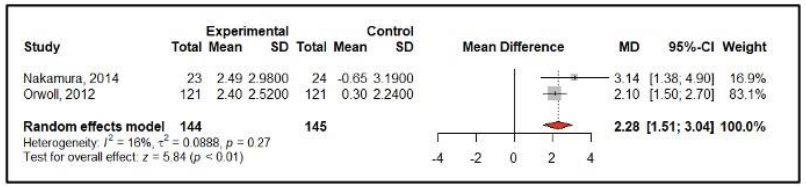
Denosumab



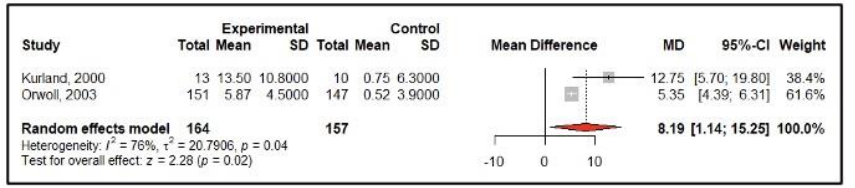
(A)



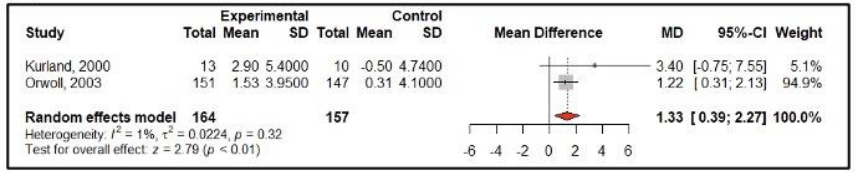
(B)



Teriparatide



(A)



(B)

Beaudart, Charlotte et al. "Efficacy of osteoporosis pharmacological treatments in men: a systematic review and meta-analysis." Aging clinical and experimental research vol. 35,9 (2023): 1789-1806.

Comparisons Between Different Anti-osteoporosis Medications On Post Fracture Mortality: A Population-based Study

- Compared to raloxifene and bazedoxifene, the following medications were associated with significantly lower mortality rates: Alendronate/Risedronate: HR = 0.83, Denosumab: HR = 0.86, Zoledronic Acid: HR = 0.78
- Patients receiving long-acting zoledronic acid exhibited the lowest mortality rates, particularly in subanalyses stratified by sex and among those over 65 years old.
- This real-world evidence highlights the importance of medication choice in managing osteoporosis-related fractures and associated mortality risks.

Table 2. Multivariate Cox proportional hazard analyses of the association between fracture sites and all-cause mortality

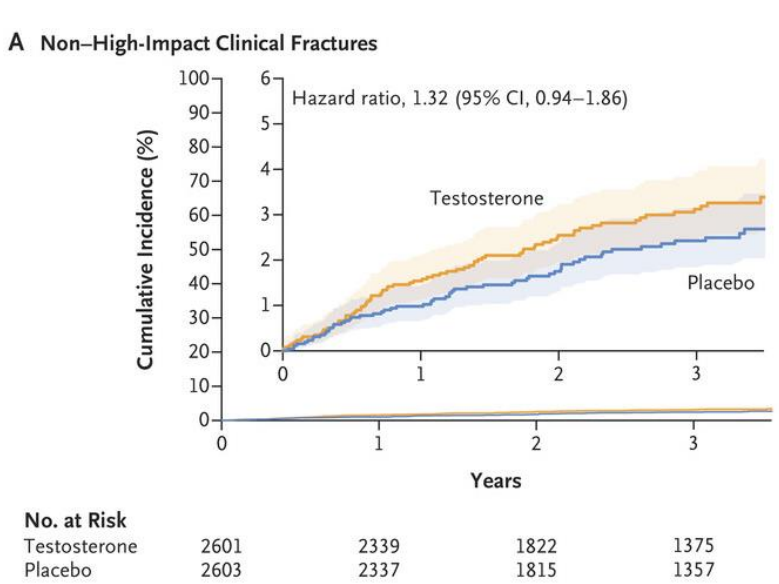
	Total fracture	Hip fracture	Vertebral fracture	Nonhip/nonvertebral fracture
Gender (ref. male)	1.00	1.00	1.00	1.00
Female	0.61 (0.59-0.63)**	0.65 (0.61-0.68)**	0.61 (0.57-0.64)**	0.52 (0.47-0.58)**
Age	1.08 (1.08-1.08)**	1.07 (1.07-1.08)**	1.08 (1.07-1.08)**	1.08 (1.07-1.09)**
CCI	1.13 (1.13-1.14)**	1.12 (1.10-1.13)**	1.14 (1.12-1.15)**	1.18 (1.16-1.20)**
Type of osteoporosis medications				
Raloxifene/bazedoxifene (ref.)	1.00	1.00	1.00	1.00
Alendronate/risedronate	0.83 (0.79-0.88)**	0.78 (0.72-0.83)**	0.88 (0.81-0.95)**	0.88 (0.79-0.99)**
Ibandronate	0.96 (0.88-1.05)	0.91 (0.79-1.04)	0.99 (0.85-1.14)	1.05 (0.85-1.29)
Denosumab	0.86 (0.81-0.91)**	0.79 (0.73-0.86)**	0.89 (0.81-0.98)**	0.96 (0.84-1.10)
Zoledronic acid	0.78 (0.73-0.84)**	0.78 (0.70-0.86)**	0.76 (0.67-0.86)**	0.81 (0.68-0.97)**

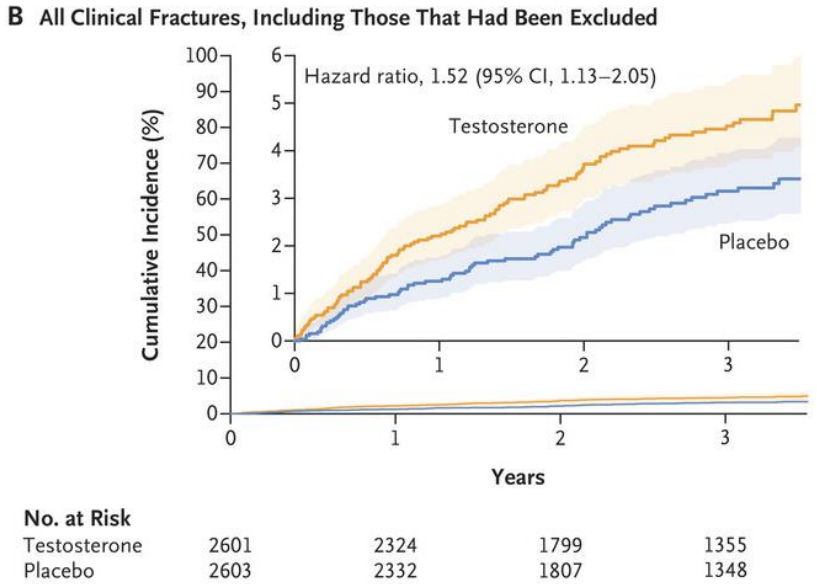
Data presented as adjusted hazard ratios (95% CI), adjusted with immortal time bias.
Abbreviation: CCI, Charlson Comorbidity Index.
**$P < 0.05$.

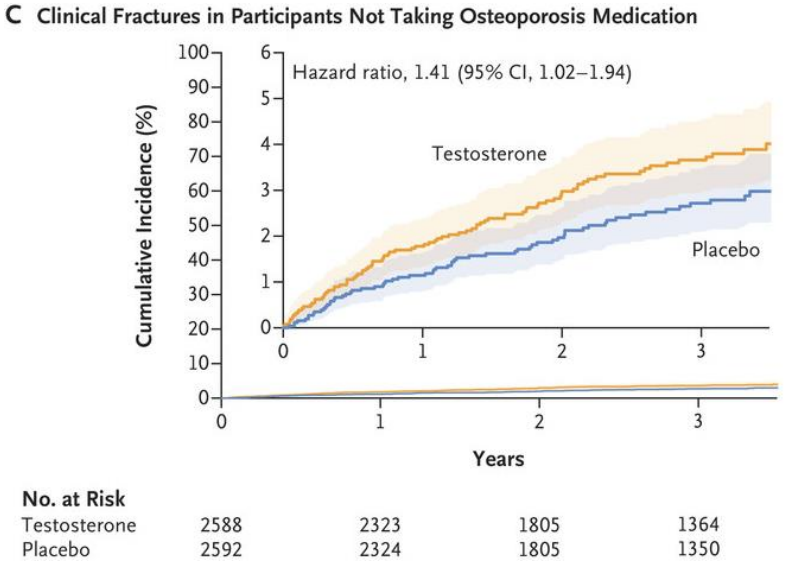
Wu, Chih-Hsing et al. "Comparisons Between Different Anti-osteoporosis Medications on Postfracture Mortality: A Population-Based Study." The Journal of clinical endocrinology and metabolism vol. 108,4 (2023): 827-833.

Testosterone Treatment And Fractures In Men With Hypogonadism

- This study showed that although testosterone therapy can enhance bone density in men with hypogonadism, it does not lead to a significant reduction in fracture risk over one year. These findings suggest that while testosterone treatment may have benefits for bone health, additional strategies may be necessary to prevent fractures in this population.





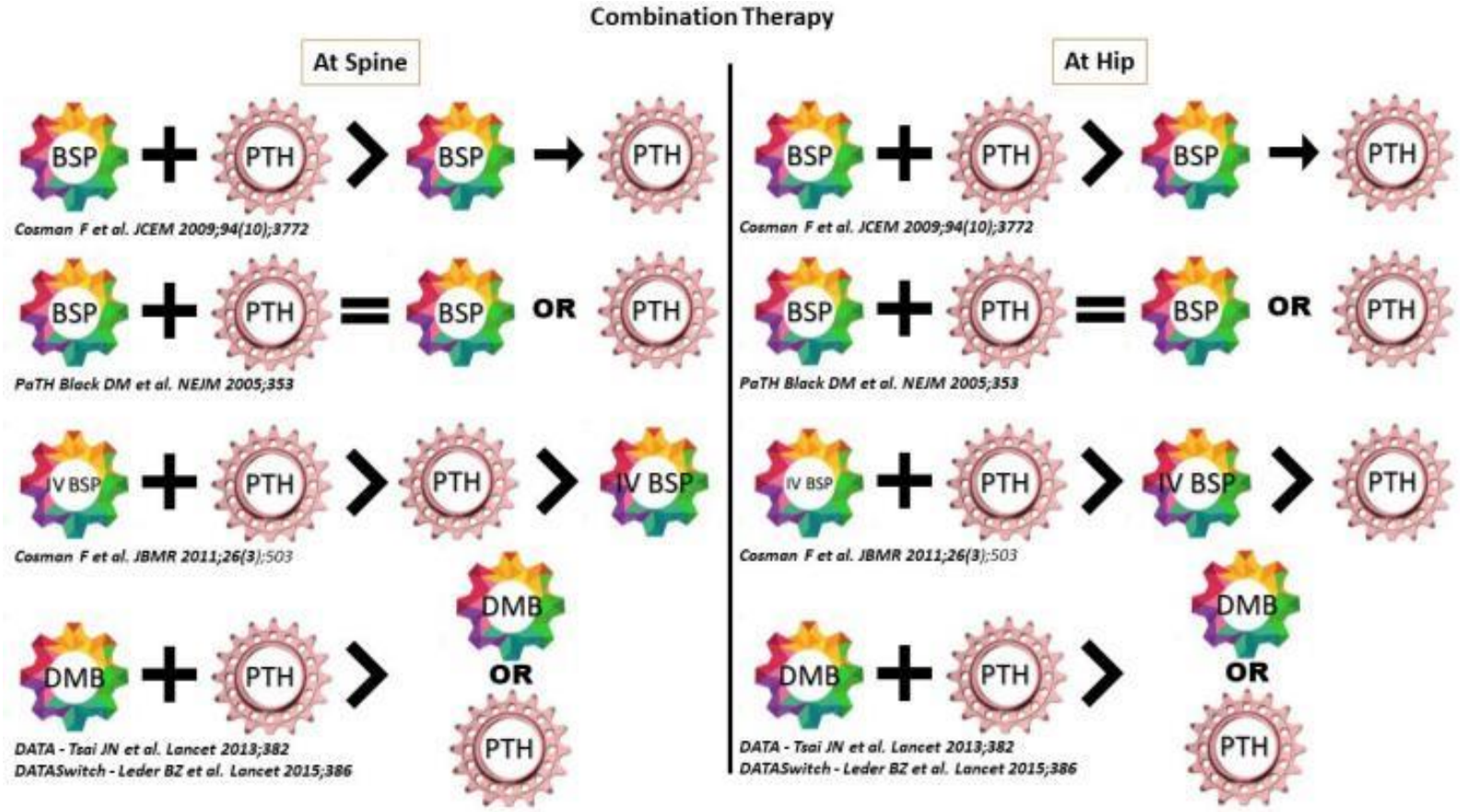


Snyder, Peter J et al. "Testosterone Treatment and Fractures in Men with Hypogonadism." The New England journal of medicine vol. 390,3 (2024): 203-211.

Combination Therapy In Osteoporosis

- Emerging evidence suggest that therapy should be initiated with an anabolic agent in patients who are at high risk to attain BMD gains quickly.
- Anabolic therapy after a potent antiresorptive such as alendronic acid is associated with an initial blunting in BMD response, however, reassuringly this does not seem to result in increased fracture risk.
- The effects of all anabolic agents appear to be reversible and the administration of an antiresorptive medication is needed after their discontinuation.

Chandran M. The why and how of sequential and combination therapy in osteoporosis. A review of the current evidence. Arch Endocrinol Metab. 2022 Nov

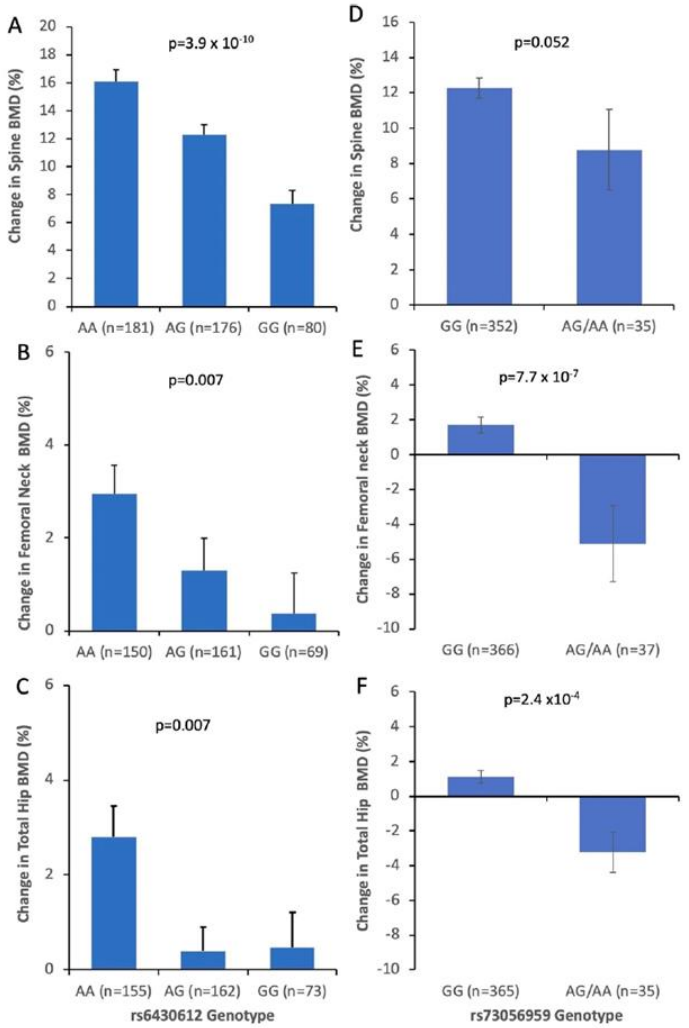


- The concomitant administration of denosumab with teriparatide has been shown to significantly increase areal BMD as well as to increase volumetric BMD
- A regimen in which a moderately potent antiresorptive is followed by a stronger one has the potential to be associated with a higher risk of adverse events such as atypical fractures and osteonecrosis of the jaw.

Chandran M. The why and how of sequential and combination therapy in osteoporosis. A review of the current evidence. Arch Endocrinol Metab. 2022 Nov

Genome-wide Association Study Identifies Genetic Variants Which Predict The Response Of Bone Mineral Density To Teriparatide Therapy

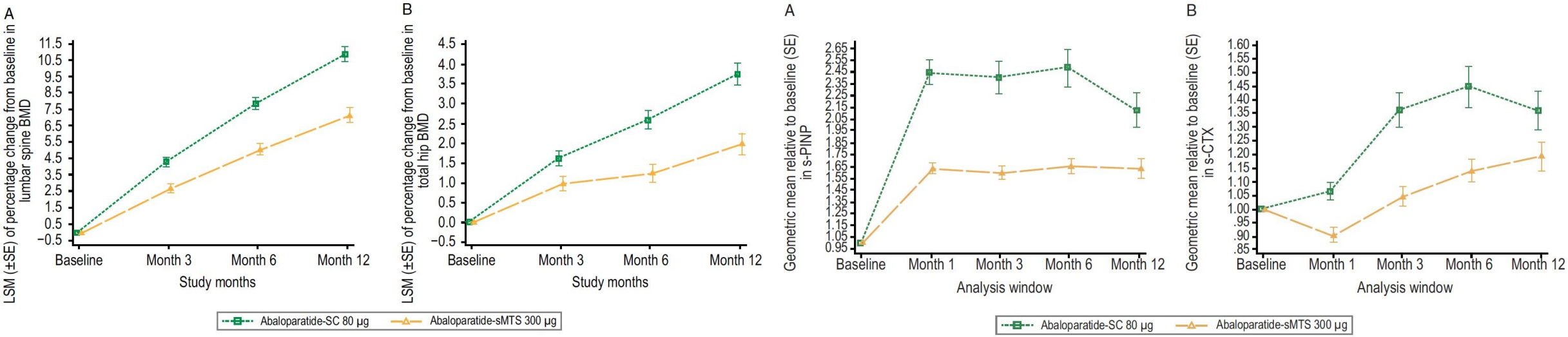
- Several genetic variants were significantly associated with the change in BMD following teriparatide treatment.
- The findings suggest that genetic profiling may enhance personalized treatment approaches for osteoporosis, allowing for more tailored use of teriparatide based on individual genetic makeup.



Alonso, Nerea et al. "Genome-wide association study identifies genetic variants which predict the response of bone mineral density to teriparatide therapy." Annals of the rheumatic diseases vol. 82,7 (2023): 985-991

Efficacy And Safety Of Transdermal Abaloparatide In Postmenopausal Women With Osteoporosis: A Randomized Study

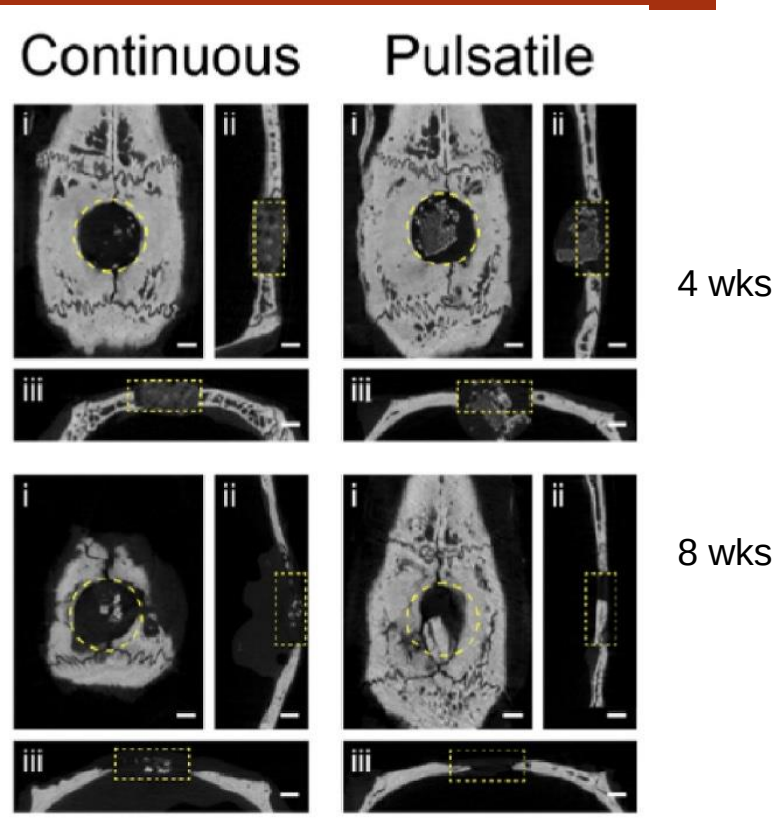
- Participants receiving transdermal abaloparatide showed significant improvements in BMD at key sites such as the lumbar spine and hip compared to those on placebo.
- The treatment was associated with a reduction in the risk of new vertebral fractures.
- The study demonstrates a favorable safety profile, suggesting that this formulation could be a viable alternative for osteoporosis management.



Lewiecki, E Michael et al. "Efficacy and Safety of Transdermal Abaloparatide in Postmenopausal Women with Osteoporosis: A Randomized Study." Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research vol. 38,10 (2023): 1404-1414.

A Biomimetic And Bioactive Scaffold With Intelligently Pulsatile Teriparatide Delivery For Local And Systemic Osteoporosis Regeneration

- The scaffold is made from mesoporous bioglass and features a polydopamine coating that allows for near-infrared (NIR) light-triggered drug release.
- Teriparatide is encapsulated in thermosensitive liposomes within the scaffold, enabling localized and systemic effects. The release can be controlled by NIR light, which heats the scaffold and triggers the release of the drug.
- The pulsatile release of teriparatide significantly improves BMD and promotes osteogenic differentiation, leading to better healing of osteoporotic bone defects.
- In animal models, the scaffolds demonstrated effective bone regeneration capabilities, indicating their potential for clinical application in treating osteoporosis-related fractures.



Che, Lingbin et al. "A biomimetic and bioactive scaffold with intelligently pulsatile teriparatide delivery for local and systemic osteoporosis regeneration." Bioactive materials vol. 19 75-87. 5 Apr. 2022

International Organizations In The Treatment Of Osteoporosis And The Prevention Of Fragility Fractures

Importance Of International Collaboration In Reducing Osteoporosis And Fragility Fractures

International collaboration is crucial in addressing the global challenge of osteoporosis and fragility fractures. These collaborations aim to enhance awareness, prevention, and treatment strategies on a global scale.

The International Osteoporosis Foundation (IOF), as the largest non-governmental organization focused on osteoporosis, plays a pivotal role in uniting stakeholders to share knowledge, research, and best practices.

IOF
International Osteoporosis Foundation

Key IOF Goals And Priorities

IOF Board Members

Africa

TERÉZA HOUGH
South Africa

ABDELLAH EL MAGHRAOUI
Morocco

NGOZI ROSEMARY NJEZE
Nigeria

LEITH ZAKRAOUI
Tunisia

Asia-Pacific

MANJU CHANDRAN
Singapore

PETER EBELING
Australia

AMBRISH MITHAL
India

ATSUSHI SUZUKI
Japan

Europe

MARIA LUISA BRANDI
Italy

OLIVIER BRUYÈRE
Belgium

RADMILA MATIJEVIC
Serbia

Latin America

CLAUDIA CAMPUSANO
Chile

PATRICIA CLARK
Mexico

OSVALDO MESSINA
Argentina

JORGE LUIS ALBERTO MORALES TORRES
Mexico

Middle East

NIZAR ABDULATEEF
Iraq

BAGHER LARIJANI
Iran

BASEL MASRI
Jordan

YOUSSEF SALEH
Saudi Arabia

North America

BESS DAWSON-HUGHES
United States of America

MICHAEL MCCLUNG
United States of America

DANIEL PINTO
United States of America

STUART SILVERMAN
United States of America

Capture The Fracture (CTF)

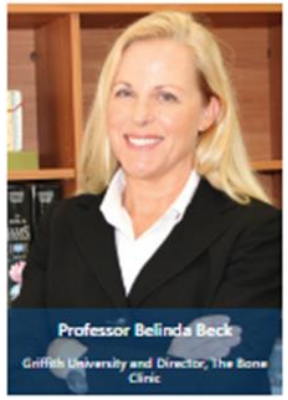
- Capture the Fracture (CTF) is a global initiative launched by the IOF in 2012, aimed at improving secondary fracture prevention for individuals who have already experienced a fragility fracture. This initiative seeks to address the significant care gap that often leaves these patients at risk for future fractures.
- Objectives of Capture the Fracture
  - Global Standards: CTF establishes internationally endorsed standards for best practices in post-fracture care, primarily through the implementation of Fracture Liaison Services (FLS).
  - Best Practice Framework: The initiative includes a Best Practice Framework (BPF) that outlines essential components for effective FLS implementation. This framework serves as a benchmark for healthcare providers and allows them to gain recognition on the CTF Global Map of Best Practices.
  - Mentorship and Resources: CTF offers mentorship programs and a variety of resources to support the development and sustainability of FLS at local levels. This is crucial for healthcare systems aiming to enhance their fracture care services

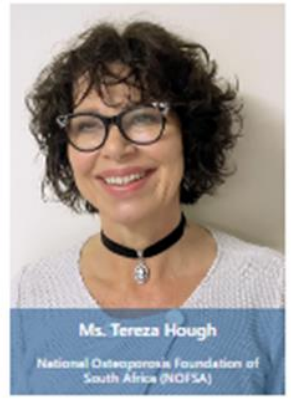
CTF Governance

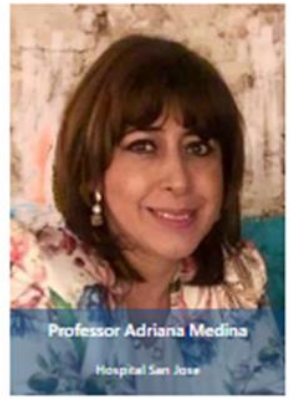
Chair

Vice-Chairs

FLS Expert Members

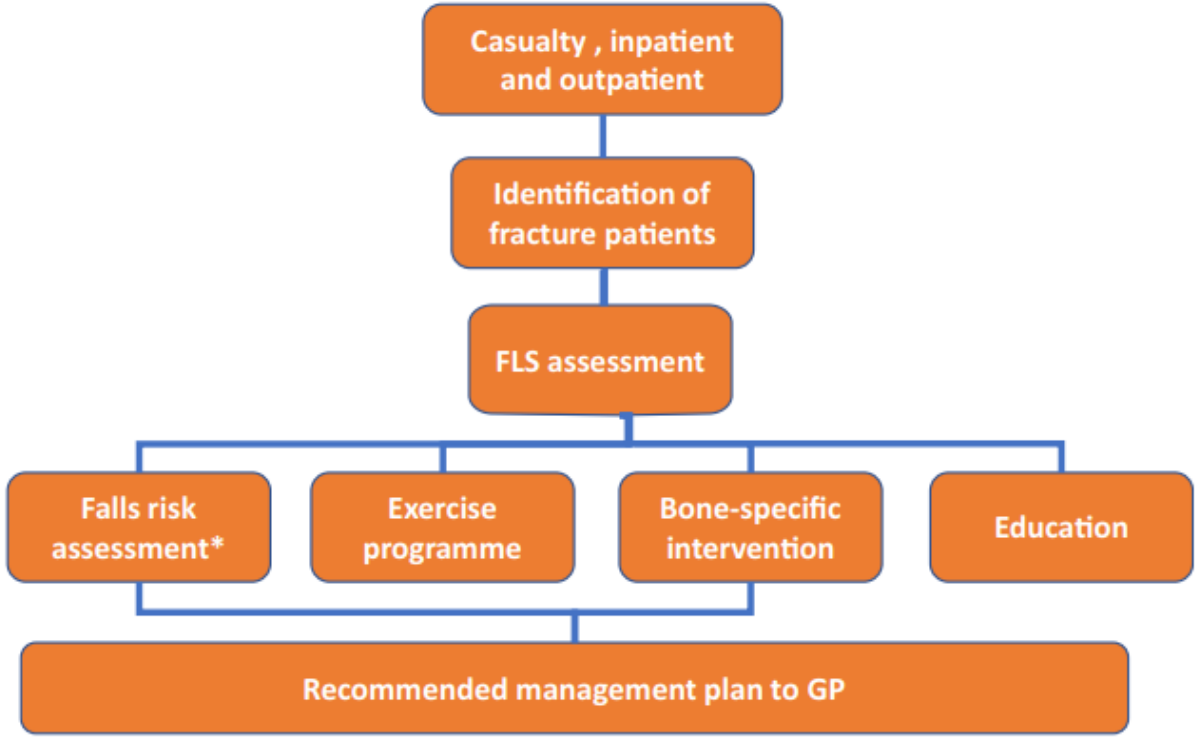






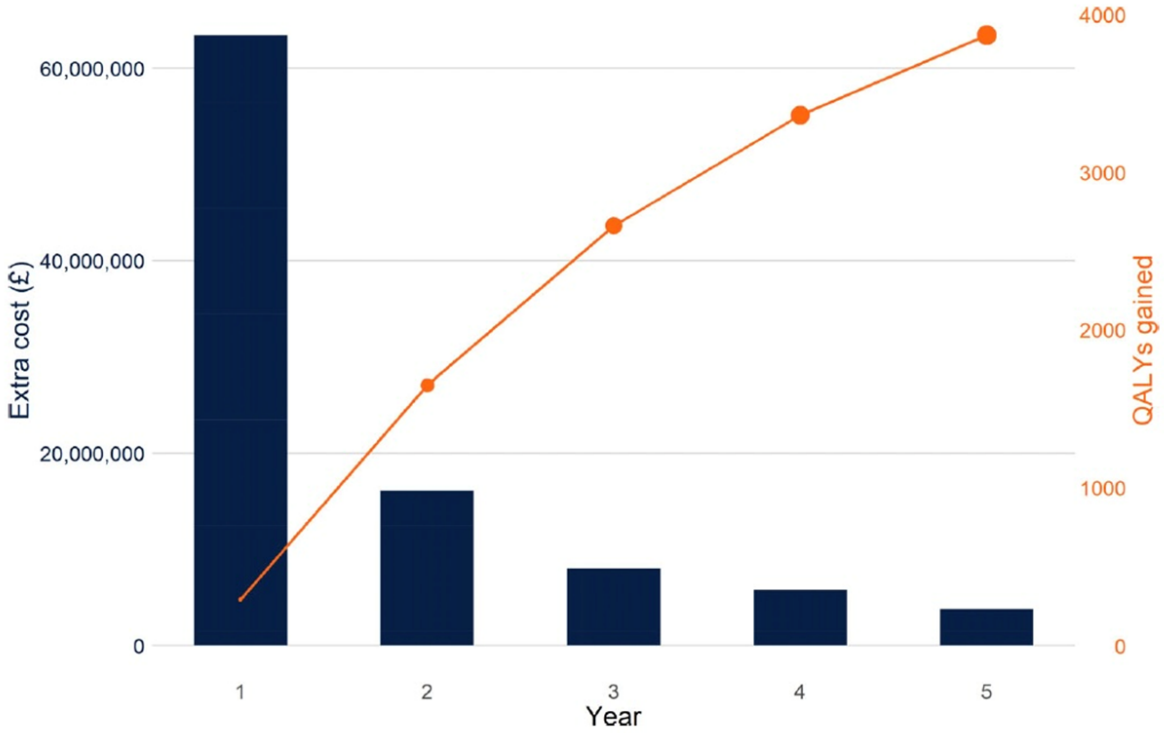
What Is Fracture Liaison Services

- Fracture Liaison Services (FLS) are specialized healthcare programs designed to provide secondary prevention for fragility fractures, particularly in older adults. These services aim to identify patients who have suffered a fragility fracture and assess their risk for future fractures, ensuring timely intervention and management.
- By providing comprehensive assessments, multidisciplinary care coordination, and targeted interventions, FLS effectively addresses the gaps in care for individuals who have sustained fragility fractures.



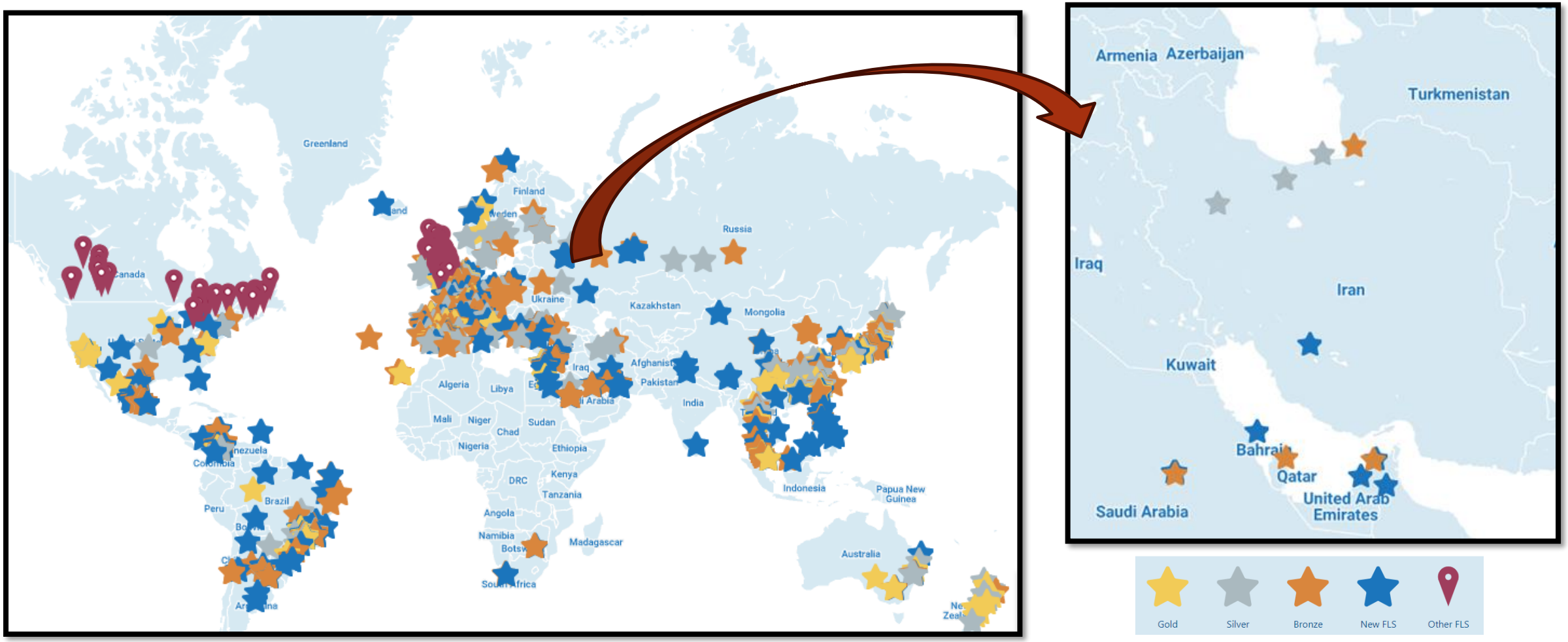
Expected Benefits And Budget Impact From A Microsimulation Model Support The Prioritization And Implementation Of Fracture Liaison Services

- This study showed that implementing FLS was projected to significantly reduce the incidence of subsequent fractures, leading to improved quality of life for patients.
- The analysis indicated that FLS could result in substantial cost savings for healthcare systems by preventing fractures and associated complications.
- The findings support the argument that investing in FLS is economically viable and beneficial for managing osteoporosis, ultimately leading to better patient outcomes and reduced healthcare costs.



Pinedo-Villanueva, Rafael et al. "Expected Benefits and Budget Impact From a Microsimulation Model Support the Prioritization and Implementation of Fracture Liaison Services." Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research vol. 38,4 (2023): 499-511.

Fracture Liaison Services: Map Of Best Practice



استئوپاد

شبکه کلینیک‌های ارائه خدمات پیشگیری از شکستگی ثانویه ایران

ما در نظام یکپارچه پیشگیری از شکستگی ثانویه استئوپاد در تلاشیم تا در زمان شکستگی دسترسی آسان به مراقبت های پوکی استخوان را در اختیار بیماران قرار دهیم.

همکاران ما:

در کلینیک‌های استئوپاد چه می‌کنیم؟

شناسایی بیماران

شناسایی بیماران با شکستگی مهره‌ای و غیرمهره‌ای با ضربه خفیف در افراد بالای ۵۰ سال

معاینه و درمان

بررسی سوابق خطر و سبک زندگی، ارزیابی خطر سقوط، مشاوره عمومی و آموزش، ارزیابی وضعیت پوکی استخوان، درمان پوکی استخوان و ...

پیگیری‌های دوره‌ای

پیگیری‌های دوره‌ای و منظم برای شروع درمان، پایبندی به درمان، اصلاح عوامل خطر زمینه‌ای و ...

بیمارستان شفا یحیائیان

شهر: تهران

سال شروع فعالیت: ۱۳۹۹

سطح ارائه خدمت: نقره‌ای

اطلاعات بیشتر

بیمارستان شهید چمران

شهر: شیراز

سال شروع فعالیت: ۱۴۰۱

سطح ارائه خدمت: فاقد ارزیابی

اطلاعات بیشتر

بیمارستان امام خمینی

شهر: ساری

سال شروع فعالیت: ۱۴۰۱

سطح ارائه خدمت: فاقد ارزیابی

اطلاعات بیشتر

بیمارستان ۵ آذر

شهر: گرگان

سال شروع فعالیت: ۱۳۹۹

سطح ارائه خدمت: برنز

اطلاعات بیشتر

بیمارستان بعثت

شهر: همدان

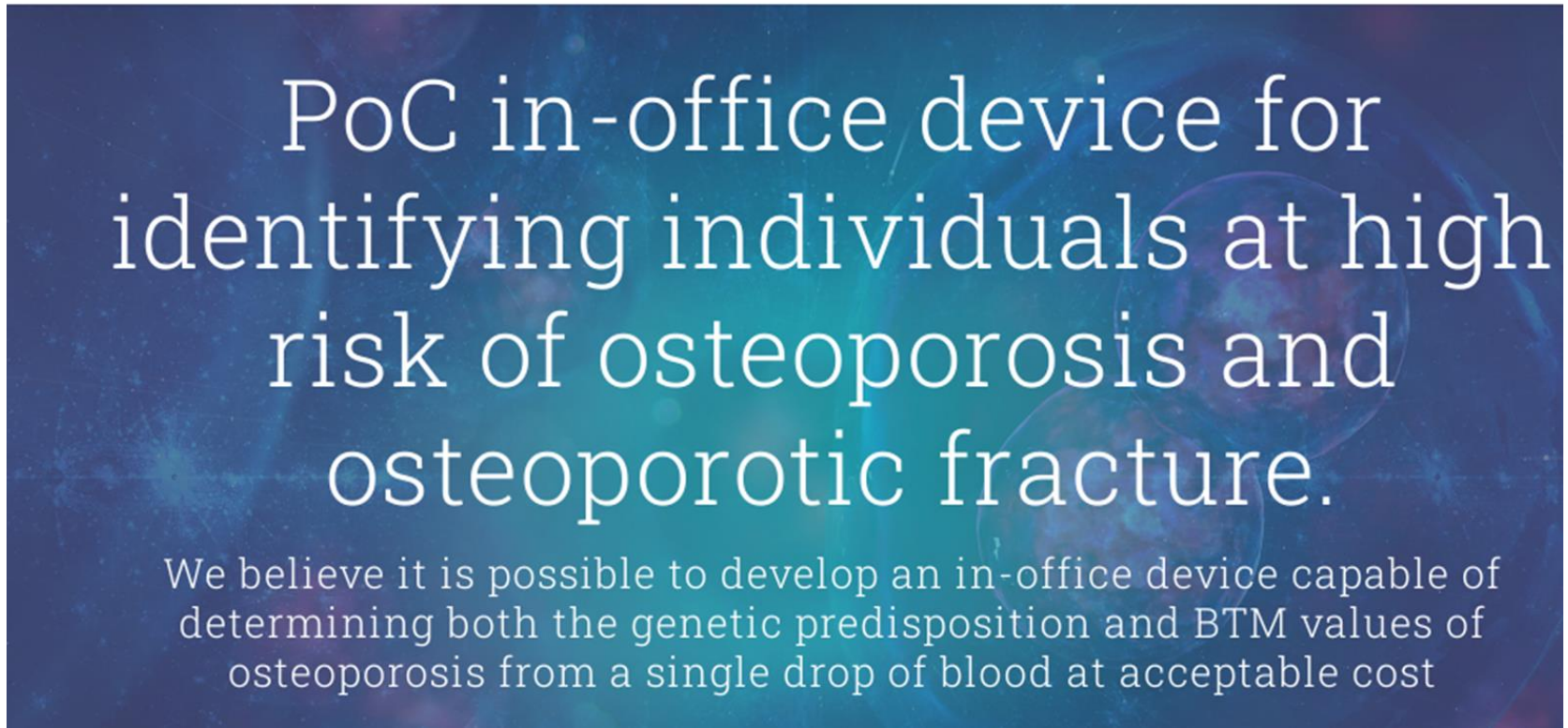
سال شروع فعالیت: ۱۴۰۲

سطح ارائه خدمت: فاقد ارزیابی

اطلاعات بیشتر

Future Directions For Osteoporosis Management

Personalized Management :New Horizons Of Diagnosis And Treatment



EMRI

Medical University of Graz

UNIVERSITAT ROVIRA i VIRGILI

microLIQUID
experts in microfluidics

Fraunhofer IMM

HEMISTRY UPRAMOLECULAR

Fundiéo

LABMAN

CMST

UNIVERSITEIT GENT

HORIZON 2020

IOF
International Osteoporosis Foundation

PoCOsteo

A PoC, in-office device for identifying individuals at high risk of osteoporosis and osteoporotic fracture

Conclusions

- Osteoporosis is caused by many different factors
- Treatment of osteoporosis is a multifaceted approach that includes lifestyle modification, exercise, and medications
- Currently approved for the treatment of osteoporosis are generally divided into broad categories of antiresorptive and osteoanabolic medications
- Covid-19 pandemic has severely affected osteoporosis management in all countries, including Iran
- General approach to osteoporosis is personalized and designed for each individual patient.
- Future strategies against osteoporotic fractures should be multidisciplinary and inclusive of different strategies.