

What Every Specialist Should Know About Osteoporosis Today



Soosan Soroosh
Professor in Rheumatology

High-Risk Populations Require Special Attention

Rheumatoid Arthritis

22-50% prevalence due to chronic inflammation and glucocorticoid therapy

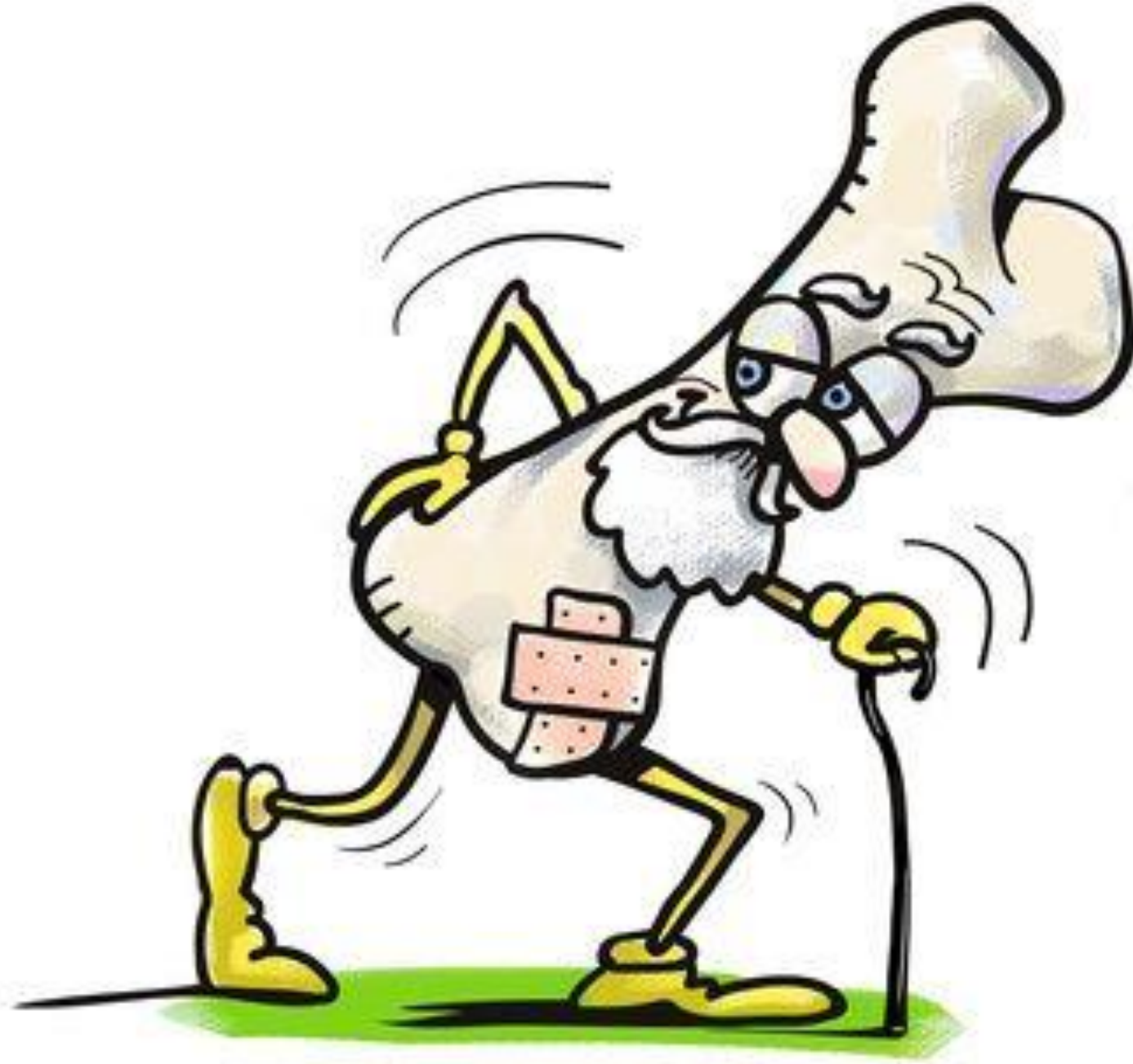
Chronic Kidney Disease

33-81% develop osteopenia in stages 3-5D from metabolic disruptions

Post-Transplant Patients

Elevated risk from immunosuppressive medications and metabolic complications

Osteoporosis



Osteoporosis Overview



Bone Deterioration

Low bone mass and
microarchitectural breakdown
characterize disease



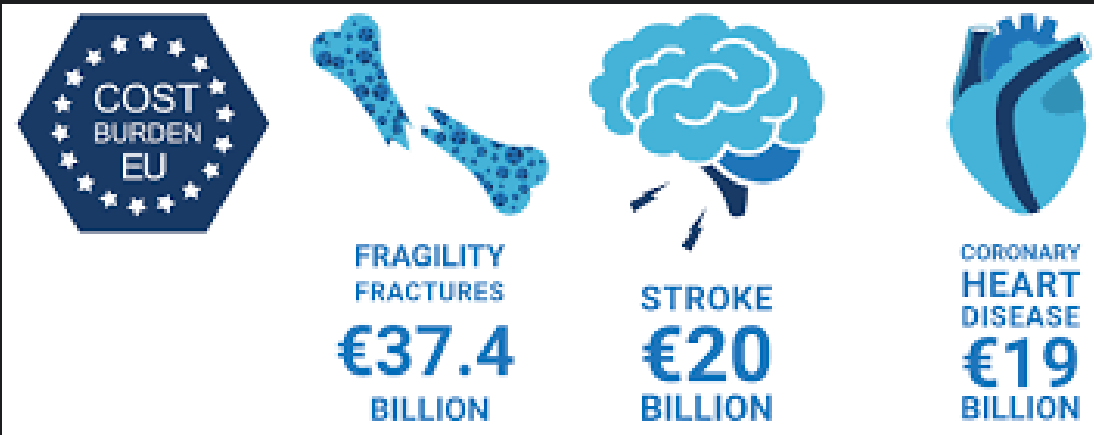
Population Impact

1 in 3 women, 1 in 5 men affected
after age 50



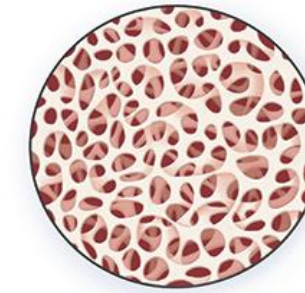
Economic Burden

Annual fracture costs exceed \$20 billion in US alone

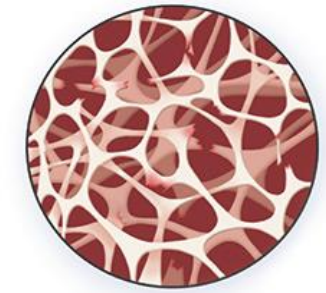


Osteoporosis

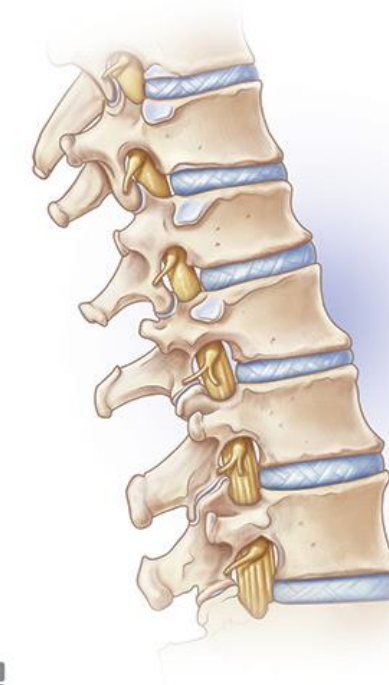
High bone density
Healthy



Low bone density
Osteoporosis



Healthy spine



Spine with
osteoporosis



Compression fracture

The Global Burden By the Numbers

200M

Global Prevalence

People worldwide
affected by
osteoporosis

30%

Postmenopausal
Women

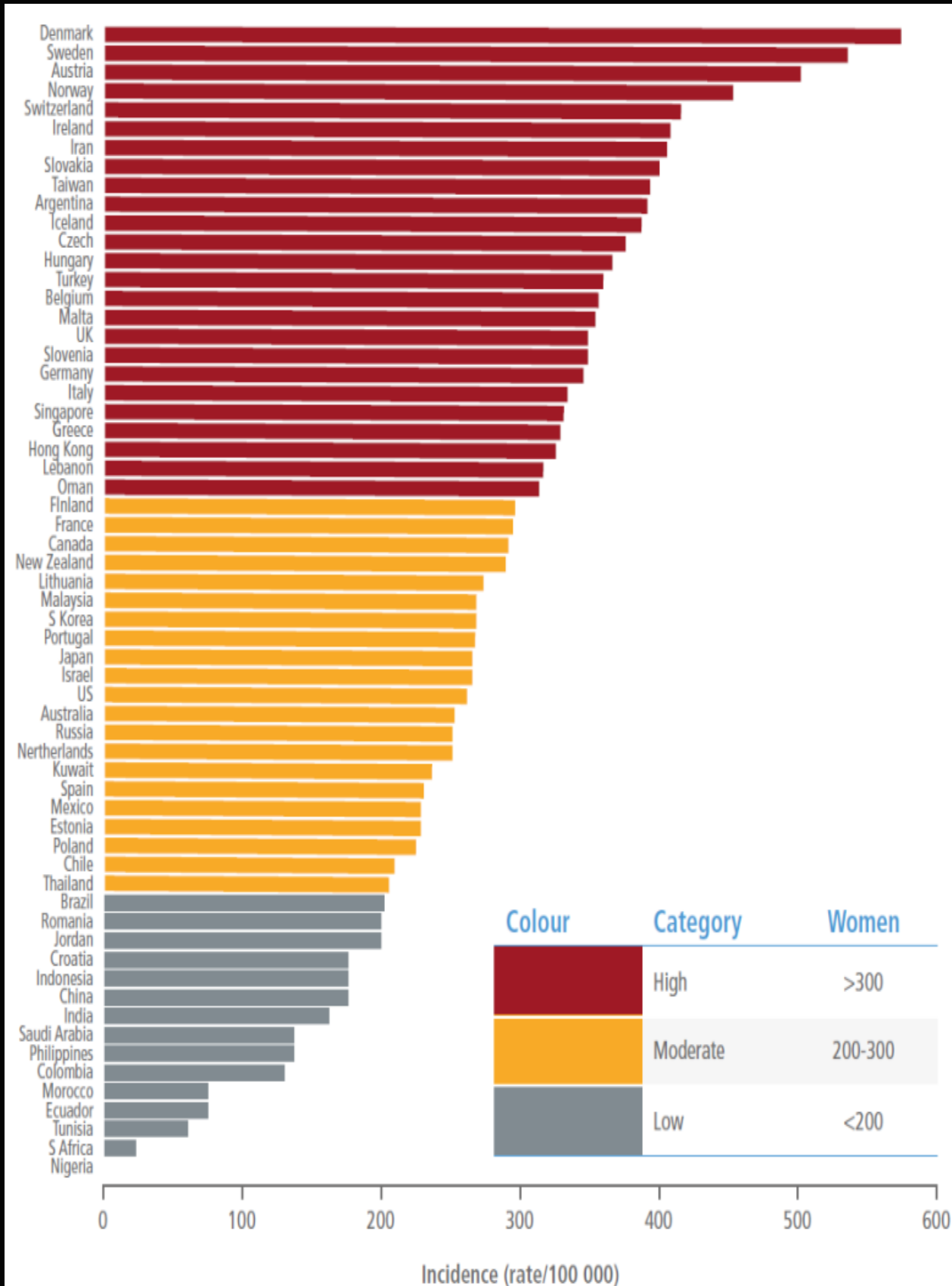
At risk for osteoporotic
fractures

\$20B

Annual U.S. Costs

Healthcare expenditure
for osteoporotic
fractures

Fracture-related mortality reaches 20-30% in the first year following hip fracture, making osteoporosis a critical public health priority across all specialties.





Key Performance Metrics

30%

Fracture Reduction

Fall prevention strategies effectiveness rate

10M

Americans Affected

Current osteoporosis patient population

\$19B

Annual Costs

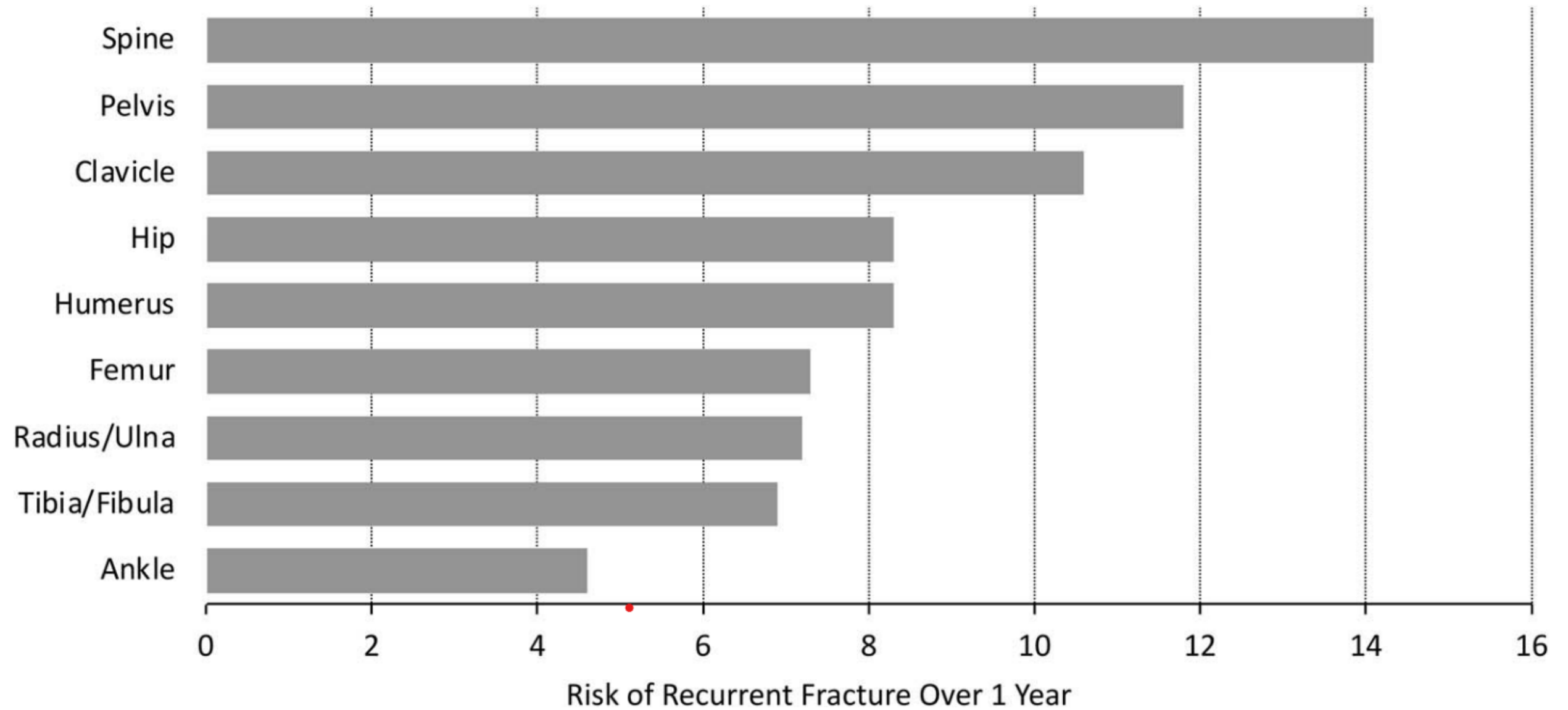
Healthcare expenses from fractures

44M

At-Risk Population

Americans with low bone mass

Risk of recurrent fractures

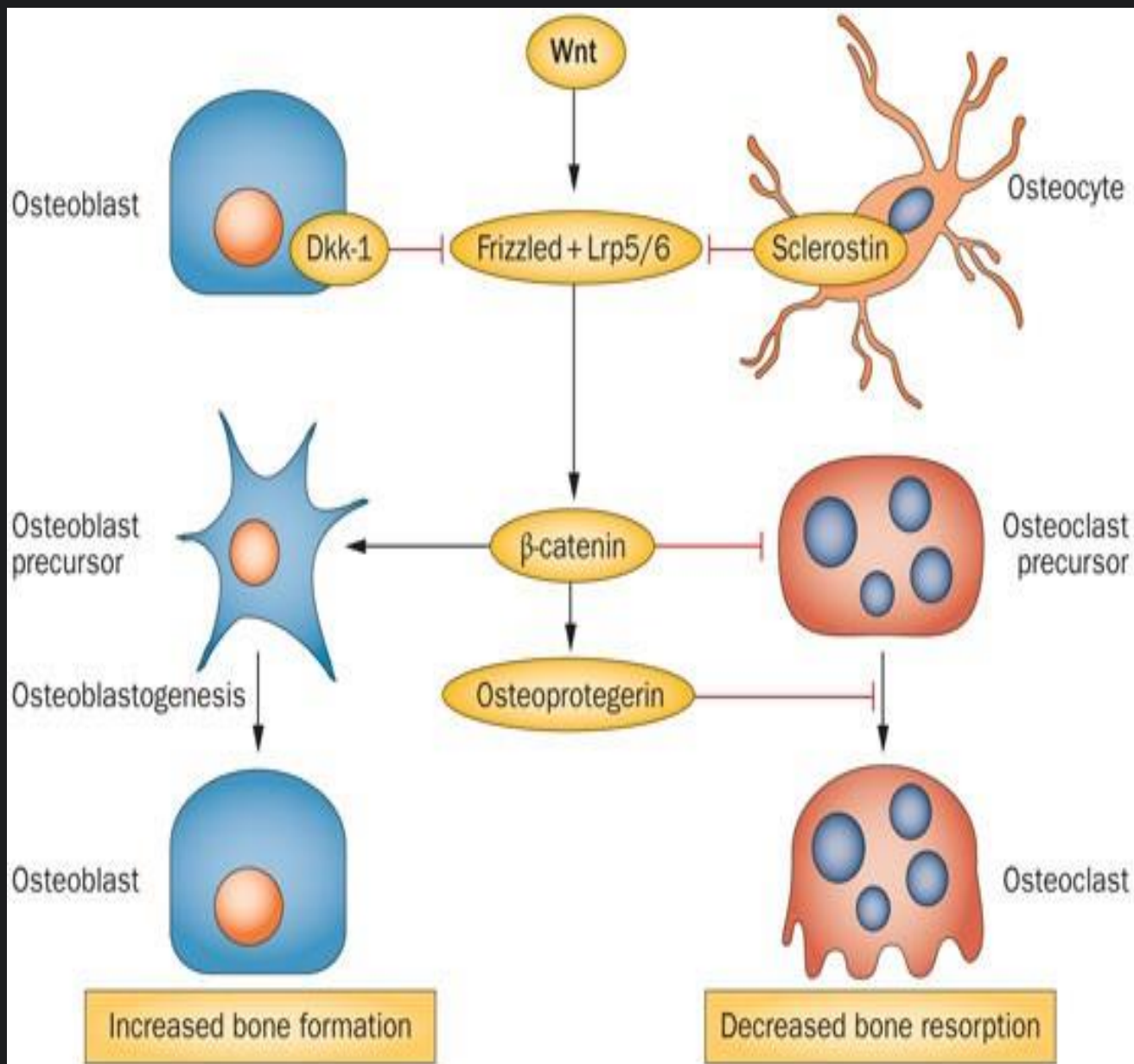


MENOPAUSE & ANDROPAUSE



Pathogenesis

Cellular and Molecular Insights



Cellular Imbalance

Disrupted osteoblast formation and osteoclast resorption

Pathway Disruption

Abnormal metabolic and molecular signaling identified

RANK Signaling

RANK/RANKL/OPG pathway controls bone remodeling

Pathophysiology

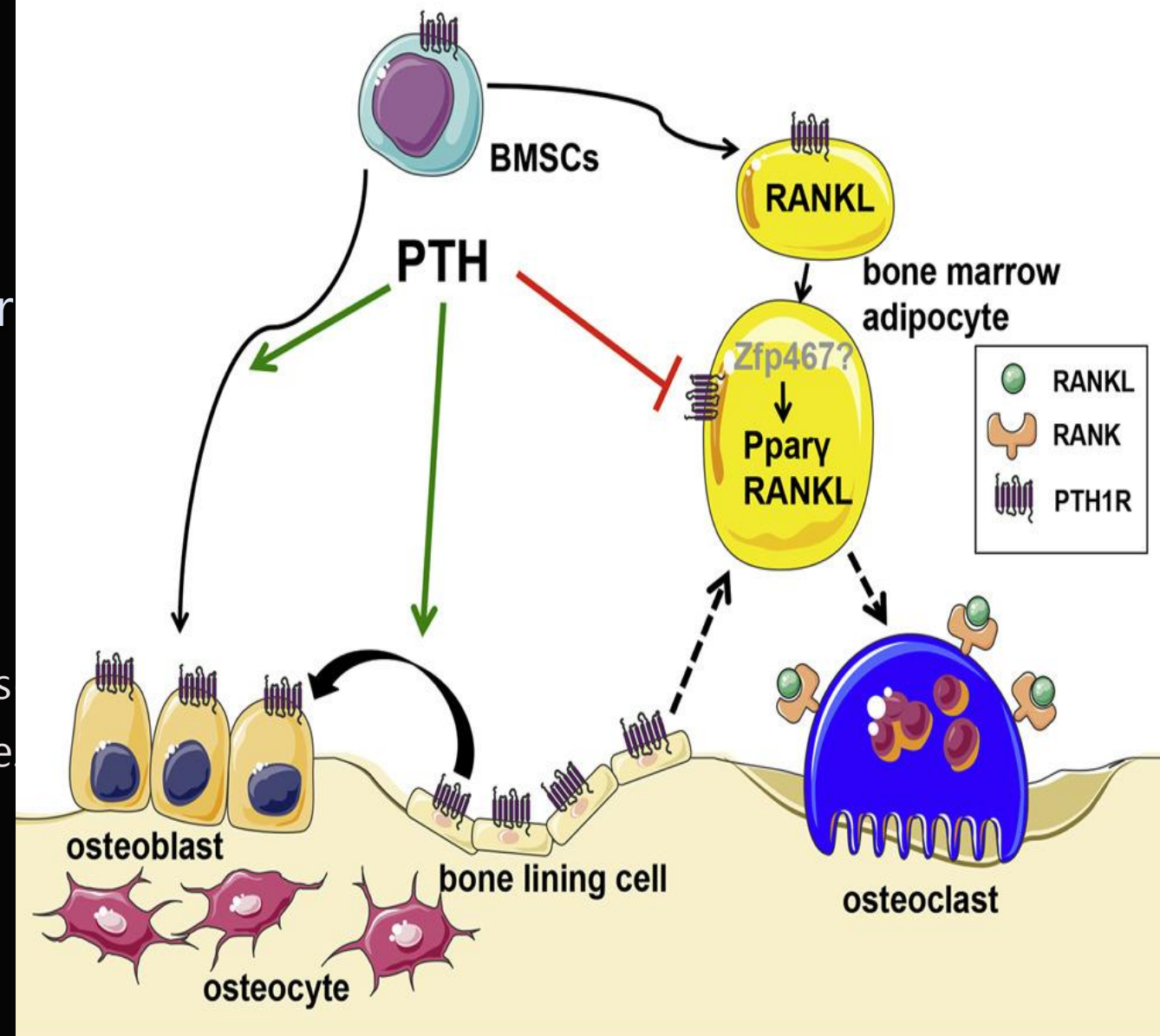
Bone Remodeling Imbalance

Osteoporosis develops when osteoclast activity exceeds osteoblast function. Key drivers include:

- Aging-related hormone decline
- Inflammatory cytokines (TNF- α , IL-6)
- Glucocorticoid-induced suppression

CKD-Mineral Bone Disorder

Secondary hyperparathyroidism, reduced calcitriol activation, and uremic toxins create complex high- or low-turnover bone diseases patterns in chronic kidney disease



Understanding Bone Remodeling



Wnt Signaling Pathway

Dysfunction in this critical disrupts bone formation and resorption balance



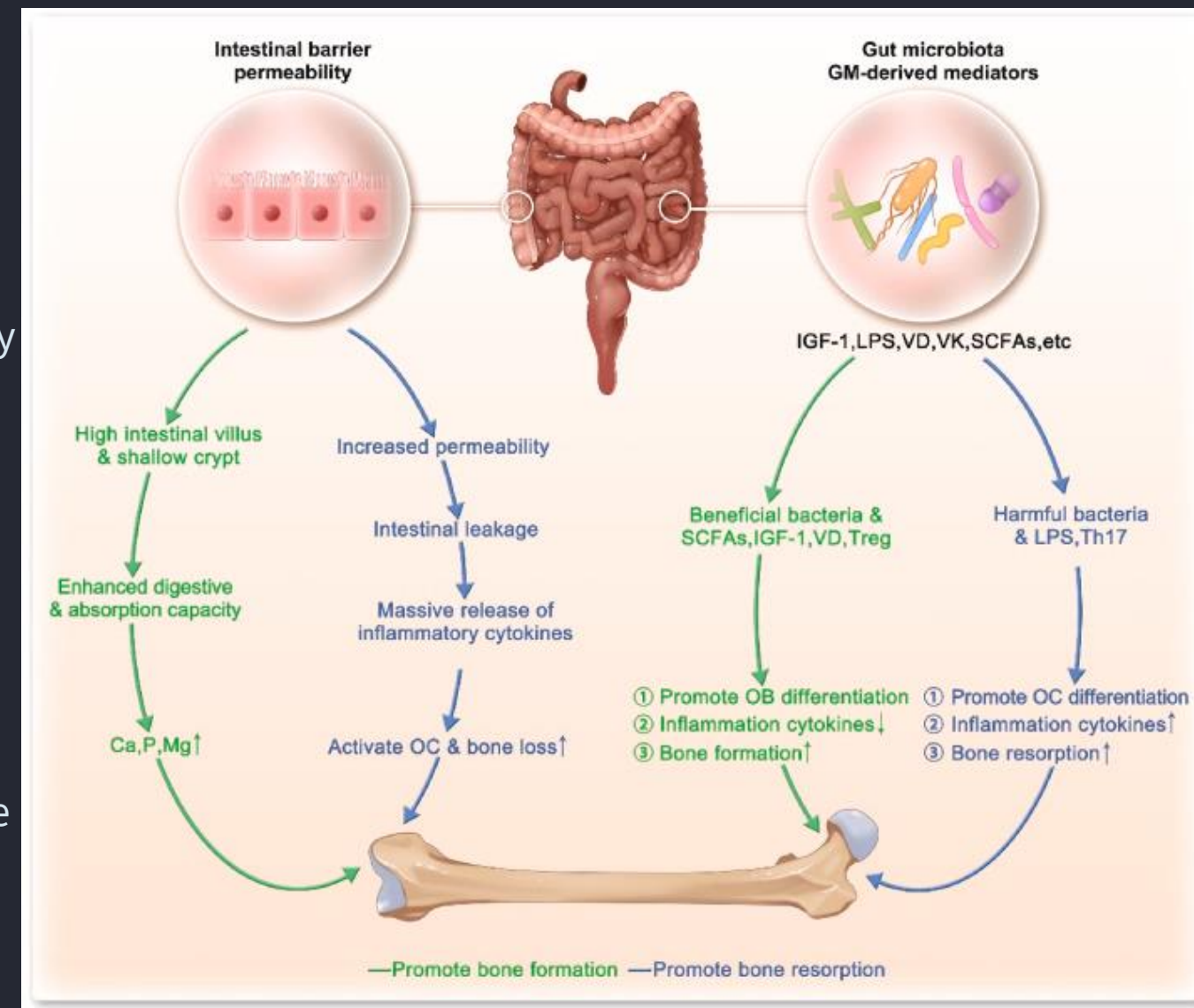
Genetic Factors

Genome-wide studies & hundreds of susceptibility loci.

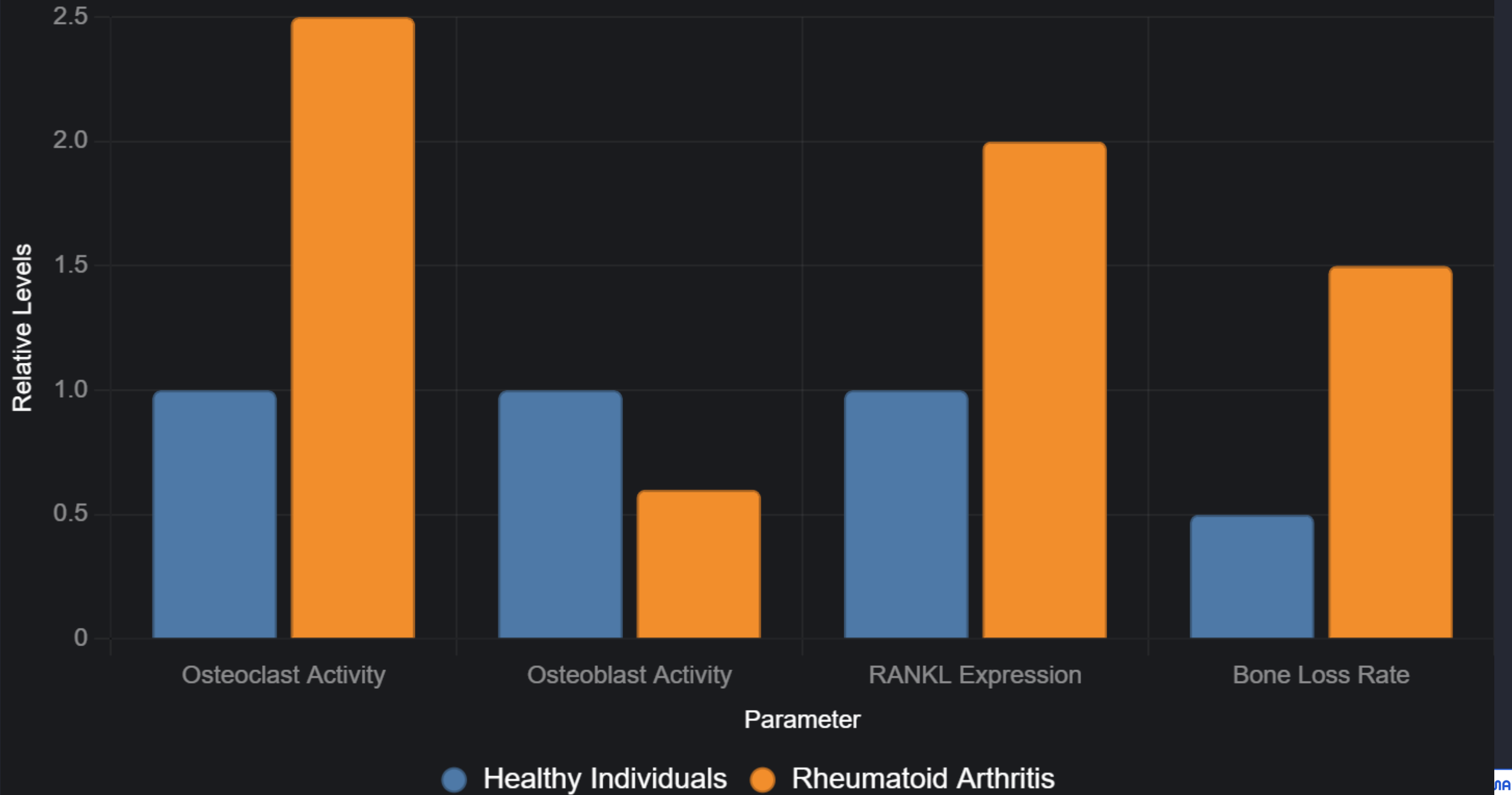


Emerging Mechanisms

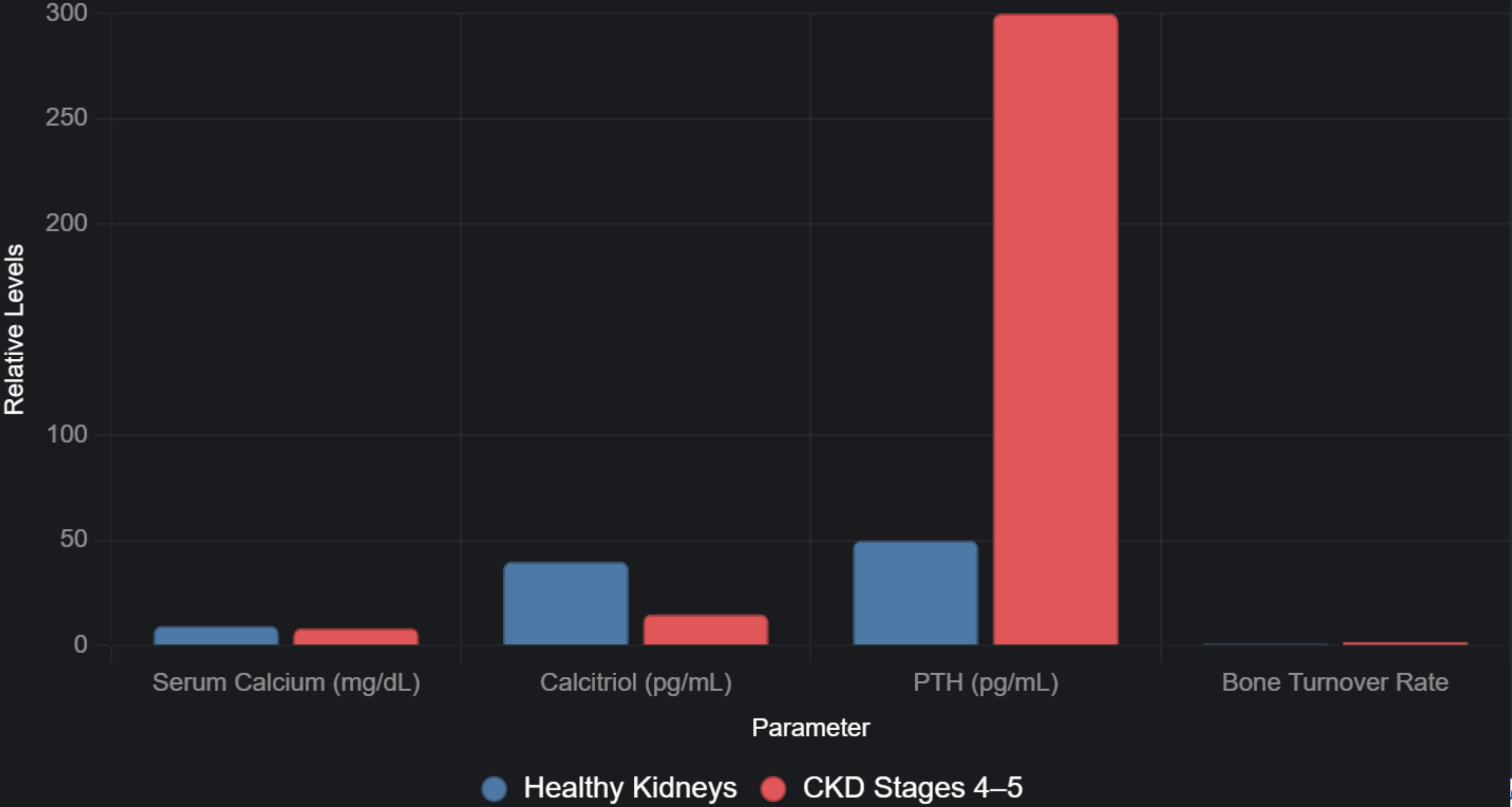
Gut microbiome, autophagy, iron balance, and cellular senescence



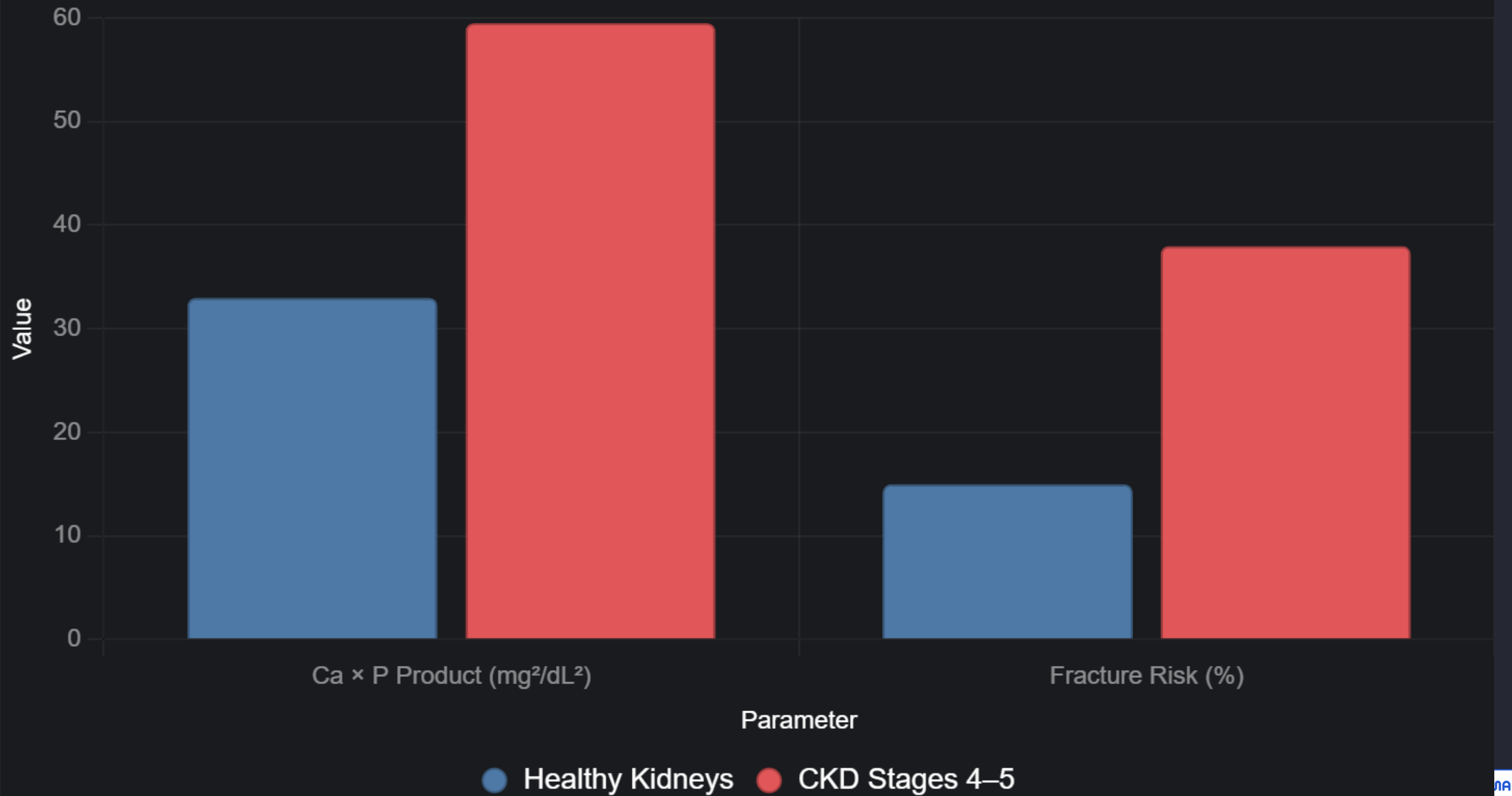
Bone Remodeling in Autoimmune Disease (RA)



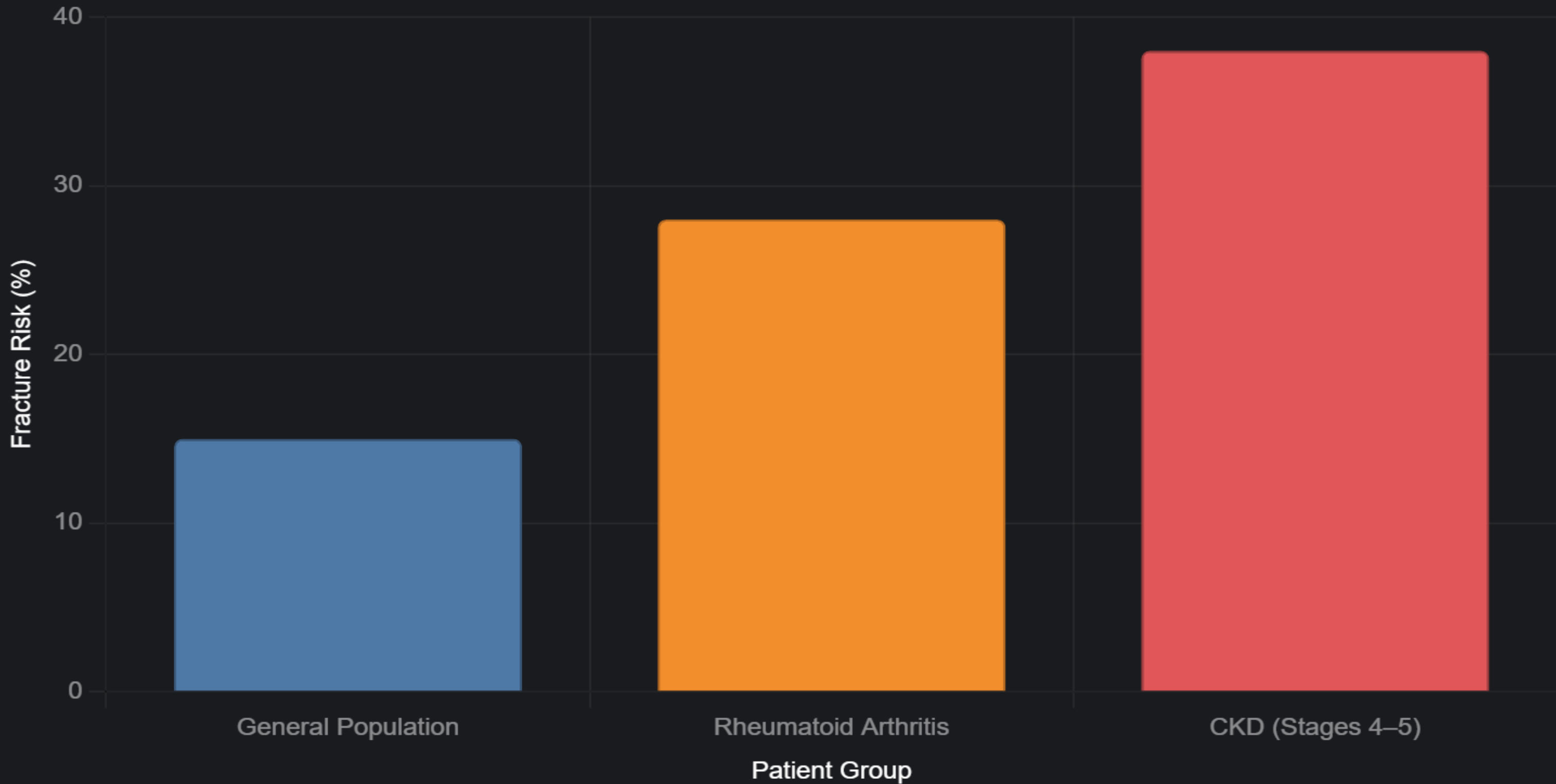
Calcium Metabolism: Healthy Kidneys vs. CKD



Ca × P Product and Fracture Risk: Healthy vs. CKD



Osteoporotic Fracture Risk in Rheumatology and Nephrology



Clinical Implementation Challenges

30%

Fracture Reduction

Raloxifene decreases vertebral fracture risk

50%+

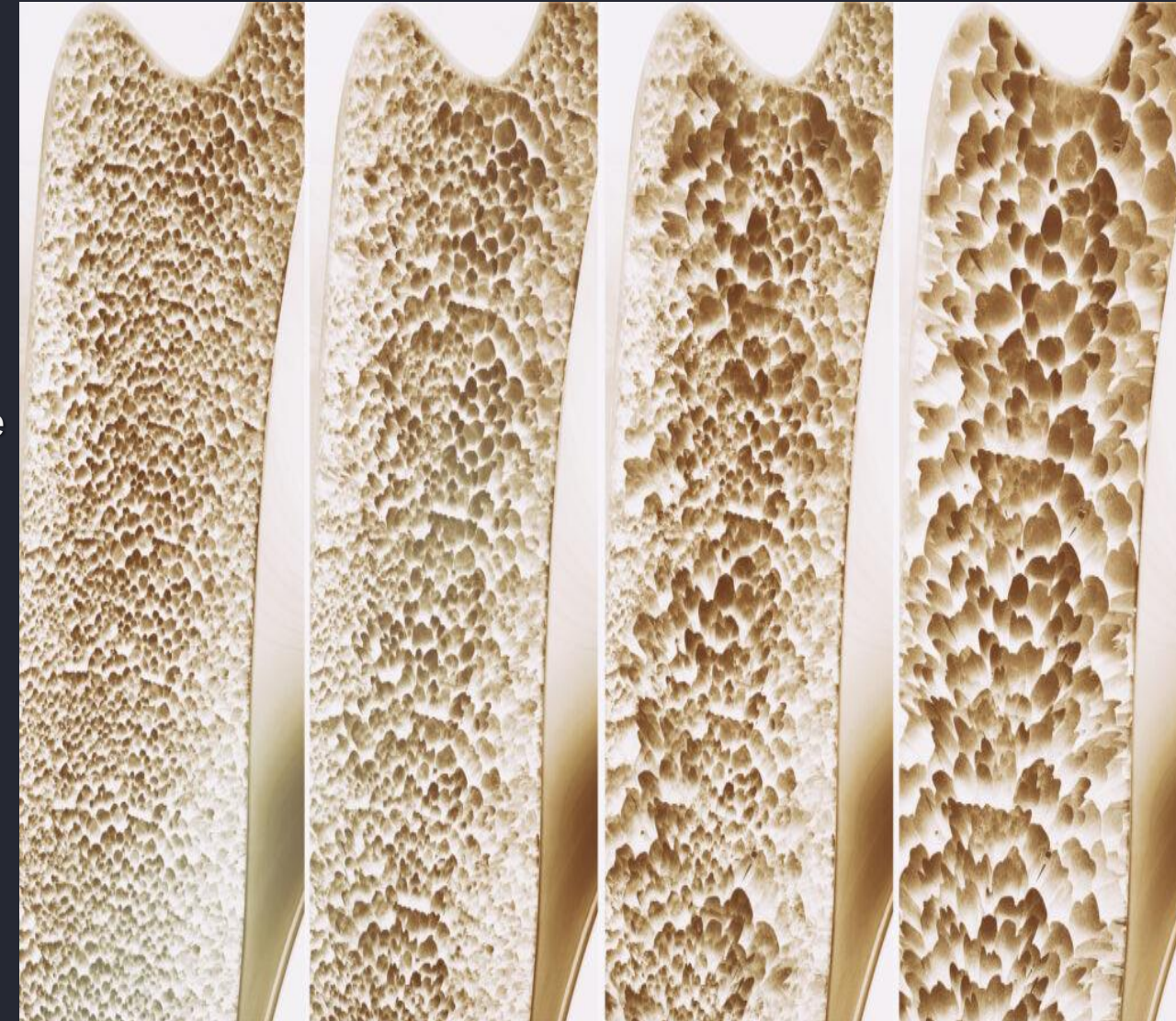
Underdiagnosis

Many patients only identified after fracture

40%

Non-adherence

Limits effectiveness of available treatments



Updated Screening Guidelines (2025)

Expanded USPSTF Recommendations

All women aged 65 and older require screening. Post-menopausal women now qualify more frequently.

Enhanced Coverage

Medicare improvements support broader screening access. More patients qualify for preventive care.

Risk Assessment Tools

FRAX calculator provides standardized risk evaluation. Earlier screening recommended for high-risk patients.




VITAMIN D AND CALCIUM SUPPLEMENTATION TO PREVENT FRACTURES IN ADULTS

CLINICAL SUMMARY OF U.S. PREVENTIVE SERVICES TASK FORCE RECOMMENDATION

Population	Men or premenopausal women	Community-dwelling postmenopausal women at doses of >400 IU of vitamin D ₃ and >1000 mg of calcium	Community-dwelling postmenopausal women at doses of ≤400 IU of vitamin D ₃ and ≤1000 mg of calcium
Recommendation	No recommendation. Grade: I statement	No recommendation. Grade: I statement	Do not supplement. Grade: D
Preventive Medications	Appropriate intake of vitamin D and calcium are essential to overall health. However, there is inadequate evidence to determine the effect of combined vitamin D and calcium supplementation on the incidence of fractures in men or premenopausal women. There is adequate evidence that daily supplementation with 400 IU of vitamin D₃ and 1000 mg of calcium has no effect on the incidence of fractures in postmenopausal women. There is inadequate evidence regarding the effect of higher doses of combined vitamin D and calcium supplementation on fracture incidence in community-dwelling postmenopausal women.		
Balance of Benefits and Harms	Evidence is lacking regarding the benefit of daily vitamin D and calcium supplementation for the primary prevention of fractures, and the balance of benefits and harms cannot be determined.	Evidence is lacking regarding the benefit of daily supplementation with >400 IU of vitamin D ₃ and >1000 mg of calcium for the primary prevention of fractures in postmenopausal women, and the balance of benefits and harms cannot be determined.	Daily supplementation with ≤400 IU of vitamin D ₃ and ≤1000 mg of calcium has no net benefit for the primary prevention of fractures.
Other Relevant USPSTF Recommendations	The USPSTF has made recommendations on screening for osteoporosis and vitamin D supplementation to prevent falls in community-dwelling older adults. These recommendations are available at www.uspreventiveservicestaskforce.org.		

For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement, and supporting documents, please go to www.uspreventiveservicestaskforce.org.

Country : **UK**

Name / ID :

About the risk factors

Questionnaire:

1. Age (between 40-90 years) or Date of birth

Age: Y: M: D:

2. Sex

☐ Male ☐ Female

3. Weight (kg)

4. Height (cm)

5. Previous fracture

☐ No ☐ Yes

6. Parent fractured hip

☐ No ☐ Yes

7. Current smoking

☐ No ☐ Yes

8. Glucocorticoids

☐ No ☐ Yes

9. Rheumatoid arthritis

☐ No ☐ Yes

10. Secondary osteoporosis

☐ No ☐ Yes

11. Alcohol 3 more units per day

☐ No ☐ Yes

12. Femoral neck BMD

Select

Clear

Calculate

BMI

The ten year probability of fracture (%)

without BMD

☐ Major osteoporotic

☐

☐ Hip fracture

☐

View NOGG Guidance

Made with

Diagnostic Approach

DXA Scanning Standards

Dual-energy X-ray absorptiometry remains the gold standard. Provides precise bone mineral density measurements.

T-Score Interpretation

- Normal: >-1.0
- Low bone mass: -1.0 to -2.5
- Osteoporosis: ≤ -2.5

Monitoring Schedule

Test every 1-2 years after treatment initiation. Longer intervals for low-risk patients with favorable scores.

Diagnostic Approach and Screening

01

DEXA Screening Protocol

Gold standard BMD measurement
Screen women ≥ 65 , men ≥ 70 , or
earlier with risk factors

02

FRAX Risk Assessment

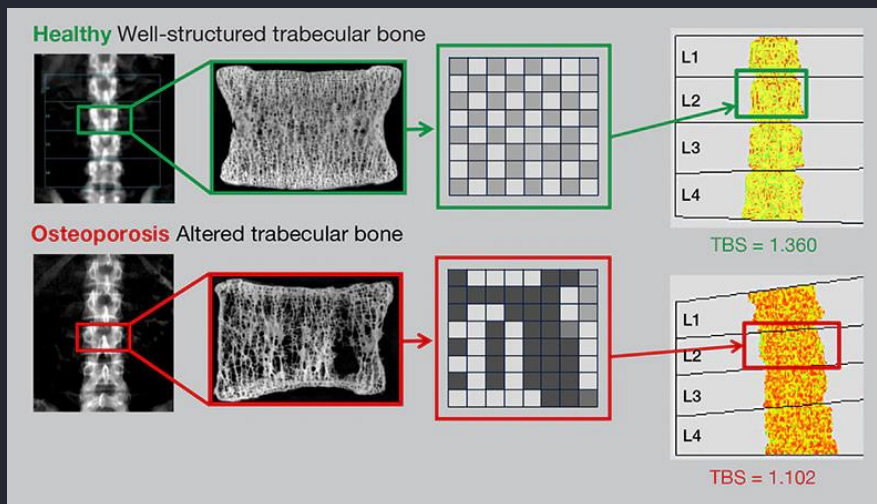
Calculate 10-year fracture
probability, though may
underestimate risk in CKD and
autoimmune diseases

03

CKD-Specific Considerations

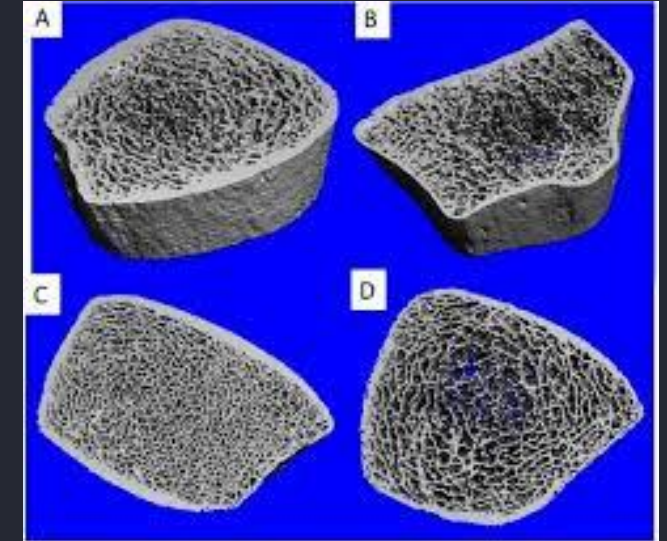
DEXA less reliable in stages 4-5D; consider quantitative CT or trabecular
bone score

Diagnostic Innovations



Early Detection

TBS and HR-pQCT identify changes before DXA
miRNA biomarkers enable earlier diagnosis



Cone-Beam CT

New imaging quantifies mandibular cortical measurements to identify low bone density.

Dual-Energy X-ray

Remains the standard for bone mineral density assessment.

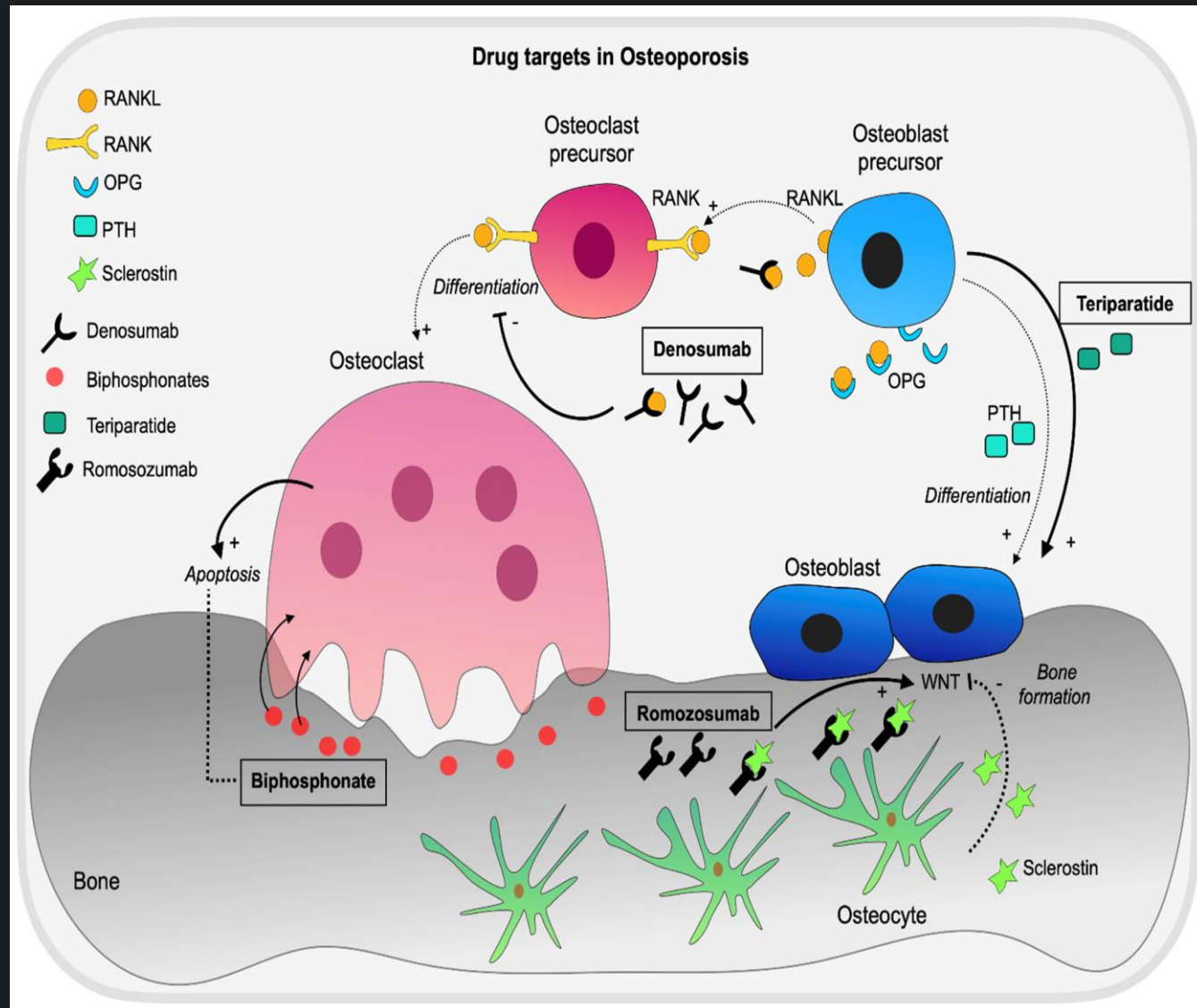
Fracture Risk Tool

Integrates clinical risk factors for better decision-making.

Advanced Imaging

Trabecular Bone Score and HR-pQCT reveal microstructure

Emerging Therapeutic Targets



Signaling Pathways

Wnt/ β -catenin and RANKL inhibition show promise. Targeted pathway modulation improves outcomes.

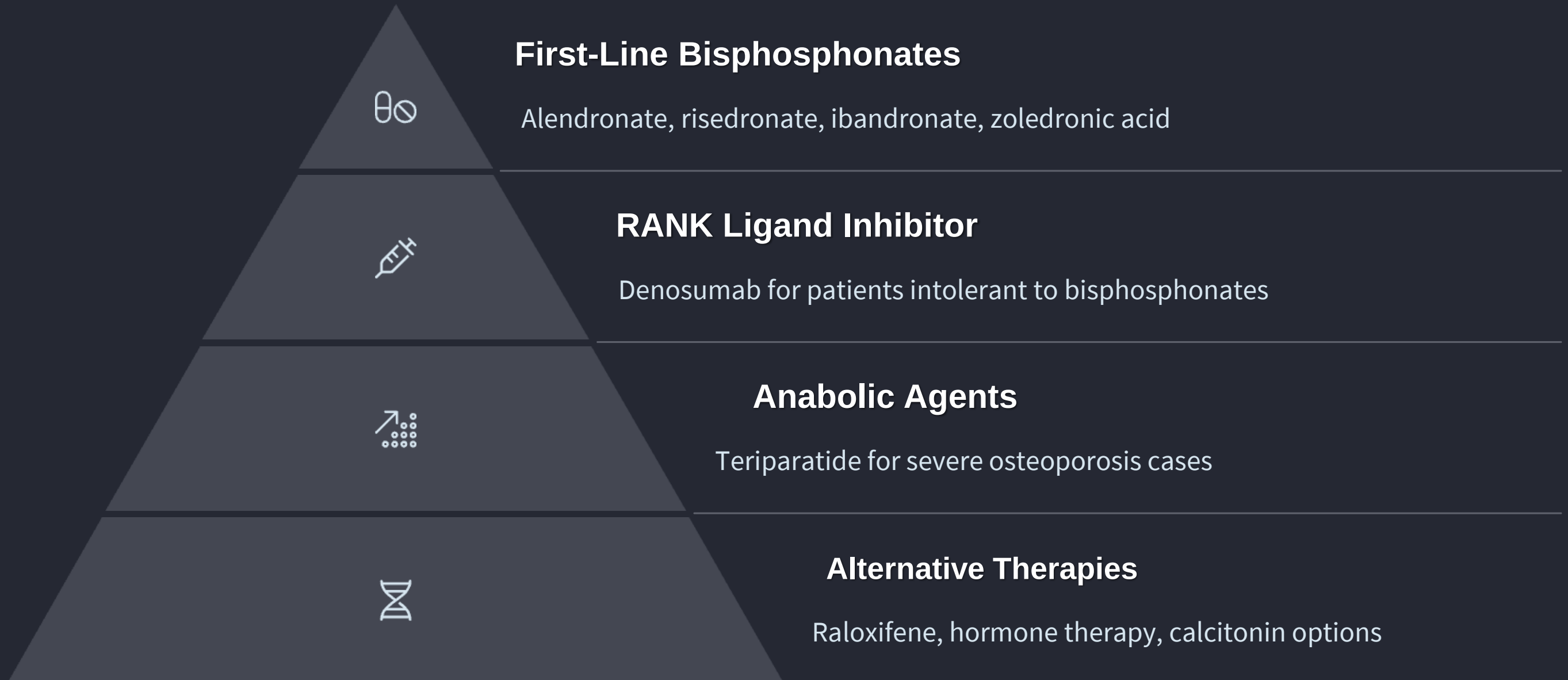
Novel Agents

Sclerostin inhibitors and cathepsin K blockers. Phase II trials demonstrate efficacy.

RNA Therapies

Experimental RNA-based treatments under investigation. Promising preclinical results emerging.

Current Treatment Options



Safety Considerations



Long-term Use

Extended zoledronic acid therapy linked to atypical femur fractures



Osteonecrosis

Bisphosphonates may increase risk of jaw complications



Hormone Therapy

Increased risk of cancer and stroke with some treatments

Non-Pharmacologic Management



Essential Nutrients

Calcium 1000-1200mg daily.
Vitamin D 800-1000 IU daily



Exercise Program

Weight-bearing and
resistance exercises 3-5
times weekly. Progressive
training



Fall Prevention

Home safety modifications
and balance training.
Remove hazards and
improve lighting.



Lifestyle Changes

Smoking cessation and
alcohol limitation. Regular
monitoring

Pharmacologic Treatment Indications

Fracture History

Any history of hip or vertebral fractures, whether clinical or asymptomatic, indicates immediate treatment need.

T-Score Criteria

Scores ≤ -2.5 at femoral neck, total hip, or lumbar spine require pharmacologic intervention.

High-Risk Osteopenia

- 10-year hip fracture probability $\geq 3\%$
- Major osteoporosis fracture probability $\geq 20\%$
- Enhanced Medicare coverage supports treatment



Advanced CKD Management Challenges

1

Drug Clearance Issues

Bisphosphonates contraindicated if eGFR <35 mL/min/1.73 m² due to accumulation risk

2

Safer Alternative: Denosumab

Not renally cleared, but requires careful monitoring for hypocalcemia with vitamin D/calcium supplementation

3

CKD-MBD Targeted Therapy

Phosphate binders, calcimimetics (cinacalcet), and calcitriol analogs for secondary hyperparathyroidism

LOW *risk*

Normal BMD, no history of fracture, and low fracture probability

No pharmacologic treatment

MODERATE *risk*

Osteopenic range BMD, no history of fracture, and low fracture probability

No pharmacologic treatment; consider bisphosphonate

HIGH *risk*

Osteoporosis range BMD, osteopenic range BMD + spine or hip fracture, high fracture probability

Alendronate
Denosumab
Risedronate
Zoledronic acid

VERY HIGH *risk*

Endocrine Society:
Osteoporosis range BMD with spine or hip fracture, multiple spine fractures

Abaloparatide
Romosozumab
Teriparatide

AACE:
Fracture within prior 12 months, fracture on osteoporosis medication, multiple fractures, fractures on bone-toxic medications, T-score < -3.0, high risk for falls, very high risk of fracture probability by FRAX^b

Abaloparatide
Denosumab
Romosozumab
Teriparatide
Zoledronic acid



Key Takeaways and Next Steps



Implement New Guidelines

Apply 2025 USPSTF screening recommendations. Expand screening to newly eligible populations.



Utilize Risk Tools

Incorporate FRAX calculator into routine assessment. Quantify individual fracture probability accurately.



Coordinate Care

Establish Fracture Liaison Services. Improve post-fracture care coordination and follow-up.



Personalize Treatment

Tailor therapy duration and selection. Monitor effectiveness with regular reassessment protocols.