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TOKYO '25

9TH ASIA-PACIFIC BONE HEALTH CONFERENCE

第9回 アジア太平洋 骨健康国際会議

PRE-CONFERENCE COURSE
University of Tokyo
Dec. 11, 2025
\ The Fundamentals of Osteoporosis: Enhancing Clinical Experience Course

DEC.
11-13
2025

Abstract Book

IOF
International Osteoporosis Foundation

Our vision is a world without fragility fractures in which healthy mobility is a reality for all.

www.iof-regional.org

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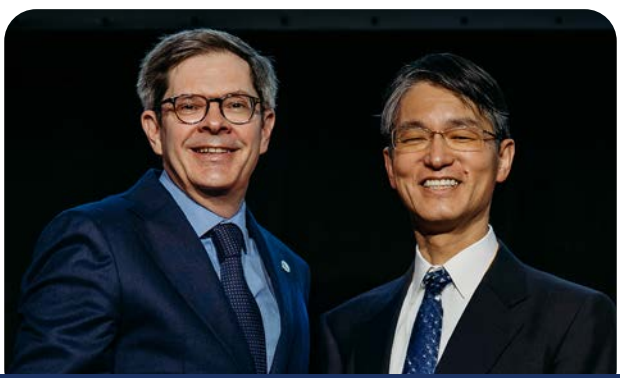
Welcome Message

Dear Colleagues,

It is a great pleasure to welcome you to the IOF Regional 9th Asia-Pacific Bone Health Conference.

As populations across the Asia-Pacific region age rapidly, the need to promote and protect skeletal health has never been more urgent. This conference brings together clinicians, researchers, and health professionals from across the region and beyond to share the latest advances in osteoporosis care, fracture prevention, and innovations in musculoskeletal health. Its strength lies not only in a robust scientific programme but also in the dynamic exchange of ideas across disciplines and borders.

We are especially grateful to our partner societies for their collaboration on joint IOF sessions, ensuring that diverse regional perspectives are well represented. These include the Asian Pacific Consortium on Osteoporosis (APCO), the Japan Osteoporosis Society (JOS), the Japanese Osteoporosis Foundation (JOF), the Japanese Society of Bone & Mineral Research (JSBMR), the Korean Society of Bone & Mineral Research (KSBMR), the Korean Society of Osteoporosis (KSO), and the Fragility Fracture Network Japan (FFN-J). We also thank the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO) for co-hosting a special session that enriches the global scope of this meeting.



This year's programme features a wide range of research abstracts from the Asia-Pacific and beyond, showcased in both poster and oral presentations. We hope that the knowledge exchanged here will help drive improvements in patient outcomes worldwide.

The Conference also marks the official launch of the Asia-Pacific Regional Audit, highlighting the epidemiology and growing burden of osteoporosis across the region. Top-line findings will be presented, offering valuable insights to inform future bone health strategies.

We invite you to explore the exhibition area, which includes the IOF booth showcasing our programmes and projects, as well as the Committee of National Societies (CNS) Village where member organizations present their activities. We extend our sincere thanks to the sponsors and exhibitors for their invaluable support, offering valuable insights for patient care.

Finally, we extend heartfelt thanks to the Steering Committee members and co-chair, Manju Chandran; and the Scientific Committee members and chairs, Eugene McCloskey and Peter Ebeling. Your leadership, dedication, and contributions have been instrumental in shaping this meeting.

We wish you a productive, insightful, and inspiring conference.

Professor Nicholas Harvey
IOF President
Conference Co-Chair

Professor Atsushi Suzuki
IOF Board member
Conference and Steering Committee Co-Chair

About IOF

The **International Osteoporosis Foundation** is the world's largest non-governmental organization dedicated to the prevention, diagnosis, and treatment of osteoporosis and related musculoskeletal diseases.

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https://osteoporosis.foundation

Vision

Our vision is a world without fragility fractures, in which healthy mobility is a reality for all.

Mission

To promote bone and musculoskeletal health as a worldwide priority.

The Asia-Pacific (APAC) Audit

IOF, in collaboration with The Asia Pacific Consortium on Osteoporosis (APCO) is currently developing an extensive update of the Asia Pacific Audit launched in 2013 with a focus on 20 key countries (Australia, Bangladesh, Brunei, China, Chinese Taipei, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Hong Kong SAR, India, Indonesia, Japan, Korea, Nepal, New Zealand, Sri Lanka, Thailand, Vietnam). The APAC Regional Conference will represent a perfect opportunity to officially launch the audit and give it the resonance in the Asia Pacific Region it deserves to promote action at the national health policy level.

Events Information

Events

December 11, 2025

Osteoporosis Pre-Conference Course
University of Tokyo

Experimental Research Building
13th Floor - Seminar Room #6.
7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8654, Japan

Osteoporosis Pre-Conference Course:
Fundamentals of Osteoporosis

December 11-13, 2025

IOF Regional
Hamamatsucho Convention Hall
Tokyo, Japan

9th Asia Pacific Bone Health Conference

Contact Information

Secretariat, Registration and Accommodation
Humacom
Rue Renier, 9
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Belgium

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www.humacom.com

Organizer
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Switzerland

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https://osteoporosis.foundation

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Corporate Support Opportunities
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IOF Global Development Manager
Isabelle.ragain@osteoporosis.foundation

Posters & Abstracts
abstracts@iof-regional.org

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Han Seok CHOI

Conference Information

Opening Ceremony Venue
December 11, 2025
IOF Regional
Hamamatsucho Convention Hall
Tokyo, Japan

Conference Venue
December 11-13, 2025
IOF Regional
Hamamatsucho Convention Hall
Tokyo, Japan

Operating Dates and Hours
Thursday, Dec. 11 . . . . . 17.30 - 20.00
Friday, Dec. 12 . . . . . 08.30 - 17.00
Saturday, Dec. 13 . . . . . 08.30 - 17.15

Poster Viewing Sessions
Friday, Dec. 12 . . . . . 13.15 - 14.00
Saturday, Dec. 13 . . . . . 13.15 - 14.00

Accreditation

Japan Osteoporosis Society (JOS)

JOS will award the credits to its members based on the following criteria:

- Certification as a "Physician certified by JOS":
  - 5 credits will be granted upon submission of proof of participation in the IOF Asia Pacific Bone Health Conference in Tokyo
  - Additional 2 credits will be awarded to those who give lectures as speakers
- Certification as an "Osteoporosis Manager":
  - 3 credits will be granted upon submission of proof of participation in the IOF Asia Pacific Bone Health Conference in Tokyo

Taiwanese Osteoporosis Association (TOA)

TOA will award 20 points its members who attend the IOF Asia Pacific Bone Health Conference in Tokyo in Tokyo. These points may be used to apply for certification as an Osteoporosis Specialist (骨鬆專科醫師), as recognised by TOA. Applicants must contact TOA after the event to proceed with the application.

Hong Kong College of Physicians (HKCP)

Retrospective application for CME accreditation of attendance at the IOF Asia Pacific Bone Health Conference in Tokyo is allowed, provided that the application is submitted to HKCP Secretariat no later than 2 weeks after the end of the event.

Applications must be supported by relevant documents including certificate of attendance and proof of registration and should be submitted to the Secretariat by email at *enquiry@hkcp.org*, or by fax to (852) 2556 9047.

Badges

For registered participants, personalized badges will be requested for entry to all scientific programmes and to access the exhibition and posters areas. Blank badges are prohibited.

Certificate of Attendance

Your certificate of attendance will be available, after the event, on the e-congress platform. Please use your credentials to access the platform.

Cloakroom

A cloakroom service for clothing and reasonably sized items is available during the opening hours of the Conference. Items of value should not be left in the cloakroom. Please make sure to collect all belongings at the end of each day.

Internet Access

A free Wireless internet connexion is available in the Conference Center.

Lunches, Breaks and Refreshments

Coffee breaks will be served in the exhibition area. Lunch and snack boxes will be provided to participants attending Sponsored Symposia.

Media

The IOF Regional Conference will not provide any Media Center.

Tourist Information

www.gotokyo.org

General Emergency Number

Fire & Ambulance: 119
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Language

All lectures given during the IOF Regional 9th Asia-Pacific Bone Health Conference will be delivered in English. To facilitate Q&A sessions, a Japanese interpreter will be present to translate the questions and answers.

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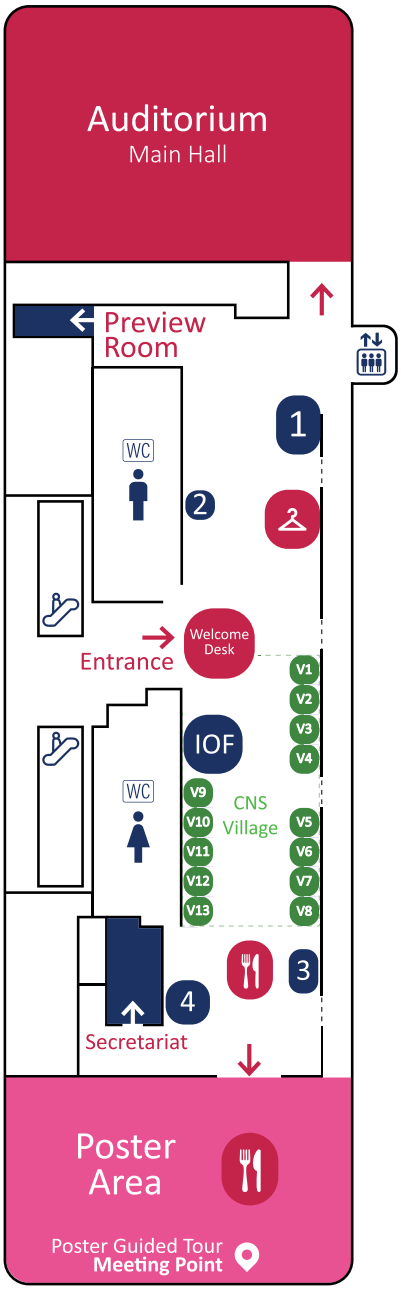

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V2. Japan Osteoporosis Society (JOS)
V3. Japan Osteoporosis Foundation (JPOF)
V4. Japanese Society for Bone and Mineral Research (JSBMR)
V5. Asia Pacific Consortium on Osteoporosis (APCO)
V6. Thai Osteoporosis Foundation
V7. China Health Promotion Foundation (CHPF)
V8. Korean Society for Bone and Mineral Research (KSBMR)
V9. Taiwanese Osteoporosis Association (TOA)
V10. Bone & Mineral Diseases Research Group, Agha Khan University
V11. International Islamic University Malaysia
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PROGRAMME - CONFERENCE

Thu, Dec. 11 | Fri, Dec. 12 | Sat, Dec. 13

17.30 OPENING CEREMONY

- *Welcome* – Nicholas Harvey, Atsushi Suzuki
- *Screening for osteoporosis/high fracture risk* – Nicholas Harvey
- *Best clinical papers in Asia Pacific in 2024-2025* – Ambrish Mithal
- *Asia Pacific Epidemiological Audit* – Manju Chandran
- *Conclusions* – Nicholas Harvey, Atsushi Suzuki

19.00 to 20.00 NETWORKING COCKTAIL

Thu, Dec. 11 | **Fri, Dec. 12** | Sat, Dec. 13

08.30 PLENARY SESSION I

IOF-APCO Joint Session: Burden of Osteoporosis in the Asia Pacific
– Chairs: Nicholas Harvey, Atsushi Suzuki

- *Burden of Osteoporosis in Asia: Top Line findings from the Asia Pacific Audit* – Manju Chandran
- *Hip Fractures and Atypical fractures in Asia Pacific* – Peter Ebeling
- *Genetic Epidemiology of Osteoporosis in Asian Populations* – Ching Lung Cheung

09.30 ORAL COMMUNICATION SESSION I

10.00 BREAK

10.30 PLENARY SESSION II

IOF-JSBMR Joint Session: Nutrition, Exercise, and Bone Health
– Chairs: Nicholas Harvey, Atsushi Suzuki

- *Vitamin D, Bone and Muscle Health: Controversies and Consensus* – Ambrish Mithal
- *Exercise and Bone Health in the Elderly* – Robin Daly
- *Diabetes and Osteoporosis - An Asian Epidemic Populations* – David Tak Wai Lui

Thu, Dec. 11 | **Fri, Dec. 12** | Sat, Dec. 13

11.30 SPONSORED LUNCH SYMPOSIUM

12.30 BREAK

13.15 POSTER GUIDED TOUR

14.00 PLENARY SESSION III

Fracture Risk Assessment
– Chairs: Saeko Fujiwara, Yoon-Sok Chung

- *Diagnostic vs Intervention Thresholds in Osteoporosis Management* – Eugene McCloskey
- *Personalised Fracture Risk Assessment: FRAX Plus and More* – Nicholas Harvey
- *Data Driven Fracture Risk Prediction: A Simple Yet Effective Tool* – Kyoung Min Kim

15.00 ORAL COMMUNICATION SESSION II

15.30 BREAK

16.00 PLENARY SESSION IV

Skeletal Fragility Due to Rare Bone Disorders and Secondary Osteoporosis
– Chairs: Ambrish Mithal, Peter Ebeling

- *High BMD Disorders And How They Have Influenced Development of Antiosteoporosis Medicines* – Manju Chandran
- *Glucocorticoid Induced Osteoporosis* – Sarath Lekamwasam
- *CKD-MBD and Osteoporosis* – Peter Ebeling

Programme - Conference

Thu, Dec. 11 | Fri, Dec. 12 | **Sat, Dec. 13**

08.30 PLENARY SESSION V

IOF-JOS-FFN-J Joint Session Falls and Fracture
– Chairs: Manju Chandran, Hiroshi Hagino, Takeshi Sawaguchi

- *Preventing Falls, Restoring Mobility: The Science of Rehabilitation in Osteoporosis* – Ian Cameron
- *Progress on FLS in Asia Pacific and ensuring quality in FLS: Lessons learned from the APAC* – Atsushi Suzuki
- *No Patients Lost: Optimizing Patient Pathways in FLS: Capturing All Patients in FLS - Coordination Post Discharge* – Fumio Fukuda

09.30 ORAL COMMUNICATION SESSION III

10.00 BREAK

10.30 PLENARY SESSION VI

IOF-KSBMR-KSO Joint Session: Artificial Intelligence and Innovative Technologies in Bone Health Assessment
– Chairs: Nicholas Harvey, Chan Soo Shin

- *Deep Learning in Detection of Osteoporosis* – Manju Chandran
- *AI in Fracture Risk Prediction* – Namki Hong
- *Innovative Tools That Go Beyond DXA: TBS, 3D Shaper, REMS* – Eugene McCloskey

11.30 SPONSORED LUNCH SYMPOSIUM

12.30 BREAK

13.15 POSTER GUIDED TOUR

Thu, Dec. 11 | Fri, Dec. 12 | **Sat, Dec. 13**

14.00 PLENARY SESSION VII

IOF-ESCEO joint session – Chair: Olivier Bruyère

- *Bone Turnover Markers for the Diagnosis and Management of Osteoporosis* – Etienne Cavalier
- *Meta-analysis, Network Meta-analysis and Umbrella Review: Methodological Differences and Interest for the Preparation of Guidelines* – Olivier Bruyère
- *Use of Parathyroid Hormone Receptor Agonists in the Management of Osteoporosis: State of the Art* – Jean-Yves Reginster

15.00 SPONSORED LECTURE

15.30 BREAK

16.00 PLENARY SESSION VIII

IOF-JOF Joint Session: Gender and its influence on Osteoporosis Management
– Chairs: Ding-Cheng Chan, Leilani Mercado-Asis

- *Osteosarcopenia in Post-Menopausal Women: Diagnosis and Management* – Sumito Ogawa
- *Osteoporosis in Men* – Noriko Yoshimura
- *Menopausal Hormonal Therapy in 2025: Where Do We Stand?* – Masakazu Terauchi

17.00 CLOSING SESSION

Chairpersons: Nicholas Harvey, Atsushi Suzuki

- *Awards to FLS Regional Mentors and to Best Oral Communication*
- Concluding remarks – Philippe Halbout

Programme - Sponsored Sessions

Thu, Dec. 11 | **Fri, Dec. 12** | Sat, Dec. 13

11.30 UCB SPONSORED LUNCH SYMPOSIUM

A Paradigm Shift in Hip Fracture Care: Insights, Challenges, and Next Actions Toward the Further Prevention of Secondary Fragility Fractures
– Chairs: Takashi Matsushita, Takeshi Sawaguchi

- *Utilizing Database-Driven KPIs to Standardize Healthcare Quality in Fragility Fracture Management* – Paul Mitchell
- *Advancing Secondary Fragility Fracture Prevention in Japan: Experience from the National Hip Fracture Database and Clinical Standard Updates* – Takeshi Sawaguchi
- *Current Status and Future Prospects of Healthcare Digital Transformation (DX) in Japan* – Shota Inoue
- *Discussion*

Thu, Dec. 11 | Fri, Dec. 12 | **Sat, Dec. 13**

11.30 AMGEN K.K. / ASTELLAS PHARMA INC. SPONSORED LUNCH SYMPOSIUM

Transforming Osteoporosis Care in Japan: Updated Guidelines and Evidence-Based Strategies through the JOINT-08 Trial
– Chair: Atsushi Suzuki

- *Transforming Osteoporosis Care in Japan: Updated Guidelines and Evidence-Based Strategies through the JOINT-08 Trial* – Hiroshi Hagino

15.00 MEDIA SPONSORED LECTURE

AI in Dentistry: Promoting Early Detection of Osteoporosis and Interprofessional Collaboration – Chair: Sumito Ogawa

- *AI in Dentistry: Promoting Early Detection of Osteoporosis and Interprofessional Collaboration* – Akira Taguchi

NEW!

APAC AUDIT 2025

THE ASIA PACIFIC REGIONAL AUDIT

EPIDEMIOLOGY, COSTS AND BURDEN OF OSTEOPOROSIS IN 2025

32 NATIONAL SOCIETIES

6 REGIONAL UNIVERSITIES

22 COUNTRIES/ REGIONS

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- **National and regional epidemiological data** for osteoporosis and fragility fractures
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- **Includes key messages and recommendations** to help tackle the fragility fracture crisis in the region

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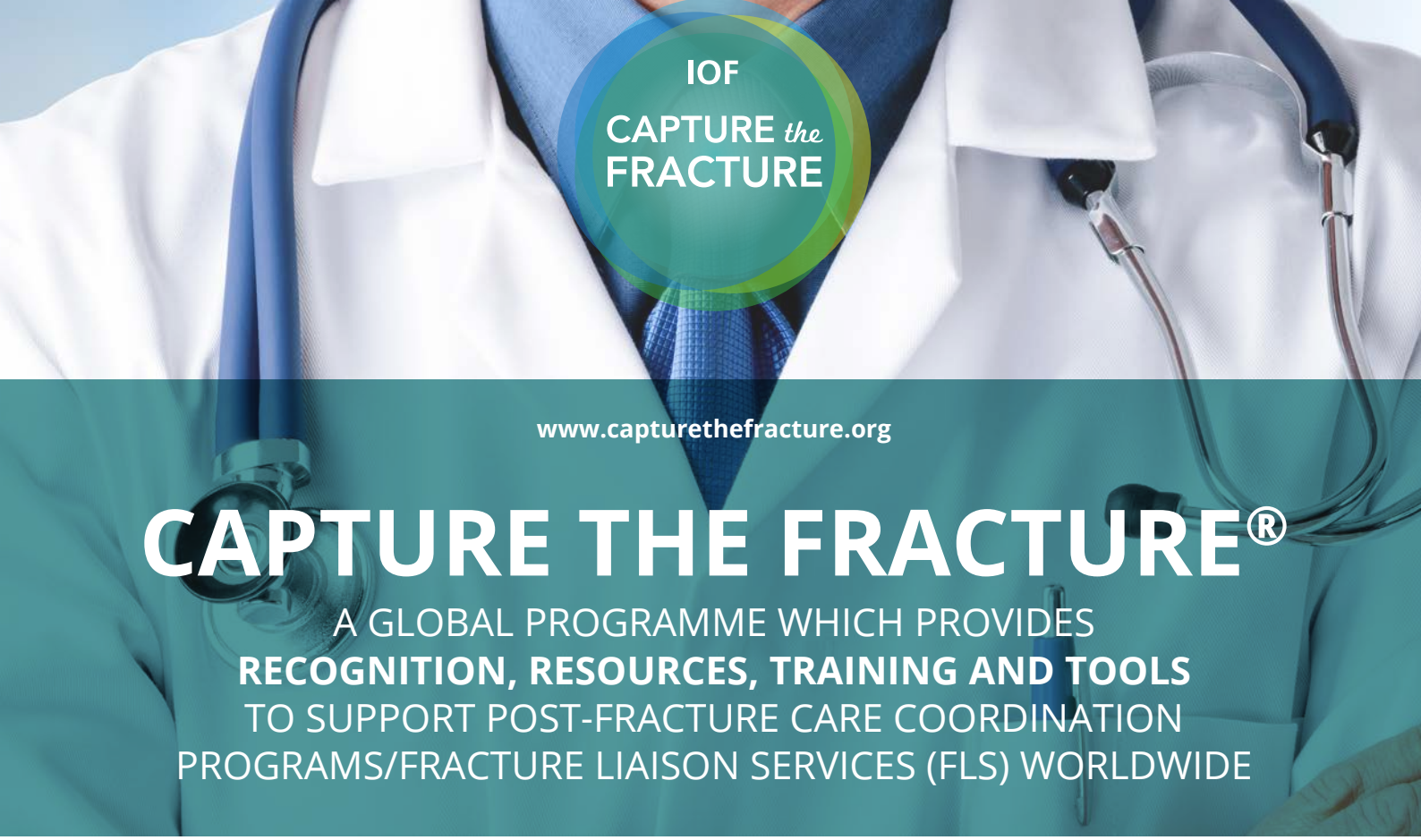

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IOF REGIONAL TOKYO '25

IOF Regional

9th Asia-Pacific Bone Health Conference

Tokyo, Japan – 2025

Plenary Lecture

Abstracts

PL1

BURDEN OF OSTEOPOROSIS IN ASIA: TOP LINE FINDINGS FROM THE ASIA PACIFIC AUDIT

M. Chandran[1]

[1]MD, FACP, FACE, FAMS, FASBMR, CCD Osteoporosis and Bone Metabolism Unit, Department of Endocrinology, Singapore General Hospital, DUKE NUS Medical School, Singapore, Singapore

The 2025 IOF–APCO Asia-Pacific Regional Audit provides the most comprehensive assessment to date of the osteoporosis and fragility fracture burden across 22 countries and regions, home to nearly half of the world's population. It reveals both the magnitude of the demographic and clinical challenge and the opportunity for coordinated regional action. By 2075, the Asia-Pacific population will exceed 4.4 billion, with average life expectancy rising from 78 to 87 years; in several economies, over half the population will be aged ≥50 years and one-third ≥70 years. This demographic shift will dramatically escalate fracture incidence and healthcare costs unless prevention and care systems are strengthened.

Audit data highlight marked disparities in health system readiness: only 12 of 22 countries maintain centralised fracture databases; fewer than 25% of hospitals across most settings are covered by Fracture Liaison Services (FLS), and treatment initiation remains below 50% in many. While 16 countries have clinical guidelines, only a few, such as Australia, New Zealand, and Thailand, report established national quality standards. Access to DXA and newer anabolic therapies is uneven, and osteoporosis is designated a national health priority in just five countries.

The Audit proposes a ten-point action roadmap: universal post-fracture care, routine primary care risk assessment, integration of osteoporosis management into prescribing practice, life-course prevention strategies, professional education, public awareness, national prioritisation, establishment of fracture registries, and formation of national alliances for falls and fracture prevention. Implementing these evidence-based, locally adaptable recommendations offers a clear path to equitable bone health, system sustainability, and healthier ageing across the Asia-Pacific.

PL2

HIP FRACTURES AND ATYPICAL FRACTURES IN THE ASIA PACIFIC

P. R. Ebeling[1]

[1]Department of Medicine, School of Clinical Sciences, Monash University, Clayton, Victoria, Australia

Most of the world's hip fractures will occur in the Asia Pacific by 2030 principally due to an ageing population in most of these countries. Of the eight countries in this region that collect annual data on hip fractures, there is substantial variation in hip fracture rates. Rates range from 606 per million in Australia to 1,386 per million in Japan. In terms of absolute numbers of hip fractures, Japan and the Republic of Korea have the highest numbers annually, at 170,000 and 38,107 per year, respectively. Data from other countries, such as the Philippines and Thailand are from the regional or hospital level, respectively, so are therefore incomplete. Hip fractures are usually identified through fracture liaison services, yet 23% of Asia Pacific countries do not have them established. The most common reimbursed first-line drug treatment in the Asia Pacific is alendronate. However, in treating patients from the Asia Pacific with bisphosphonates for osteoporosis, specific considerations need to be made. Atypical femur fractures (AFFs) have been reported in anti-resorptive treated individuals, bisphosphonate-naïve individuals and individuals with monogenic bone diseases. The likelihood of developing an AFF increases with prolonged exposure to anti-resorptive treatment, particularly with the bisphosphonate, alendronate. In one US cohort, the risk was increased 43.5-fold for 8 years or more of bisphosphonate use. However, the AFF risk declines promptly following anti-resorptive discontinuation. More recently, Asian ethnicity has emerged as an important risk factor for AFF, increasing the risk 4- to 5-fold. We also recently identified in our own AFF cohort that Asians, particularly those of Southeast Asian ethnicity, were 2- to- 3-times more likely to sustain an "earlier onset AFF" (an AFF sustained following ≤5 years of anti-resorptive use) compared with non-Asians. This implies that the duration of bisphosphonate therapy could be limited to ≤5 years in Asians, particularly those of Southeast Asian ethnicity. This is beginning to be reflected in recent osteoporosis management guidelines in the Asia Pacific, including the 2024 Osteoporosis Society of Hong Kong Guidelines, which limits oral bisphosphonate therapy to 5 years in total, then switching to denosumab in those with a continuing high fracture risk. It is unclear whether screening Asian patients after 3 years with extended femur DXA scans or femur x-rays in needed for the early identification of AFFs.

In conclusion, hip fractures are a major and increasing problem in the Asia Pacific that require intervention with anti-osteoporosis drugs to prevent further fractures. The benefit-risk ratio for bisphosphonates, the most used drugs, is lower in Asians than Caucasians which means that the optimal duration of therapy should carefully be considered in this Asia Pacific population.

PL3

GENETIC EPIDEMIOLOGY OF OSTEOPOROSIS IN ASIAN POPULATIONS

C.-L. Cheung[1,2]

[1]Associate Professor, Department of Pharmacology and Pharmacy, HKU, Hong Kong, Hong Kong SAR China, [2]Adjunct Scientist, Hinda and Arthur Marcus Institute for Aging Research, Hebrew SeniorLife, Boston, United States

Osteoporosis is a common disease that affects >200 million postmenopausal women globally and is characterized by low bone mineral density (BMD) and deteriorated microarchitecture, leading to fragility fracture. BMD is known to have a substantial heritability ranging from 50% to 85%. Given the substantial heritability of BMD, many genetic studies of osteoporosis have been conducted using a candidate gene approach and a genome-wide association approach. Findings from the genetic studies of osteoporosis have important implications that the BMD-associated genes can be potential biomarkers and/or therapeutic targets of osteoporosis. Alkaline phosphatase is a bone formation marker and its gene, ALPL, was identified as a BMD-associated gene. Similarly, romosozumab, denosumab, and raloxifene targets sclerostin, TNF superfamily member 11, and estrogen receptor, in which the gene associated with these proteins (SOST, RANKL, and ESR1) were “re-identified” as bone-associated genes from the genetic studies of osteoporosis. These examples illustrate the clinical relevance and importance of the findings generated from genetic studies of osteoporosis.

Most GWAS of osteoporosis focus on common variants, which often have small effect sizes on clinical outcomes. Rare but functionally significant variants are excluded from common GWAS designs. Identifying these rare variants usually requires sequencing, which current GWAS chips do not support. A recent large-scale whole exome sequencing study in the UK Biobank demonstrated that rare variants independently influence clinical outcomes beyond common variants identified by GWAS. Rare genetic variants with large effect size were reported to explain a substantial proportion of missing heritability in complex diseases. These highlight the importance of analyzing rare functional variants through whole-genome sequencing (WGS). Although WGS is important to addressing missing heritability, the under-representation of non-Caucasian genetic studies, especially sequencing studies, hampers the discovery of novel disease genes that may not be present in other populations due to differences in genetic background. This inequality is widely acknowledged in the field. This research gap also hinders the development of precision medicine.

This lecture will examine the progression of genetic research on osteoporosis within Asian populations, emphasising distinct differences in the genetic architecture of osteoporosis among various groups. Additionally, it will address prospective advancements in the field of genetics.

PL4

VITAMIN D, BONE AND MUSCLE HEALTH: CONTROVERSIES AND CONSENSUS

A. Ambrish[1]
[1]Institute of Endocrinology and Diabetes, Max Healthcare, New Delhi, India

Vitamin D is essential for bone and muscle health. Severe deficiency can lead to osteomalacia or rickets. In elderly individuals with vitamin D deficiency, supplementation reduces fracture risk. Vitamin D also contributes to muscle function, potentially improving strength and lowering the risk of falls, particularly in older adults.

Although the serum 25-hydroxyvitamin D [25(OH)D] concentration is the most commonly used marker of vitamin D status, the optimum serum level required to maintain bone health remains controversial. While some guidelines recommend serum levels above 30 ng/mL, others question the relevance of such a cut-off and argue that measuring 25(OH)D levels may not always be necessary.

What are the controversies?

1. Serum 25(OH)D is an imperfect indicator of the biological effects of vitamin D. Parathyroid hormone (PTH) levels do not always correlate with 25(OH)D concentrations, and low vitamin D levels without accompanying hyperparathyroidism may not significantly affect bone metabolism. Moreover, measurement techniques for serum 25(OH)D have varied across studies, often producing inconsistent results. Vitamin D metabolite ratios have been explored to improve diagnostic reliability.

2. The literature on vitamin D supplementation largely consists of association studies rather than randomized controlled trials. Observational or correlational findings cannot establish causation.

3. Most trials have been conducted in vitamin D–replete white Caucasian populations. Extrapolating these findings to vitamin D–deficient or ethnically diverse populations may therefore be misleading.

What is the current consensus?

A serum 25(OH)D concentration of around 20 ng/mL is generally considered an adequate threshold for achieving and maintaining bone health in most populations. Levels below 12 ng/mL are classified as deficient. Some studies suggest that the upper limit of the optimal range should be 40–50 ng/mL.

Typically, daily supplementation with 800–2000 IU of vitamin D (depending on baseline levels) is sufficient. Smaller daily doses may be preferable to large intermittent doses, as the latter may increase the risk of falls and fractures in older adults.

PL5

EXERCISE AND BONE HEALTH IN THE ELDERLY

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Exercise is recommended to protect against fragility fractures because it is the only proven strategy to simultaneously maintain or improve bone strength, muscle mass, strength, and function, and reduce fall risk (i.e., applied loads), all key risk factors for fracture. However, not all forms of exercise are equally effective. Bone responds best to short, targeted bouts of loading involving unusual strain patterns, high magnitude and rapidly applied loads. The guiding principle for any program is specificity; physiological adaptations occur in direct response to the type and dose of exercise. To be safe and effective, programs must be tailored to each individual's fall and fracture risk, physical capacity, and personal goals. Current best practice guidelines recommend a multi-component approach: 1) progressive resistance training (PRT) at least twice weekly targeting the muscles attached to or near the hip, spine and forearm; 2) weight-bearing impact exercise (50-100 multi-directional, moderate impacts per session) performed at least 3/week, and 3) regular challenging balance and mobility training to reduce falls risk. For those unable to tolerate impact (e.g., due to osteoarthritis), high-velocity PRT (power training), which involves rapid concentric muscle contractions, is an effective alternative. It delivers rapid loads to bone and trains movement speed and power, critical for fall prevention. Aerobic exercise like walking and cycling are encouraged, but not to the exclusion of the above, as they do little to prevent bone or muscle loss. Individuals with a history of fragility fracture, deconditioning, comorbidities, hyperkyphosis, or impaired mobility benefit from the same exercise principles, but closer supervision, more gradual progression, and a greater emphasis on correct posture and technique is needed. Importantly, instructions should focus *'how to'* rather than *'don't do'* messages to build confidence and capability. A key challenge that remains is how best to deliver these programs widely and effectively. Digital health technologies are emerging as a feasible, safe and effective approach allowing evidence-based exercise and self-management programs to be delivered and monitored remotely, making bone health and fracture prevention programs accessible to anyone, anywhere, at any time.

PL6

DIABETES AND OSTEOPOROSIS – AN ASIAN EPIDEMIC

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Diabetes and osteoporosis are emerging as major public health challenges across Asia, constituting a dual epidemic with significant individual and societal impacts. The Asia-Pacific region accounts for over one-third of the global diabetes population, while osteoporosis-related fractures pose a substantial burden, with one in three women and one in five men over 50 experiencing osteoporotic fractures in their lifetime. Evidence indicates a high fracture burden in Asia, compounded by the increased fragility and poorer outcomes observed in individuals with diabetes.

This session will address the urgent need to optimize bone health in the context of the Asian diabetes epidemic. Despite recognition of the increased fracture risk among people with diabetes, the persistent gap representing diabetes-related excess fracture risk appears to remain. A multifaceted approach is needed to address this issue. Key strategies include achieving and maintaining optimal glycaemic control – targeting hyperglycemia, minimizing hypoglycemia, and reducing glycaemic variability – and early intervention for diabetes to reduce occurrence of diabetic complications which in turn are associated with fracture risks. Notably, individuals with type 2 diabetes often fracture at higher bone density T-scores than their non-diabetic counterparts, suggesting that the intervention threshold may need to be modified in this population. Proactive osteoporosis management is essential. Moreover, the high prevalence of coexisting cardiovascular and metabolic comorbidities in individuals with diabetes influences fracture risk, with medication choices potentially impacting skeletal health. Overall, it is hoped that a comprehensive approach integrating glycaemic optimization, proactive osteoporosis management and managing cardiometabolic comorbidities can address this Asian epidemic of diabetes and osteoporosis.

PL7

DIAGNOSTIC VS INTERVENTION THRESHOLDS IN OSTEOPOROSIS MANAGEMENT

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Osteoporosis and its associated fractures is increasingly recognised as one of the main types of non-communicable diseases (NCDs) alongside cardiovascular diseases (e.g. heart attacks, stroke), cancers, chronic respiratory diseases (e.g. chronic obstructive pulmonary disease, asthma) and diabetes. Like other NCDs, osteoporosis is a chronic disease resulting from a combination of behavioural, metabolic and environmental risk factors, and within each the metabolic factor is often classified as a distinct disease that requires intervention to reduce the risk of the NCD outcome. For example, in the case of cardiovascular diseases, high blood pressure (hypertension) and high cholesterol levels (hypercholesterolaemia) are recognised clinical entities, in the same way that low bone mineral density is characterised in osteoporosis. All of these metabolic factors show continuous relationships with the relevant NCD outcome, but most are defined by the setting of diagnostic thresholds (e.g. BMD-defined osteoporosis) that have also frequently been used, not just for diagnosis, but also as intervention thresholds. It is increasingly recognised that the use of a diagnostic threshold in one risk factor as an intervention threshold in a multifactorial disease is an inadequate approach to targeting treatment. In cardiovascular disease, for example, a 2021 meta-analysis by the Blood Pressure Lowering Treatment Trialists' Collaboration called for a revision of hypertension guidelines to consider blood pressure-lowering treatment for any individual who has a sufficiently high absolute risk of cardiovascular disease, regardless of the actual blood pressure. It also emphasised the importance of using multivariable risk prediction tools which are less sensitive to random errors than the use of individual risk factors. FRAX, the most widely established fracture risk assessment tool, is now incorporated in many national and international guidelines to address thresholds for intervention, but is still frequently used alongside single risk factor diagnostic thresholds particular the BMD T-score threshold of -2.5. This talk will illuminate some of the discordances caused by use of diagnostic thresholds in a single risk factor as an intervention threshold and address the benefits of targeting treatment based on multicomponent risk assessment tools.

PL8

PERSONALIZED FRACTURE RISK ASSESSMENT: FRAX PLUS AND MORE

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In the field of bone health management, we benefit from established diagnosis, evidence-based approaches to risk assessment, and a range of highly effective treatments to reduce future fracture risk. Guidelines on the management of bone health and osteoporosis in older age have historically focused on decisions to treat or not treat with anti-osteoporosis medications. Deeper understanding of risk assessment, and availability of bone building anabolic therapies, which appear to act more quickly and with greater magnitude of effect than oral anti-resorptive medications, has paved the way for implementation of personalised stratified therapeutic approaches. A position paper from ESCEO led to the concept of fracture risk classification as low, high or very high, using age-dependent intervention thresholds based on absolute fracture probability according to IOF-ESCEO guidelines. Selection of appropriate therapy can be tailored to baseline fracture risk using this approach, with anabolic therapy targeted to those at very high fracture risk. In this presentation, I will review the evidence around personalisation of bone health assessment, incorporating fracture probability and other modalities such as genotype. I will demonstrate how new platforms such as FRAXplus can contribute a more accurate personalised assessment of fracture risk, and how different approaches to fracture risk categorisation, genetic characterisation of risk, and other modalities might impact optimised care pathways in the future.

PL9

DATA DRIVEN FRACTURE RISK PREDICTION: A SIMPLE YET EFFECTIVE TOOL

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Most existing fracture risk prediction models have focused on estimating long-term risk, typically over 10 years. While such models are valuable, they may not be sufficient for identifying individuals at immediate or short-term risk of fracture, which is a crucial window for intervention. To address this gap, we aimed to develop a simplified and clinically practical risk tool for predicting short-term fracture risk using nationwide health data. We utilized a large-scale national cohort of older adults who underwent standardized health examinations in Korea. Routinely available clinical variables—including anthropometric measures, bone health indicators, and recent fracture history—were integrated into a simplified scoring system. Statistical modeling was applied to derive risk estimates for major osteoporotic fractures and hip fractures within 1–3 years. The focus was on creating a tool that can be applied in routine clinical settings without requiring complex calculations or specialized software. The simplified scoring system demonstrated clear risk stratification across categories. Individuals with higher scores showed progressively greater short-term fracture incidence. The model offers practical utility by converting complex regression outputs into a user-friendly risk grouping, supporting both clinicians and public health practitioners in early identification of vulnerable populations. This nationwide analysis highlights the feasibility and value of constructing a simple, data-driven risk prediction tool to estimate imminent fracture risk. By leveraging routinely collected health information, such tools can enhance clinical decision-making, facilitate timely preventive strategies, and ultimately reduce the burden of osteoporotic fractures at both individual and population levels.

PL10

HIGH BMD DISORDERS AND HOW THEY HAVE INFLUENCED DEVELOPMENT OF ANTIOSTEOPOROSIS MEDICINES

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High bone mineral density (HBM) phenotypes—classically spanning osteopetroses, pycnodysostosis, and sclerosteosis/van Buchem disease—offer a powerful "reverse translational" window into skeletal biology and the evolution of osteoporosis therapeutics. Deconstructing osteoclast-rich versus osteoclast-poor osteopetrosis highlights how disruption of acidification (TCIRG1, CLCN7, OSTM1, CA2), vesicular trafficking (PLEKHM1, SNX10), and cytoskeletal organization (LRRK1, FERMT3) impairs resorption and drives generalized osteosclerosis. In pycnodysostosis, loss of cathepsin-K (CTSK) uncouples collagen degradation from mineral dissolution, producing dense yet brittle bone and motivating development of cathepsin-K inhibitors (e.g., odanacatib)—a target validated biologically even as specific agents were halted for safety signals. Conversely, the Wnt–LRP5/6 axis illuminated by sclerosteosis (SOST loss) and LRP5 gain-of-function HBM set the stage for sclerostin inhibition as a first-in-class bone-forming strategy (romosozumab), establishing the "foundation effect" of an anabolic-first sequence followed by antiresorptives for sustained fracture risk reduction. Ongoing debates around major adverse cardiovascular events in ARCH versus neutrality in FRAME underscore the need to individualize benefit–risk and refine mechanistic understanding. Taken together, HBM disorders have catalyzed a shift from serendipitous drug discovery toward mechanism-based targeting of osteoclast acidification, proteolysis, and Wnt signaling. This talk synthesizes genotype-to-phenotype relationships, mechanistic pathways of resorption and formation, and the translational arc from rare diseases to mainstream therapeutics, offering pragmatic guidance on patient selection, sequencing (anabolic→antiresorptive), and vigilance for off-target risks when harnessing lessons learned from "too much bone.

PL11

GLUCOCORTICOID-INDUCED OSTEOPOROSIS

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Glucocorticoid therapy is associated with an increased risk of bone loss and skeletal fractures. The bone mineral density (BMD) loss in glucocorticoid use is most pronounced in the initial few months due to the loss of trabecular bone. The negative impact of glucocorticoid therapy is seen with doses of prednisone or its equivalent as low as 2.5mg per day. The risk of fracture increases in dose dependent manner and recent patient care pathways have listed those on prednisone or its equivalent >7.5 mg daily under very high-risk category. It is well known that BMD as well as FRAX output do not reflect the real fracture risk in glucocorticoid uses. Glucocorticoid-induced bone loss should be treated aggressively, particularly during the initial months, to counteract the loss of trabecular bone. Aggressive therapy is required in those with other clinical risk factors such as older age, prior fragility fracture and high dose of glucocorticoids. In order to minimize the fracture risk, the dose and duration of glucocorticoid should be kept to the minimum. Alternative therapeutic measures should be used whenever possible. The prevention and treatment strategies for glucocorticoid-induced bone loss are similar to those used in postmenopausal osteoporosis. While all patients should receive an adequate dose of calcium and vitamin D, non-pharmacologic measures such as prevention of falls, physical activity and proper nutrition should be implemented. The selection of specific medications such as bisphosphonates, denosumab and osteoanablic agents depends on the risk level, hence, should be individualized.

PL12

CKD-MBD AND OSTEOPOROSIS

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CKD is commonly associated with ageing. Most have stage 1, 2 or 3 CKD with estimated glomerular filtration rates (eGFR) of ³90 mLs/min, 60-89 mLs/min, and 30-59 mLs/min, respectively. However, many will have stage 4 CKD (15-29 mLs/min) and stage 5 CKD (<15 mLs/min) or are on dialysis (stage 5D). CKD is associated with excess morbidity, including fractures, and mortality. There is an exponential increase in hip fractures with increasing CKD stage.

CKD-Metabolic Bone Disorder (MBD) occurs in stage 4 and 5 CKD, and is characterized by bone (renal osteodystrophy), soft tissue (calcifications), and mineral (phosphate, calcium, fibroblast growth factor-23, calcitriol, sclerostin, Dikkopf-1) abnormalities. Its pathological endpoints are increased cardiovascular risk, mortality and fractures.

Hip fracture incidence is increased at every age for patients with Stage 3b, 4 and 5 CKD. Mortality after any fracture is also increased in patients with CKD, being highest in patients with Stage 5 CKD. It is unclear whether conventional anti-osteoporosis drugs are either appropriate, or effective, in patients with CKD stages 4 and 5, which has led to therapeutic inertia. A reluctance to use anti-resorptive drugs also relates to the possibility of underlying adynamic bone disease and theoretical worsening of skeletal fragility. In adynamic bone disease, turnover is low, mineralization is normal, and volume is low, while in hyperparathyroidism, turnover is high, mineralization is normal, and volume is low. By contrast, in osteomalacia, turnover is low, mineralization is low, and volume is normal.

2024 KDIGO guidelines indicate 2 clinical syndromes: CKD-associated osteoporosis, encompassing increased fracture risk in patients with CKD; and CKD-associated cardiovascular disease, including vascular calcification and structural abnormalities, such as valvular calcification and left ventricular hypertrophy. The complexity of bone and cardiovascular manifestations of CKD-MBD necessitates personalized approaches to management with a focus on assessment of both fracture risk, using DXA, and bone turnover in individual patients with CKD Stage 3a–5D, if these results will impact treatment decisions. In patients with high turnover, an anti-resorptive drug +/- vitamin D should be used, while in patients with low turnover, an anabolic drug +/- vitamin D could be used instead. The use of calcitriol or other active vitamin D analogs is reserved for patients with CKD stages 4–5 with hyperparathyroidism.

Data from large RCTs show both risedronate and denosumab reduce vertebral fractures in patients with milder CKD (stage 2-4 CKD for risedronate, and stage 2-3 CKD for denosumab). Denosumab use can also be associated with severe hypocalcaemia in stage 4 and 5D CKD patients even though it is cleared by the liver, not the kidney. This can be corrected by administration of active vitamin D analogues and calcium. Denosumab has no adverse effect on kidney function in CKD. Teriparatide is effective at reducing vertebral and nonvertebral fractures in patients with eGFR <80 mLs/min. Renal risks of bisphosphonates are poorly explored in patients with CKD stages 3b–5D, which calls for caution in this group.

Trabecular bone score and alternative bone imaging techniques such as hip structural analysis and high-resolution peripheral quantitative computerised tomography (HR-pQCT) need further evaluation pending clinical implementation. FRAX® predicts fracture probability in all CKD stages. However, more evidence is required to determine whether adjustments to conventional FRAX® estimates must be made in stage 4 and 5 CKD. Regarding biochemistry, 2017 ECTS guidelines recommend combining PTH with bone specific alkaline phosphatase (BSAP) as the best non-invasive way to divide patients into high or low bone turnover. Bone biopsy may be rarely required, however, the inability to perform a bone biopsy should not preclude treatment in those with a high risk of fracture.

In conclusion, it is critical that an individualized approach to managing osteoporosis is taken in patients with CKD.

PL13

PREVENTING FALLS, RESTORING MOBILITY: THE SCIENCE OF REHABILITATION IN OSTEOPOROSIS

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Objectives: There is an extensive evidence base supporting falls and fall related fracture prevention as well as rehabilitation for older people with fragility fractures. The aim of this presentation is to provide an overview of these topics with an emphasis on clinical recommendations.

Material and Methods: A narrative review of falls prevention, and rehabilitation after minimal trauma fractures, utilising clinical practice guidelines and case studies is presented.

Results: Exercise is the key intervention to prevent falls and fall injuries. This complements the clear benefits of physical activity and exercise in the prevention and management of most conditions affecting older people (eg, frailty, sarcopenia, dementia, cardiovascular disease, chronic respiratory disease, diabetes, stroke and hip fracture). Priority exercises involve moving from sit to stand and undertaking activities to challenge balance. Older people at high risk of injury benefit from a targeted approach that, in addition to exercise, involves management of specific health conditions. After hip fracture or other significant fracture, a multidisciplinary approach, progressive resistance exercises, and balance training are strongly recommended. Early ambulation, weight-bearing exercise, activities of daily living training, ongoing home-based rehabilitation, management of comorbidities and complication prevention, and nutritional support are also suggested.

Conclusions: Exercise programs provide the basis for both falls prevention and restoring mobility after significant fractures. The older patient will often have other health conditions that also require careful management.

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PL14

PROGRESS ON FLS IN ASIA PACIFIC AND ENSURING QUALITY IN FLS: LESSONS LEARNED FROM THE APAC

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Fracture Liaison Services (FLS) have become a cornerstone of secondary fracture prevention worldwide. In the Asia-Pacific (APAC) region, diverse health systems, rapid aging, and resource variability have shaped FLS adoption. This abstract reviews regional progress and highlights lessons from Japan's Osteoporosis Liaison Service (OLS) for ensuring quality and sustainability.

FLS expansion is evident across APAC, supported by IOF- Capture the Fracture® (CTF) and national networks. Japan launched the OLS in 2011, addressing not only secondary fracture prevention but also primary fracture prevention, patient education, public awareness initiatives, and community-based osteoporosis screening. Over 5,000 OLS coordinators have been certified, including nurses, pharmacists, dietitians, therapists, and other healthcare professionals. The OLS-7 framework extends beyond the "5i" FLS model to include nutrition, falls prevention, medication review, quality of life, and database management. Despite these advances, uptake remained uneven until the introduction of national reimbursement in 2022, which markedly improved implementation. Since 2022, the number of FLS in the CTF Network has more than doubled.Key lessons include:

1. Policy alignment – financial incentives and national standards drive hospital adoption.

2. Multidisciplinary coordination – trained liaison coordinators sustain adherence and comprehensive care.

3. Quality benchmarking – CTF accreditation promotes continuous improvement and regional harmonization.

4. Context-specific KPIs – tailoring indicators to national and regional healthcare settings is an effective strategy.

In conclusion, FLS in APAC has progressed from pilot programs to structured, reimbursed models integrated into national health systems. Lessons from APAC emphasize that policy, multidisciplinary training, and international benchmarking are key to ensuring quality and equity in FLS.

PL15

NO PATIENTS LOST: OPTIMIZING PATIENT PATHWAYS IN FLS: CAPTURING ALL PATIENTS IN FLS – COORDINATION POST DISCHARGE

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In Japan, the April 2022 revision of medical fees introduced a new emergency surgery surcharge for proximal femur fractures within 48 hours of injury and new fees for ongoing secondary fracture prevention management. This marked a major turning point in proximal femur fracture treatment in Japan and promoted task shifting within hospitals. Multidisciplinary Fracture Liaison Service (FLS) teams were formed, establishing a system where each professional leverages their expertise for individualized care.

A key feature of our hospital is that on the third postoperative day, medical clerks create and send an information sheet to the rehabilitation hospital. At discharge, an outpatient appointment is scheduled for 120 days later, and a document notifying the attending physician of the billing for “Secondary Fracture Prevention Continuation Management Fee 1” is mailed. This process initiates seamless community-based medical collaboration spanning the acute, recovery, and maintenance phases. Furthermore, to promote awareness of osteoporosis treatment, our hospital actively implements osteoporosis education alongside postoperative therapy and fall prevention guidance provided by rehabilitation therapists.

Furthermore, during the 120-day outpatient follow-up, X-ray examinations, bone density measurements, and blood tests are performed, with medication adjustments made as necessary. Routine prescriptions are delegated to the primary care physician, establishing a circular regional collaboration model. Additionally, starting in 2023, we are promoting information sharing with recovery-phase and long-term care facilities, as well as local medical institutions, utilizing ICT (Information and Communication Technology).

PL16

DEEP LEARNING IN THE DETECTION OF OSTEOPOROSIS: FROM PROMISE TO PRAGMATICS

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Deep learning (DL) is reshaping osteoporosis detection via two synergistic avenues: image-based opportunistic screening and risk prediction beyond DXA. First, DL models trained on routine radiographs (chest and lateral spine) and CT can estimate BMD, flag vertebral fractures, and triage patients for DXA—transforming everyday imaging into a population-scale screening channel. Recent multicenter studies show strong agreement between automated DL-BMD on CT and manual reference measures, and accurate DL pipelines can segment vertebrae and classify fresh versus old compression fractures, improving timeliness of care. Second, externally validated analyses now indicate that AI-enhanced chest radiograph screening followed by guideline-based treatment is cost-effective across health systems—supporting near-term implementation in radiology workflows. Complementary machine-learning approaches integrate routine clinical data to predict osteoporosis and imminent fracture risk, offering scalable case-finding where DXA capacity is limited.

This talk will (1) summarize the current evidence on DL performance for vertebral fracture detection and BMD estimation across modalities; (2) review economic evaluations and service models for opportunistic screening; and (3) outline governance, equity, and safety requirements: dataset diversity, external validation, prospective impact studies, calibration across vendors, and transparent pathways from “AI-flag” to definitive diagnosis and treatment. I will also position AI within Asia-Pacific priorities, embedding tools into existing fracture registries, FLS workflows, and primary-care case-finding, to close the 20–49% treatment gap observed regionally. The message is pragmatic: AI is ready to augment, not replace, DXA and clinical risk tools; the win comes from thoughtful integration, measuring outcomes, and iterating with clinicians, radiologists, and patients at the center

PL17

AI IN FRACTURE RISK PREDICTION

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Artificial intelligence (AI) can be defined as the computer science of the ability to learn and perform suitable techniques to solve problems and achieve goals, appropriate to the context in ever-varying world. Machine Learning (ML) is a subset of AI that learns patterns from data, while Deep Learning (DL) is a further subset of ML that uses multi-layer neural networks to capture complex patterns. Fractures pose a significant health issue among the older adults. Although there are proven and safe treatments available, they remain underutilized in those at high risk, highlighting the need for more effective strategies in identifying at-risk individuals and assessing fracture risk. AI and ML offer potential to improve the detection of high-risk patients by extracting key insights from complex, high-dimensional data, such as imaging, medical records, and data from wearable devices. AI-ML could facilitate the automated screening of asymptomatic morphologic vertebral fractures from routine spine radiographs and computed tomography images, provide home-based monitoring and interventions to address modifiable risk factors including propensity to falls, and integrate diverse types of data to predict fractures. This approach would lead to more accurate fracture risk assessments, allowing more personalized, timely treatments. Hybrid approach between domain knowledge (established statistical models) and ML-derived features could be a pragmatic approach to enhance the predictive performance of the models. There remain questions regarding the performance of prediction models in real-world settings, limited data on the calibration of predicted probability from machine learning models, feasibility of multi-modal models in fracture risk prediction, and generalizability of certain ML models to various clinical settings. In summary, AI holds promise for enhancing fracture risk assessment, by facilitating case detection, opportunistic screening, and by discovering and quantifying new risk factors beyond the traditional clinical setting.

PL18

INNOVATIVE TOOLS THAT GO BEYOND DXA: TBS, 3D SHAPER AND REMS

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Dual x-ray absorptiometry (DXA) remains the cornerstone of clinical assessment of bone mineral density (BMD) as a measure of bone strength. While many other techniques to measure bone strength have been developed, most have remained within the field of research rather than finding clinical utility (e.g. quantitative computed tomography, QCT). However, a number of techniques have been developed that add value to the clinical assessment of bone strength and fracture risk, some of which are derived from existing DXA images and are therefore more readily applied in clinical practice.

Trabecular Bone Score (TBS) is a software add-on to DXA that enables a grey-level textural measurement of lumbar spine images and is a validated index of bone microarchitecture. There is compelling evidence that TBS predicts hip and major osteoporotic fracture in both primary and secondary osteoporosis, and can, when included with BMD and clinical risk factors, inform treatment decisions. As expected from its analysis of trabecular structure, TBS is less sensitive to treatment induced changes during short-term anti-resorptive therapy, but appears to provide useful adjunctive information in monitoring treatment with long-term denosumab and anabolic agents.3D-Shaper is a software extension of DXA that infers 3D bone structure and density from standard 2D hip scans. It does so by applying a statistical shape and density model (built from QCT databases) to provide a differentiation of trabecular vs cortical bone, as well as geometric and structural indices (shape, thickness, moments of inertia etc.). It has advantages over QCT of lower cost and lower radiation, but limitations include that density values and some geometric measures are approximated, and accuracy of cortical thickness or very thin cortical shells is sub-optimal.

Outside DXA, ultrasound-based measurements of bone remain of interest though their uptake in clinical practise has been limited. Recently, radiofrequency echographic multi spectrometry (REMS) analysis has received attention. REMS comprises a ultrasound scan of reference axial sites (lumbar spine and proximal femur), followed by radiofrequency spectral analysis to determine the status of internal bone microarchitecture by comparison with spectra from normal, osteopenic and osteoporotic reference vertebrae. Assessment of its role in determining BMD and fracture risk is ongoing.

PL19

BONE TURNOVER MARKERS FOR THE DIAGNOSIS AND MANAGEMENT OF OSTEOPOROSIS

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Bone turnover markers (BTMs) have become valuable tools to complement bone mineral density (BMD) for a more comprehensive assessment of skeletal health. While they are not used alone to diagnose postmenopausal osteoporosis, they help detect secondary causes when levels are markedly elevated. BTMs provide dynamic information on bone formation and resorption, allowing earlier evaluation of treatment response and adherence. Early changes in markers such as PINP and β-CTX-I within months of starting therapy correlate well with long-term BMD gains and reduced fracture risk, making them practical surrogates when BMD changes take longer to appear. Attention to pre-analytical factors like circadian rhythm, fasting status and sample type is essential to ensure reliable results, as is the use of standardized assays. Current recommendations highlight intact PINP, β-CTX-I, bone-specific alkaline phosphatase (BALP) and TRACP5b as preferred reference markers. In chronic kidney disease (CKD), interpretation must account for altered clearance, and markers such as intact PINP, BALP and TRACP5b are preferred because they are less influenced by reduced renal function. Beyond individual markers, integrated parameters like the Bone Balance Index (BBI) and new approaches such as the calcium isotope ratio show promise to better reflect net bone turnover and true skeletal balance. Despite some challenges in standardization, ongoing efforts are improving the harmonization and clinical utility of BTMs. When used appropriately, they are practical, responsive and informative biomarkers that add significant value to osteoporosis management and patient care.

PL20

META-ANALYSIS, NETWORK META-ANALYSIS AND UMBRELLA REVIEW: METHODOLOGICAL DIFFERENCES AND CRITICAL APPRAISAL FOR GUIDELINE DEVELOPMENT

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Systematic reviews and quantitative evidence syntheses, such as meta-analyses, network meta-analyses (NMAs) and umbrella reviews, play a central role in informing clinical guidelines. Each method offers a distinct approach to summarising the literature: traditional meta-analyses aggregate results from comparable studies, NMA allows for indirect comparisons between multiple interventions, and umbrella reviews synthesise findings across multiple systematic reviews. However, the growing complexity of these tools raises concerns about variability in their methodological quality and the risk of misinterpretation if they are used inappropriately. This presentation will examine the methodological foundations, strengths and limitations of each approach, with a particular focus on their application in the field of musculoskeletal health, including conditions such as osteoporosis, osteoarthritis and sarcopenia. Key issues such as risk of bias, heterogeneity, small-study effects, publication bias and overlap of primary studies will be critically discussed. The importance of robust quality assessment tools and transparent reporting standards will be emphasised to ensure that these syntheses reliably support evidence-based guideline development.

PL21

USE OF PARATHYROID HORMONE RECEPTOR AGONISTS IN THE MANAGEMENT OF OSTEOPOROSIS

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During the last years, the paradigm of the treatment of osteoporosis has significantly changed, following the publication by ESCEO and IOF of an algorithm for the management of patients at risk of fractures. Now, the classical "one-size fits all" treatment approach is obsolete. Patients should be treated on the basis of their fracture risk. Patients at imminent (very high) risk for fracture should receive, as first-line, background treatment, a bone forming agent (BFA) followed by the prescription of an anti-resorptive agent. Three BFA are currently marketed, two PTH Receptor 1 Agonists and an anti-sclerostin antibody. PTH RA include Teriparatide and Abaloparatide while Romosozumab is the anti-sclerostin antibody. All of them have shown to significantly reduce fracture rates at all skeletal sites including spine, non-spine, major osteoporotic fractures and hip. They provide a greater anti-efficacy compared to anti-resorptive agents. All of them present a reasonable risk/benefit ratio with only minor concerns for the prescription of Romosozumab in patients with a previous history of cardiovascular disorders. After a BFA is stopped, an anti-resorptive agent should be prescribed to maintained the benefit obtained during treatment. When BFA are prescribed after the prolonged administration of a potent anti-resorptive agent, their beneficial effect on cortical bone is partially mitigated which suggests that an anti-resorptive agent could be prescribed during the first months of administration of the BFA. Sequential treatment associating a BFA and an anti-resorptive agent was shown to be cost-effective compared to an anti-resorptive agent alone and compared to no treatment. The benefit of BFA is particularly evident (clinically and economically) in patients at higher risk for fracture.

PL22

OSTEOSARCOPENIA IN POSTMENOPAUSAL WOMEN: DIAGNOSIS AND MANAGEMENT

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Osteoporosis and sarcopenia in postmenopausal women increase in risk with aging and postmenopausal hormonal changes, becoming major causes of falls, fractures, and the need for long-term care. Osteoporosis is a condition where reduced bone mass and deteriorated bone quality increase fracture risk. Treatment options include bisphosphonates, denosumab, selective estrogen receptor modulators (SERMs), and parathyroid hormone preparations. Calcium and vitamin D intake, smoking cessation, and moderate sun exposure are also important. Sarcopenia, on the other hand, is characterized by a decrease in skeletal muscle mass and strength, directly impacting mobility and functional abilities. The foundation of treatment and management involves nutritional improvements, including vitamin D and protein,along with consistent resistance exercise and balance training. Recently, the co-existence of osteoporosis and sarcopenia, termed osteosarcopenia, has gained attention, with comprehensive interventions being recommended. Common to both conditions are the essential need for lifestyle improvements, regular bone density and muscle strength assessments, and environmental modifications to prevent falls. Combining drug therapy with nutritional and exercise therapy, and adopting a multifaceted approach from an early stage, contributes to extending women's healthy lifespan.

PL23
OSTEOPOROSIS IN MEN

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Falls and fractures are the third leading cause of the need for long-term care in Japan, and osteoporosis (OP), the main underlying condition, is known to be more prevalent among women. However, approximately 5% of Japanese men aged ≥40 years—around 4.1 million individuals—are also affected by OP (Yoshimura et al., *JBMM* 40: 829, 2022). Regarding fracture incidence, the male-to-female ratio is about 1:3 for proximal femoral fractures (Takusari et al., *JBMR Plus* 5(2): e10428, 2021) and 1:2 for vertebral fractures (Horii et al., *Osteoporos Int* 33: 889, 2022). Nevertheless, post-fracture outcomes are generally poorer in men (Muraki et al., *JBMM* 24, 2006, and others). Therefore, from the perspective of preventing long-term care dependency, addressing male OP has become an urgent issue.

Despite this, men are currently not included in national screening programs for early OP detection, and therapeutic options remain limited. Thus, the diagnostic and treatment systems for male OP still face significant challenges.

In this presentation, we will report on the prevalence, secular trends, fracture incidence, prognosis, and risk factors of male OP in Japan, using data from the Research on Osteoarthritis/Osteoporosis Against Disability (ROAD) study, a large community-based cohort initiated in 2005 across three regions. In addition, we will present international epidemiological findings to provide a comprehensive overview of male OP and discuss future directions for prevention and management.

PL24

MENOPAUSAL HORMONAL THERAPY IN 2025: WHERE DO WE STAND?

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Since the 1990s, menopausal hormone therapy (MHT) was regarded as the gold standard for treating postmenopausal osteoporosis. However, with the emergence of bisphosphonates and other anti-osteoporotic agents in the 2000s, and particularly after the 2002 Women's Health Initiative (WHI) report, the role of MHT in this field has markedly declined. Consequently, the concept of treating postmenopausal osteoporosis with MHT now appears to have lost prominence worldwide.

Nevertheless, MHT holds two unique advantages in osteoporosis management: (1) it alleviates menopausal symptoms while simultaneously preventing aging-related diseases such as atherosclerotic cardiovascular disease, and (2) it reduces fracture risk even in women at low baseline risk. The first advantage has been consistently supported by subsequent analyses, which confirmed that initiation of MHT within 10 years after menopause confers substantial cardiovascular benefit. Notably, WHI sub-analyses revealed that women aged 50–59 years who commenced MHT had a 31% reduction in mortality during the intervention period (hazard ratio 0.69).

Regarding the second point, it is important to note that all osteoporosis drugs introduced since the 2000s have demonstrated fracture prevention only in high-risk populations, such as women with pre-existing vertebral fractures. For example, alendronate showed efficacy in the FIT I trial among high-risk women, but not in FIT II, which enrolled lower-risk women without vertebral fractures. In contrast, WHI provided the first clear evidence of fracture prevention with MHT in a cohort of generally healthy women with a mean age of 63 years, thus underscoring its distinctiveness.

In summary, initiation of MHT within 10 years after menopause not only relieves menopausal symptoms but also prevents cardiovascular disease, reduces fracture risk even in low-risk women, and ultimately lowers mortality by approximately 30%. These benefits should be fully explained when discussing therapeutic options for menopausal women.

PL25

SCREENING FOR OSTEOPOROSIS/HIGH FRACTURE RISK

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Most guidelines for the management of osteoporosis and bone health in older age focus on treatment of individuals who experience a fragility fracture and case finding for risk assessment based on the presence of clinical risk factors. However, in many settings the majority of individuals at high fracture risk do not experience appropriate assessment and treatment. Fracture Liaison Services and orthogeriatric services represent highly effective pathways to ensure that individuals presenting with a fracture receive highly effective treatment to reduce their risk of experiencing a further fracture event. However, systematic mechanisms to identify, assess and treat individuals at high fracture probability in the community are urgently needed, regardless of the presence/absence of a prior fracture. In this presentation, I will review the care gap and need for systematic fracture risk assessment in primary care, the evidence base supporting introduction of this approach, incorporating guidance on screening interventions in general, and highlighting work undertaken through the International Osteoporosis Foundation to achieve this critical goal.

PL26

ASIA PACIFIC EPIDEMIOLOGICAL AUDIT

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The 2025 IOF–APCO Asia-Pacific Regional Audit provides the most comprehensive assessment to date of the osteoporosis and fragility fracture burden across 22 countries and regions, home to nearly half of the world's population. It reveals both the magnitude of the demographic and clinical challenge and the opportunity for coordinated regional action. By 2075, the Asia-Pacific population will exceed 4.4 billion, with average life expectancy rising from 78 to 87 years; in several economies, over half the population will be aged ≥50 years and one-third ≥70 years. This demographic shift will dramatically escalate fracture incidence and healthcare costs unless prevention and care systems are strengthened.

Audit data highlight marked disparities in health system readiness: only 12 of 22 countries maintain centralised fracture databases; fewer than 25% of hospitals across most settings are covered by Fracture Liaison Services (FLS), and treatment initiation remains below 50% in many. While 16 countries have clinical guidelines, only a few, such as Australia, New Zealand, and Thailand, report established national quality standards. Access to DXA and newer anabolic therapies is uneven, and osteoporosis is designated a national health priority in just five countries.

The Audit proposes a ten-point action roadmap: universal post-fracture care, routine primary care risk assessment, integration of osteoporosis management into prescribing practice, life-course prevention strategies, professional education, public awareness, national prioritisation, establishment of fracture registries, and formation of national alliances for falls and fracture prevention. Implementing these evidence-based, locally adaptable recommendations offers a clear path to equitable bone health, system sustainability, and healthier ageing across the Asia-Pacific.

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Oral Communication

Abstracts

OC1

INCIDENCE OF VERTEBRAL FRACTURE IN A COHORT OF AUSTRALIAN WOMEN: DATA FROM THE GEELONG OSTEOPOROSIS STUDY

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Purpose: Vertebral fractures are a common outcome of osteoporosis, yet these skeletal injuries are often asymptomatic and undiagnosed. Studies to assess the rate of incident fractures are often limited by their study design (e.g. clinical trials with strict inclusion and exclusion criteria, opportunistic clinical samples). This study aimed to assess the incidence of vertebral fracture in a representative cohort of Australian women.

Methods: Lateral vertebral assessment (Lunar Prodigy) was obtained at two time points for participants of the Geelong Osteoporosis Study. Incident vertebral fractures were defined by the software according to Genant semi-quantitative criteria where the fracture was new at follow-up. Baseline characteristics, including age, height, weight and other clinical confounders, were compared between those with and without incident fracture. Incidence rate was calculated as number of participants with incident fracture over the total number of person-years (p-y) of observation, and subsequently age-standardised to the Australian population.

Results: Participants were 701 women (ages 21-86y), 19 of whom experienced an incident vertebral fracture over a median 6.86 years of follow up (total 4703.38p-y of observation). The standardised incidence rate was 6.78 (4.19-9.37) fractures per 1000p-y. Individuals who fractured were older (70.1 vs 48.7, $p<0.001$) and shorter (158.1 vs 163.0cm, $p=0.001$), than those who did not. They were more likely to be fallers (52.6% vs 24.5%, $p=0.005$), smokers (42.1% vs 12.8%, $p<0.001$), to have lower mobility (42.1% vs 13.5%, $p<0.001$), and have an existing vertebral fracture at baseline (10.5% vs 1.6%, $p=0.005$). They also had lower femoral neck bone mineral density (BMD) ($p=0.001$). No associations were observed between incident fracture and back pain (prevalent or onset), self-rated health or height loss at follow-up.

Conclusions: Incident fracture was associated with older age, shorter height, smoking, low mobility, and previous falls, as well as prior vertebral fracture and lower bone mineral density, but not associated with back pain, self-rated health or height loss.

OC2

LONG TERM TRENDS OF DISTAL RADIUS FRACTURES IN ADULTS AGED ≥ 50 YEARS IN SOUTH KOREA USING NATIONWIDE CLAIMS DATABASE (2006-2022)

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Purpose: This study was to assess the long-term trends of incidence and mortality as well as subsequent fractures after distal radius fractures in South Koreans over 50-years-of-age using a nationwide claims database from 2006 to 2022.

Methods: National health insurance database was used to collect the patients ≥50-years-of-age treated for distal radius fractures from 2006 to 2022. Distal radius fractures were defined using diagnosis code (S525, S526) and treatment codes (N1601, N1611, N1603, N1613, N0996, N0983, N0643). Incidence rates, one-year mortality rates and subsequent fractures were calculated with standardization adjusted for gender and age distribution.

Results: The number of distal radius fractures increased by 96.9% over the 16-year study periods (51,152 in 2006 and 100,729 in 2022). The incidence rates of distal radius fractures rose from 426 per 100,000 in 2006 to 442 per 100,000 in 2022. The one-year mortality rates after a distal radius fracture decreased from 2.73% in 2006 to 1.79% in 2021. The one-year mortality rate in 2021 for men (3.41%) was higher than that for women (1.32%). The one-year subsequent distal radius fracture rates after distal radius fractures increased from 0.76% in 2006 to 7.44% in 2021. subsequent rates of all osteoporotic fracture sites after distal radius fractures was also increased from 2.19% in 2006 to 8.96% in 2021.

Conclusions: Long term trends of this study that the increased number and incidence rates but, decreased mortality rates after distal radius fracture in South Korea, is necessary to start action of prevention of subsequent osteoporotic fractures to minimize their related socio-economic burdens.

OC3

ETHNIC-SPECIFIC RISK FACTORS FOR OSTEOPOROSIS AND FRAGILITY FRACTURES IN ELDERLY HAKKA WOMEN

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Objective: The aim of this study was to determine the prevalence and identify risk factors for osteoporosis and osteoporotic fractures in Hakka women.

Materials and Methods: We retrospectively analyzed 1,429 Hakka women aged ≥50 years who underwent dual-energy X-ray absorptiometry (DXA) at a single center in Taiwan. Medical records were reviewed to identify fragility fractures at the spine, hip, and distal radius.

Results: The mean age of participants was 73.3 years, with average height 153.2 cm, weight 56.8 kg, and body mass index (BMI) 24.2 kg/m². Mean T-scores were −2.03 at the lumbar spine and −1.80 at the hip. The prevalence of osteoporosis was 40.9%. Regression analysis showed age was negatively associated with bone mineral density (BMD) at all sites ($p < 0.001$). Body weight was positively associated with hip BMD ($\beta = 0.091$, $p = 0.012$), while height and BMI were not independently significant after adjustment. Fragility fractures occurred in 43.7% of participants, most commonly vertebral fractures (32.0%). Fracture prevalence increased across BMD categories: 29.0% in normal, 41.3% in osteopenia, and 53.9% in osteoporosis groups ($p < 0.001$). Logistic regression demonstrated age as a strong predictor of fracture risk ($\beta = 0.089$, OR = 1.093, 95% CI 1.079–1.108, $p < 0.001$), with risk rising 9.3% per year. BMI demonstrated a non-linear relationship with fracture risk, which declined with increasing BMI until approximately 27.6, where the lowest predicted risk (38.5%) was observed.

Conclusions: Osteoporosis and fractures are highly prevalent in elderly Hakka women, with age emerging as the most consistent determinant of bone loss and fracture risk. Body weight positively influences hip BMD, while a BMI of approximately 27 appears to confer the lowest fracture risk. These findings highlight the importance of ethnic-specific data in fracture risk stratification and support the role of maintaining adequate body weight as a modifiable factor. Early identification of high-risk individuals and tailored prevention strategies are essential in aged populations to reduce the burden of osteoporotic fractures.

Acknowledgements: The authors would like to thank the staff of the Orthopaedic Department and Radiology Department at Taoyuan General Hospital for their support during data collection.

OC4

PARSIMONIOUS DEEP LEARNING SURVIVAL MODELS FOR HIP FRACTURE RISK PREDICTION: A COMPARISON WITH FRAX AND BONE MINERAL DENSITY

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Objective: To evaluate parsimonious deep learning (DL) survival models for hip fracture risk prediction and compare their performance with the FRAX™ tool and bone mineral density (BMD) alone.

Material and Methods: We included 80,004 individuals (aged 40–90) from the Manitoba Bone Density Registry. New hip fractures were registered in 2,276 cases (2.84%). Baseline variables were age, sex, prior fracture, and femoral neck (BMD). Two DL survival models, DeepSurv and a multi-layer perceptron (MLP), were trained using Cox proportional hazards loss with the Breslow approximation. The dataset was split into 70% training, 10% validation, and 20% testing. Each model was trained across five random seeds (results averaged) using four sampling strategies: native, stratified, balanced, and oversampled. Model performance was evaluated using Harrell's concordance index (C-index), integrated Brier score (IBS), time-dependent AUCs at 3, 5 and 10 years, and Kaplan–Meier (KM) analysis. Logistic recalibration was applied to improve calibration.

Results: C-index differences between sampling strategies were not significant. Native sampling yielded the lowest mean absolute error at 10 years (MAE@10yr) for both models. Mean C-index for MLP was 0.819 (95% CI: 0.818–0.820) and for DeepSurv was 0.818 (95% CI: 0.817–0.819) using native sampling. Time-dependent AUCs for MLP were 0.897 (95% CI: 0.872–0.921) at 3 years, 0.849 (95% CI: 0.820–0.877) at 5 years, and 0.819 (95% CI: 0.800–0.839) at 10 years. For DeepSurv, AUCs were 0.897 (95% CI: 0.874–0.919) at 3 years, 0.848 (95% CI: 0.820–0.875) at 5 years, and 0.818 (95% CI: 0.799–0.838) at 10 years. At 10 years, DL outperformed BMD alone (0.750, 95% CI: 0.725–0.775) and FRAX without BMD (0.797, 95% CI: 0.774–0.819), and was similar to FRAX with BMD (0.810, 95% CI: 0.789–0.830). IBS values were consistent across samplers (0.1536–0.1589). DeepSurv showed better calibrated MAE@10yr of 0.036 (95% CI: 0.00–0.086) than MLP (MAE@10yr = 0.069, 95% CI: 0.052–0.282). Calibration plots showed agreement with observed 10yr risk. KM curves confirmed significant separation by risk tertile.

Conclusions: DL survival models using age, sex, prior fracture and BMD matched or exceeded FRAX for hip fracture risk prediction. They may offer practical alternatives in settings lacking complete FRAX inputs.

OC5

WHAT IS THE ASSOCIATION BETWEEN UROLITHIASIS AND OSTEOPOROSIS? A SYSTEMATIC REVIEW AND META-ANALYSIS OF EPIDEMIOLOGIC AND GENETIC EVIDENCE

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Objective: Emerging evidence suggests a bidirectional association between urolithiasis and osteoporosis, potentially mediated through shared metabolic and hormonal mechanisms. This study aimed to systematically evaluate the association between these two conditions.

Methods: A systematic review and meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and registered on PROSPERO. Three databases (Medline, EMBASE and Cochrane Library) were searched up to May 2025 using comprehensive terms for "osteoporosis" and "urolithiasis", "nephrolithiasis" or "kidney stone". Eligible studies included observational studies in adults that reported likelihood ratios or raw data for prevalence of urolithiasis and osteoporosis. Two independent reviewers conducted study screening, data extraction, and quality assessment using the Newcastle-Ottawa Scale (NOS). Between-study heterogeneity was assessed using the I^2 statistic, and publication bias was evaluated via funnel plots and Egger's test. Random-effects models were used to compute pooled odds ratio (OR).

Results: A total of 11 studies were included. Nine observational studies (case control and cohort) indicated a higher likelihood of osteoporosis in patients with nephrolithiasis (OR = 1.20, 95% CI: 1.13–1.28), and vice versa (OR = 1.51, 95% CI: 1.31–1.73). Complementing the observational evidence, two large mendelian randomization (MR) studies supported a unidirectional causal effect of urolithiasis on osteoporosis. One MR study based on the Japan Biobank (n > 400,000) identified a significant direct causal effect, robust to multiple sensitivity analyses and multivariable adjustments. A second MR study using FinnGen and UK Biobank data (n > 800,000) found a similar causal association (OR ~1.14–1.15), with mediation analysis revealing that total body bone mineral density accounted for ~50% of the effect, and SHBG for ~2–3%. No mediating role was observed for serum 25(OH)D or calcium supplementation, and no reverse causality was observed in the MR studies.

Conclusion: This review of epidemiologic and genetic evidence establishes a robust and likely unidirectional causal relationship between urolithiasis and osteoporosis. Clinicians should consider proactive osteoporosis screening in patients with urolithiasis, irrespective of traditional lifestyle risk factors. Future work should further study exploring genetic causality and mediation mechanisms, and explore targeted interventions along shared biological pathways to mitigate dual disease risk.

OC6

HIP MUSCLE STRENGTH PREDICTS FALLS AND MEDIATES FEAR OF FALLING–FALL RELATIONSHIP: A COMPETING RISK AND MEDIATION ANALYSIS

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Objectives: Falls remain a major public health concern, commonly associated with age-related hip and lower limb weakness. Hip muscle strength is vital for balance, while fear of falling (FOF) increases risk by restricting activity and strength. This study explored the association between hip muscle strength and incident falls among older adults and assessed whether hip strength mediates the relationship between FOF and incident falls.

Material and Methods: Participants (n = 952, aged ≥65 years) were from the Geelong Osteoporosis Study. The primary outcome was fall-related emergency presentations, identified through linkage with the Victorian Emergency Minimum Dataset (VEMD), which comprehensively records emergency presentations across hospitals with emergency departments in Victoria, Australia. The authors acknowledge the Victorian Department of Health as the source of these data. Hip abductor and flexor strength were assessed using a hand-held dynamometer and adjusted for leg lean mass measured by dual-energy X-ray absorptiometry. FOF was assessed with the 14-item Modified Falls Efficacy Scale. Associations between hip strength and incident falls were examined using Fine and Gray competing risk regression analysis. Mediation analysis tested whether hip strength mediated the FOF–falls association.

Results: Men were followed for a median of 9.3 years (IQR 5.0–17.1) and women for 18.1 years (IQR 8.7–20.3). Falls occurred in 125 men (21.2%) and 94 women (26.0%), yielding incidence rates of 20.5 per 1000 person-years in men (95% CI: 17.2–24.5), 17.8 in women (95% CI: 14.5–21.8), and 19.3 overall (95% CI: 16.9–22.0). Higher hip abductor strength (HAS) was associated with reduced fall risk (aSHR = 0.835, 95% CI: 0.724–0.963), while hip flexor strength was not. HAS mediated 23.7% of the link between fear of falling and incident falls.

Conclusion: Higher hip abductor strength was associated with a lower risk of fall-related emergency presentations and partially mediated the relationship between FOF and incident falls. Effective fall prevention should combine strength training with strategies to reduce FOF.

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OC7

KURE-DREAMS-3: CITY'S BOLD MOVE CUT VERTEBRAL AND HIP FRACTURES IN AN AGING SOCIETY

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Background: This study represents the third phase of the Kure Data-based Results and Evidence Assisted by a Multi-profession Study (Kure-DREAMS) project, a large-scale municipal cohort for skeletal health improvement. The first phase reported the regional incidence of clinical vertebral and hip fractures, and the second investigated regional and dose-dependent incidence and trend of antiresorptive agent-related osteonecrosis of the jaw.

Objectives: In 2017, Kure City designated osteoporosis and fracture prevention as key administrative policies and launched a comprehensive initiative called the "Kure Project." The purpose of this study was to evaluate the impact of a government-supported, multidisciplinary fracture liaison service (FLS) and public awareness activities on the incidence of clinical vertebral fractures (CVF) and hip fractures (HF) in Kure City, which is experiencing rapid population aging.

Material and Methods: A population-based study targeting individuals aged 65 years and older was conducted in Kure using National Health Insurance and Late-Stage Elderly Medical Care System claims data from 2015 to 2021. Fracture events were identified using diagnosis and procedure codes, and annual trends in CVF and HF incidence rates were analyzed by age and sex. Poisson regression analysis was used, with 2017 (pre-project) as the baseline year.

Results: The incidence rates of CVF and HF showed an increasing trend until 2017 but subsequently shifted to a decreasing trend in both sexes, particularly pronounced in women. Compared to 2017, the age- and sex-adjusted incidence rate ratios in 2015 were 0.76 (95% CI, 0.70–0.83) for CVF and 0.87 (0.78–0.96) for HF. By 2021, the rates were 0.89 (0.82–0.96) for CVF and 0.85 (0.76–0.94) for HF, indicating a significant post-intervention decrease. This effect was more pronounced in women than in men. Increased use of osteoporosis medications and the establishment of the FLS system are considered contributing factors to the decrease.

Conclusions: The government-led multidisciplinary FLS and public awareness campaigns on osteoporosis were associated with a sustained and significant reduction in clinical vertebral fractures and proximal femoral fractures in Kure City since 2017. These findings highlight the importance of fracture prevention strategies tailored to regional characteristics in a super-aged society.

OC8

IMPACT OF OSTEOPOROSIS PHARMACOTHERAPY ON MOTALITY FOLLOWING VERTEBRAL FRACTURES IN JAPANESE ELDERLY PATIENTS AGED 75YEARS AND OLDER (J-BOLD STUDY): RETROSPECTIVE COHORT STUDY USING LARGE-SCALE CLAIM DATABASE

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Objective(s): With the advent of a super-aging society, the importance of pharmacotherapy for osteoporosis is increasing. However, national-scale studies on pharmacotherapy for osteoporotic vertebral fractures remain limited in Japan. This study aims to investigate the status of osteoporosis pharmacotherapy before and after osteoporotic vertebral fractures using large-scale claims data for elderly patients and to examine the impact of osteoporosis drug therapy on long-term prognosis.

Material and Methods: A descriptive epidemiological study was conducted using an insurer database containing claims data for elderly patients. The study population consisted of patients aged 75 years or older newly diagnosed with osteoporotic vertebral fractures. We examined the administration of osteoporosis drugs before and after vertebral fractures and assessed their association with mortality. Propensity score matching was conducted based on patient background to analyze matched subjects. The chi-square test was used for comparisons between two groups. The Kaplan-Meier method was employed to estimate survival functions, and significance testing was performed using the log-rank test.

Results: Out of 552,931 elderly patients with osteoporotic fractures, 265,301 patients with vertebral fractures were extracted. The average age was 84.2 years, and 72.9% were female. The administration rate of osteoporosis drugs was 44.6% before and 50.3% after the fracture. Active vitamin D was the most commonly prescribed osteoporosis drug before and after the fracture, followed by bisphosphonates. The group that used osteoporosis drugs before the fracture showed significantly lower mortality compared to the non-use group ($p=0.00019$). Similarly, in the group that newly used osteoporosis drugs after the fracture, mortality was significantly lower compared to the non-use group ($p<0.0001$).

Conclusion(s): The rate of pharmacotherapy for osteoporotic vertebral fractures in elderly patients was approximately 50%. Patients using osteoporosis drugs showed lower mortality, suggesting that osteoporosis drug use may extend survival in cases of osteoporotic vertebral fractures.

Disclosures: The authors declare that there is no conflict of interest.

OC9

EFFECTS OF A SMARTPHONE APP-DELIVERED EXERCISE INTERVENTION ON MUSCULOSKELETAL HEALTH IN OLDER ADULTS WITH SARCOPENIC OBESITY UNDERTAKING CALORIC RESTRICTION: A 6- MONTH RANDOMISED CONTROLLED TRIAL

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Objective: To compare the effects of a 6-month home-based functional and impact training (FIT) intervention delivered by a smartphone application versus aerobic exercise on vertical jump, physical function, and body composition in older adults with sarcopenic obesity undergoing caloric restriction.

Material and Methods: One-hundred and sixteen community-dwelling adults aged 60-89 years with self-reported obesity (body mass index [BMI] ≥30 kg/m^2) and a SARC-F screening score ≥2 were randomised to FIT; comprising 3-5 sessions per week of home-based resistance, balance, and impact exercise) or control (150 min/week of walking/jogging) with both interventions delivered via the Physitrack® app for 6 months. Concurrently, all participants commenced a 6-month caloric restriction intervention (750-1000 kcal restriction from habitual intake delivered by an Accredited Practicing Dietitian using Physitrack® and telephone consults. Vertical jump power (W/Kg; primary outcome) and physical function (stair climb power, 5x sit-to-stand time, gait speed, and Short Physical Performance Battery [SPPB]), and dual X-ray absorptiometry-determined body composition and areal bone mineral density (aBMD) were assessed at baseline and follow-up.

Results: At baseline, participants had a mean±SD age of 66.5±4.0 years and BMI of 35.8±4.4 kg/m^2, with females accounting for 74.5%. During the 6-month intervention, 22 of 59 (37.3%) FIT and 18 of 57 (31.6%) control participants withdrew or were lost to follow-up. Mean weight loss was -2.1 kg (95%CI: -3.4, -0.9) for FIT and -1.7 kg (95%CI: -3.0, -0.5) for control, with no significant difference between groups. Vertical jump and stair climb power significantly improved in FIT group but not control, while chair stand time and SPPB significantly improved in both groups (P<0.05), with no difference between groups). Total fat mass, and appendicular lean mass significantly decreased in both groups, with no significant differences between them. Lumbar spine and total hip aBMD did not change in either group.

Conclusions: FIT and control experienced similar weight loss, body composition improvements and functional gains, with no significant differences between groups, although lower-limb muscle power improved only in FIT. High attrition rates in both groups suggest intervention adaptations or modifications may be necessary to increase acceptability in this population.

Keywords: digital health, sarcopenic obesity, exercise intervention, weight loss

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POSTERS

Abstracts

P101

VITAMIN D AND LIPID PROFILES IN INFERTILE FEMALE SUBJECTS: A COMPARATIVE ANALYSIS BETWEEN PCOS AND NON-PCOS GROUPS

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Abstract: Vitamin D and Lipid Profiles in Infertile Female Subjects: A Comparative Analysis between PCOS and Non-PCOS Groups

Objective: This research is aimed to explore the relationship of vitamin D and lipid profile in females with PCOS and non-PCOS infertile female subjects.

Study Design: A case-control multicentric research.

Place and Duration of the Study: The Department of Biological and Biomedical Sciences (BBS) Aga Khan University and Jinnah Postgraduate Medical Centre (JPMC) in collaboration with the Australian Concept Infertility Medical Center (ACIMC), from February 2021 to March 2023.

Materials and Methods: 180 participants; 114 PCOS and 66 non-PCOS infertile women were enrolled. The lipid profile of patients was acquired from desk records and vitamin D was estimated by enzyme-linked immunosorbent assay. Applicants were classified according to their Vitamin D levels as Sufficient (30-100 ng/ml), Insufficient (20-29 ng/ml), or Deficient (20 ng/ml). Median, interquartile range, frequency, and percentages were described. Statistical significance was resolute by Mann-Whitney U and chi-square tests with p-values of 0.05.

Results: Females with PCOS had significantly low vitamin D (p-value <0.001). Total cholesterol, low-density lipoprotein, very low-density lipoprotein, and triglyceride levels were significantly surged, and HDL was less in comparison to the non-PCOS group (p-value <0.001). A significant increase in total cholesterol, triglycerides, low-density lipoproteins, and very low-density lipoproteins was found in vitamin D deficient subgroup compared with insufficient or sufficient groups (p-value 0.05).

Conclusion: The study provides a link between females with PCOS and abnormalities in lipid profile. Decreased vitamin D levels in females with PCOS were linked with an abnormal lipid profile rise in cholesterol, triglycerides, and low-density lipoproteins which may lead to metabolic abnormalities.

Keywords: Vitamin D, Polycystic ovary syndrome, metabolic syndrome, Body mass index, lipid profile.

P102

VITAMIN D SUPPLEMENTATION AND ITS ROLE IN MODULATING OVARIAN RESERVE AND OXIDATIVE STRESS IN INFERTILE FEMALES

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Abstract: Polycystic Ovarian Syndrome (PCOS) is associated with Vitamin D deficiency in Pakistan. This study compared the effectiveness of a vitamin D oral dose with a single intramuscular dose, on ovarian reserve and oxidative stress markers in infertile females with Vitamin D deficiency.

Material & Methods: This Quas intervention study was conducted as a collaborative project of Australian-Concept-Infertility-Medical-Centre, and Aga Khan University, Karachi. The study included: Group A (n=120 PCOS) and Group B (n=60 non-PCOS) females. The participants' vitamin D levels were assessed, route of administration and dose were decided according to the participant's vitamin D levels. The vitamin D deficient PCOS and non-PCOS were given vitamin D (200,000 IU) I/M single dose for 12 weeks, while vitamin D insufficient PCOS and non-PCOS were given Vitamin D (50,000 I.U) weekly, for 12 weeks. Pearson's Chi-Square test and paired t-test were applied using SPSS version 22 and a p-value of <0.05 was considered significant.

Results: The study observed statistically significant mean differences in AMH, TAOC, and PON-1 from baseline to post-treatment in females who received oral treatment in vitamin D insufficient PCOS and non-PCOS infertile females ($p<0.01$). Significant mean differences in AMH, TAOC, and PON 1 from baseline to post-treatment were noted in I/M treatment in the vitamin D-deficient group PCOS and non-PCOS infertile females ($p<0.001$).

Conclusions: I/M administration of vitamin D is required to improve the ovarian reserve and reduce oxidative stress in vitamin D-deficient infertile females, however, oral administration of vitamin D can improve AMH, TAOC, and PON-1 levels in vitamin D insufficient (21ng/ml – 29ng/ml) infertile females. Therefore, vitamin D levels of infertile females must be checked before offering any treatment.

Keywords: PCOS, AMH, TAOC, PON-1, Vitamin D

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VITAMIN D SCREENING BEFORE FERTILITY TREATMENT PLANS: PILOT STUDY IN PCOS AND NON-PCOS INFERTILE FEMALES

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Background: Polycystic ovarian syndrome (PCOS) and hypovitaminosis D are the two most common endocrine disorders in young women leading to many adverse metabolic consequences. To compare Vitamin D (VD) levels, Body Mass Index (BMI), lipid profile, hormonal parameters, and oocytes in PCOS and non-PCOS infertile females and explore whether VD levels are associated with these parameters.

Design: This was a cross-sectional study

Place & duration of study: This study was conducted from July 2019 to June 2020 after ethical approval at Aga Khan University in collaboration with the Australian Concept of Infertility Medical Centre (ACIMC).

Methodology: It was conducted on 88 infertile females with age range of 25 to 45 years who were recruited for intracytoplasmic Sperm Injection (ICSI). Subjects were divided into two groups, PCOS (n=37) and non-PCOS (n=51) based on diagnostic criteria of PCOS. VD was analyzed in serum by using ELISA. Statistical analysis was performed with Statistical Package for Social Sciences (SPSS) version 20. Mann- Whitney U test and spearman's rank correlation were applied

Results: The mean BMI was significantly higher among PCOS females as compared to non-PCOS females ($p< 0.001$). There were statistically significant differences in total cholesterol, triglycerides, Low Density Lipoprotein (LDL-C), High Density Lipoprotein (HDL-C), and very low-density lipoprotein (VLDL) among groups ($P < 0.05$). There was significant co relation of vitamin D with maturity of oocytes ($r=0.836$, p value <0.0001).

Conclusion: The findings indicated that PCOS women were obese, had abnormal lipid profile with low VD levels. Low levels of VD were associated with poor maturity of oocytes which is required for successful conception.

Keywords: Polycystic Ovary Syndrome, Vitamin D Deficiency, Number of Oocytes, Body

Mass Index, Lipid Profile

P104

ORTHOSTATIC TREMOR: A RARE CAUSE OF FALLS, 10 YEARS FOLLOW UP

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A 72-year-old female has been followed up in the Falls Clinic because of recurrent falls and tremors.

She has had tremors for 10 years, which she described as “shakes”, that gradually increased over the years. Initially the tremors could last few hours and gradually improve. When she stands, the tremors start from the legs upwards to the trunk, they increase with anxiety, and this hampered her walking.Her medical history includes hypertension, CVA with slight residual left leg weakness, osteoarthritis, oropharyngeal squamous cell cancer treated with radiotherapy 18 months ago.She did not drink alcohol for the last 8 years, previously she used to drink 2 – 3 bottles of whisky a week.

She had occasional postural hypotension. Heart, chest, abdominal and neurological examination was normal. On several occasions, she had coarse tremors of the legs, arms and trunk on standing. The tremors could be so severe that she could not walk more than few steps and was unsteady. Kidney, liver and thyroid function tests were normal. CT head was normal. MRI scan showed small ischaemic foci in the posterior left lentiform nucleus and tiny focus in the left pons.Early in the course of disease, tremors were attributed to anxiety and the sequalae of excess alcohol. However, on follow up and detailed observation of tremors, the diagnosis of orthostatic tremor was made seven years after first presentation. she was started on Primidone 50 mg OD and subsequently increased to 100 mg OD. Her tremor improved subjectively and objectively, and she had less falls.

The tremors fluctuated over the years with gradual deterioration specially in stressful periods or intercurrent illness. She was trembling from head to toe and was fearful of walking. Her mobility gradually deteriorated and continued to have falls. The dose of Primidone was gradually increased over time to 300 mg OD to control the symptoms.

Discussion: Orthostatic tremor (OT) is a rare neurological movement disorder. The main clinical feature is 13 – 18 Hz tremor of the legs and trunk on standing that improves on sitting. It can be primary or secondary. The pathophysiology remains poorly understood.

The diagnosis is clinical, and EMG is the gold standard for confirmation. However, OT may take long time to be diagnosed. The natural course of OT is gradual progression. There is no cure for OT and treatment is symptomatic. Clonazepam, probably the first line medication, Pregabalin, Primidone and Levetiracetam have been tried with some evidence of benefit.

P105

LACTOBACILLUS ACIDOPHILUS (LA) AMELIORATES INFLAMMATORY BONE LOSS UNDER POST-MENOPAUSAL OSTEOPOROTIC CONDITIONS VIA TARGETING THE GUT RORΓT- PTREG-TH17 CELL AXIS

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Research in the past decade has elucidated the explicit role of the immune system in the pathophysiology of osteoporosis. Recent studies have further unraveled the complex interactions between bone and immune cells and explored safe, effective immunomodulatory approaches—such as probiotics—for preventing and managing osteoporosis. As a result, various immune factors have continuously been discovered to play specific roles in maintaining bone homeostasis. The role of the Tregs is already well established in the context of post-menopausal osteoporosis (PMO). While $Foxp3^+$ Tregs are mostly matured in the thymus (tTregs), some are also produced from $Foxp3^-CD4^+$ T-cell precursors in the peripheral tissues (pTregs). Notably, the specific role of pTregs or tTregs in PMO remains to be elucidated. Here, we reveal that an inflammatory environment in estrogen-deficient conditions disrupts the balance of both tTregs and pTregs, and within pTregs further alters the populations of $ROR\gamma T^-$ and $ROR\gamma T^+$ pTregs, while promoting Th17 cell expansion—likely through the conversion of $ROR\gamma T^-$ pTregs into Th17 cells. Notably, supplementation with *Lactobacillus acidophilus* (LA) in a butyrate-mediated manner restores the homeostasis of $ROR\gamma T^-$ pTregs and Th17 cells. Furthermore, priming of $ROR\gamma T^-$ pTregs with butyrate under inflammatory conditions reduces their osteoclastogenic potential. Collectively, our findings reveal for the first time that the $ROR\gamma T^-$ pTregs–Th17 cell axis plays a central role in PMO pathogenesis, and that probiotic LA alleviates bone loss by enhancing the immunoregulatory function of pTregs.

P106

HIDDEN CUMULATIVE OPIOID EXPOSURE IN OLDER ADULTS WITH HIP FRACTURE: A MISSED STEWARDSHIP OPPORTUNITY

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Background: Older adults with hip fracture are routinely exposed to opioids at multiple stages of their care—pre-hospital, emergency department, ward, theatre, and recovery. Because prescribing and administration are recorded in separate systems, the true cumulative burden is rarely visible. In this population, excess opioid use is linked to delirium, respiratory depression, ileus, falls, and prolonged hospital stay.

Methods: We retrospectively reviewed 50 randomly selected hip fracture admissions (≥60 years, including those with dementia). Data were collated from paramedic sheets, ED drug charts, WellSky inpatient prescribing, and anaesthetic records. Opioid exposure during the first 48 hours was quantified in morphine milligram equivalents (MME) and benchmarked against national stewardship thresholds (caution >90 MME/day; harms outweigh benefits >120 MME/day).

Results:

\ Over 50% received IV morphine from paramedics before arrival.

\ In the ED, 20 mg oral morphine was frequently prescribed.

\ On the ward, a further 10 mg oral dose was common prior to surgery.

\ Intraoperatively, fentanyl and midazolam were universally administered.

\ **66% (33/50) exceeded 99 MME/day in the first 48 hours:**

\ 19 patients received 100–120 MME/day.

\ 14 patients exceeded 120 MME/day, above the “harms outweigh benefits” threshold.

Conclusions: Fragmented documentation obscures the total opioid burden in hip fracture patients, creating a hidden safety risk. Clinicians rarely see the full picture, limiting the ability to adjust prescribing safely.

Recommendations & Impact:

\ Develop an integrated opioid exposure chart across the patient pathway.

\ Embed stewardship protocols with routine MME monitoring and early review >90 MME/day.

\ Promote multidisciplinary awareness (ED, anaesthetics, orthopaedics, geriatrics, nursing, rehab).

\ Pilot education and digital solutions to improve visibility and reduce harm.

This work identifies a system-wide gap, not an isolated failure. By connecting fragmented records, we can strengthen opioid stewardship, reduce complications, and support safer recovery for frail trauma patients.

P107

BEYOND THE HIP: EXPOSING MISSED OPPORTUNITIES IN DISTAL RADIUS FRAGILITY FRACTURE MANAGEMENT

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Background: Distal radius fractures (DRFs) are the second most common fragility fracture after hip fracture and often represent the first warning sign of underlying osteoporosis. Despite this, they are not captured within the National Hip Fracture Database (NHFD), and consequently their management receives less structured oversight. According to **NICE guidance (CG146, NG185, QS149)**, all adults ≥50 years with fragility fractures should be assessed for bone health and considered for secondary prevention. The **British Orthopaedic Association (BOAST 16: Management of Distal Radial Fractures)** further recommends timely analgesia, use of local or regional anaesthesia (e.g., haematoma block), clear documentation of neurovascular status, and appropriate referral for follow-up. However, literature and local experience suggest that compliance with these standards is variable.

Methods: We retrospectively reviewed 200 randomly selected patients aged ≥60 years presenting with low-energy distal radius fractures. Data were collected from ED notes, drug charts, plaster room documentation, and referral records. Outcomes assessed: timeliness of analgesia, provision of local haematoma block (LHB), and referral to the Fracture Liaison Service (FLS) for bone health optimisation.

Results:

- **Analgesia:** All patients received some form of analgesia within 4 hours of arrival (NICE recommends within 30 minutes).
- **LHB use:** Only **55% (110/200)** underwent LHB for manipulation, despite BOAST guidance recommending local or regional anaesthesia in preference to systemic opioids.
- **FLS referral:** Only **22% (44/200)** were referred for bone health optimisation, falling well short of NICE secondary prevention standards.

Discussion:

Our findings highlight important gaps between recommended standards and current practice.

- **Analgesia**: While universal, the timing fell outside the NICE target of 30 minutes, and reliance on systemic opioids risks delirium, constipation, and respiratory depression in frail patients.
- **Pain management techniques**: Underuse of LHB indicates incomplete compliance with BOAST standards and contributes to opioid exposure.
- **Secondary prevention**: Missed FLS referrals mean patients remain untreated for osteoporosis, losing the opportunity to prevent the fracture cascade culminating in hip fracture.

Future Directions:

We propose an integrated ED–orthogeriatric pathway for DRFs including:

\ Analgesia within 30 minutes, prioritising LHB in line with BOAST guidance.

\ Routine frailty (CFS) and delirium (4AT) screening in the ED.

\ Automatic FLS referral for all fragility fractures as per NICE standards.

Impact:

Currently, DRFs represent a missed opportunity for early secondary prevention. Addressing this gap by embedding BOA and NICE recommendations into the care pathway has the potential to:

\ Improve pain control and reduce opioid-related harms.

\ Optimise bone health and reduce risk of subsequent hip fracture.

\ Deliver safer, standardised, and more equitable care for older adults with fragility fractures.

P108

TOO MANY NEEDLES: UNNECESSARY BLOOD TESTS IN FRAGILITY FRACTURE PATIENTS

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Background: Fragility fractures in older adults often require orthopaedic and orthogeriatric co-management. Blood tests are essential for diagnosis and perioperative optimisation; however, repeated testing without clinical indication causes patient harm, dissatisfaction, and higher costs. The Royal College of Pathology (RCPath) recommends minimum retesting intervals to reduce unnecessary testing.

Aim: To evaluate the frequency and consequences of unjustified repeat blood testing in fragility fracture patients.

Methods: We retrospectively reviewed 700 patients ≥65 years admitted with fragility fractures over 18 months at a UK orthopaedic unit. Data collected included blood test frequency (ED, orthogeriatric, Orthopaedic ward doctors), justification against RCPath standards, length of stay (LOS), and downstream investigations.

Results:

- 100% had admission bloods in ED (appropriate).
- 95% had orthogeriatric osteoporosis panel within 24h (appropriate).
- 72% (≈500/700) had ≥1 repeat set within 24–48h without indication.
- Patients with unjustified repeats had 1.5 days longer median LOS.
- 18% underwent additional investigations triggered by minor abnormalities.
- Repeated venepuncture contributed to patient/family dissatisfaction and iatrogenic anaemia in some frail patients.

Discussion: Our findings mirror published literature, where 30–60% of inpatient blood tests are unnecessary (Koch et al., 2017; Faulkner et al., 2016). This demonstrates our results are in line with wider evidence across medical and orthopaedic settings.

Conclusion: Unnecessary repeat blood testing affects >70% of fragility fracture patients, prolonging LOS and causing avoidable harm. Embedding RCPath standards, adopting a local protocol, and educating junior staff can reduce over-testing and improve patient-centred care.

Keywords: Fragility fracture, Orthogeriatrics, Blood tests, RCPath, Quality improvement

P109

PATHOGENESIS OF COGNITIVE NEUROSIS-LIKE DISORDERS IN PATIENTS WITH INITIALLY CHRONIC VIRAL ENCEPHALITIS

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Background: 126 patients with initial chronic viral encephalitis were surveyed.

Method: brain MRI, research of cerebrospinal fluid and its dynamic, definition of a spectrum of 20 basic amino acids in blood serum and liquor

Results: The most significant and informative appeared the decrease in free amino acids: serine (5,12±0,15mg/l; P< 0,01), glycine (6,59±0,2mg/l; P< 0,001), histidine (5,11±0,12mg/l; P< 0,05), alanine (12,93±0,12mg/l; P< 0,001), arginine (5,62±0,09mg/l; P< 0,001), tyrosine (5,08±0,09mg/l; P< 0,001), methionine (2,19±0,12mg/l; P< 0,001), phenylalanine (3,36±0,14mg/l; P< 0,001), lysine (6,94±0,17mg/l; P< 0,001), leucine (4,64±0,14mg/l; P< 0,001), threonine (6,2±0,14mg/l; P< 0,001), glutamic acids (2,99±0,16mg/l; P < 0,001) at simultaneous increase in concentration of tryptophan (7,36±0,12mg/l; P < 0,001). Among the connected amino acids in СМЖ the reliable increase, in comparison with control group healthy participants was observed, glycine (11,44±0,13mg/l; P < 0,001), histidine (6,12±0,11mg/l; P< 0,001), methionine (5,86±0,07mg/l; P < 0,01), lysine (19,42±0,16mg/l; P < 0,001), leucine (18,94±0,14g/l; P< 0,01), threonine (18,94±0,14mg/l; P < 0,001), glutamic acids (9,69±0,17mg/l; P < 0,001).

Conclusions/Learning Points: In pathogenesis of cognitive neurosis like disorders in patients with initial chronic viral encephalitis the great importance has the decrease in content of the majority free and bonded amino acids in cerebrospinal fluid and blood serum (alanine, glycine, glutamic acids, leucine, methionine, threonine, tryptophan, phenylalanine) at simultaneous increase of tryptophan, that it must be considered at carrying out of therapeutic actions.

P110

REHABILITATION AND DIAGNOSTIC ASSESSMENT OF HAND FUNCTION IN PATIENTS WITH NEUROPATHIES

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Background: 34 patients with flaccid peripheral paresis of varying severity were examined.

Method: Assessment of stato-dynamic violations using codes ICF

Results: The assessment of topographic localization showed that the median nerve was most often affected (16 people; 47.1%), neuropathy of the ulnar (10 people; 29.4%) and radial (8 people; 23.5%) nerves was noted somewhat less frequently. Assessment of statodynamic disturbances included quantitative assessment of proprioceptive function (b260), touch function (b265), sensory functions associated with temperature and other stimuli (b270), pain sensation (b280), joint mobility function (b710), muscle strength (b730), muscle tone (b735), combined motor-reflex functions (b750). Additionally, the results of dynamometry were evaluated, the patient's ability to carry out daily activities using the hand was analyzed: the ability to touch with fingers, pinch, lift, hold, move an object, etc.

Conclusions/Learning Points: A method for assessing the manipulative function of the hand in patients with traumatic and compression-ischemic neuropathies has been developed. Clinical and functional diagnostics of 34 patients with the presence of flaccid peripheral paresis of various degrees of severity was performed. It is advisable to use the assessment method to solve the issues of medical expertise, as well as to assess the effectiveness of rehabilitation.

P111

TAY-SACHS DISEASE. CLINICAL OBSERVATION

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Tay-Sachs disease is based on a genetically determined disorder of ganglioside metabolism, accompanied by their increase in the gray matter of the brain, liver, and spleen.
Girl K.D., 1 year 5 months, complaints of developmental delay – does not hold her head, does not roll over, does not sit, does not walk, does not talk. From 1 year and 4 months, attacks appeared in the form of short-term trembling of the limbs. Twice up to 1 year and 5 months, she was treated in the neurology department due to delayed psychomotor development, examined by geneticists in order to clarify the diagnosis. Objectively: the head is macrocephalic, does not hold the head, the large fontanelle is closed, does not turn over, does not sit, does not walk. Divergent strabismus. Muscle tone is sharply reduced in the extremities, there is no support. Tendon-periosteal reflexes are reduced. Conclusion: CT scan – signs of mixed hydrocephalus. O. ophthalmologist. Diagnosis: Tay-Sachs disease. Partial atrophy of the optic nerves in both eyes.
Genetic test results: 1. At the Institute of Genetics and Cytology of the National Academy of Sciences of Belarus (Laboratory of Non-Chromosomal Pathology), mitochondrial DNA was analyzed for the presence of mutations T8993 G (maternal inherited Leigh syndrome) and A3343 G (MELAS syndrome), as well as for the presence of large MT DNA deletions. PCR analysis of DNA samples isolated from leukocytes was performed. According to the results of DNA analysis, these mitochondrial genome disorders were not revealed. 2. Activity of lysosomal enzymes in leukocytes: decreased activity of β-hexosaminidase A: 10.7; 7.2 mmol/g Diagnosis: GM2 – gangliosidosis. Tay-Sachs disease. The risk of having a child with such diseases in a family of 25% is high. The material of the sick girl and her parents was sent for DNA testing to the Research Center for Medical Genetics of the Russian Academy of Medical Sciences in Moscow - a partial analysis of the gene HEHA (Tay-Sachs disease, H1H 272800). Treatment is symptomatic, specific enzyme replacement therapy has not been developed. The girl received anticonvulsants: depakine, carbamazepine, topamax, as well as diacarb, asparkam, emoxypine.
Stroke in children (clinical case).
Stroke occurs not only in adults, but also in children, the frequency of its development in children ranges from 0.2 to 79 cases per 100,000 children, depending on the territory and time of registration, and ranges from 55 to 70% of the total number of all types of strokes. There is no gender difference, however, many experts note that boys are slightly more likely to suffer among children under 3 years old, and girls are more likely to suffer among schoolchildren and adolescents. The main causes of stroke in children are heart diseases-congenital heart defects, diseases of the blood system and coagulopathy, cerebrovascular malformations, Moya-Moya disease, vasulitis, hereditary and acquired vasculopathy, homocysteinuria, compression of the vertebral artery, autoimmune diseases. In 1998, focal cerebral arteriopathy was first described, which is currently one of the most common causes of stroke in children.
Focal transient cerebral arteriopathy is an acquired arteriopathy (due to acute intestinal infection, streptococcal infection), damage to the junction area of the distal portion of the internal carotid artery, as well as the proximal sections of the middle and anterior cerebral arteries, associated with stroke in the basal nuclei of the brain.
One of the main causes of stroke in children is head trauma.
9-23% of cases of stroke in children are cryptogenic.

Even a slight fall from the sofa to the carpet provoked the development of a stroke in a child. A 1-year-old girl was treated at the Minsk Regional Children's Clinical Hospital with a diagnosis of stroke in the basin of the left middle cerebral artery (basal nuclei), probably due to a minor head injury, with pronounced right-sided hemiparesis, lower prosoparesis, acute period.
Concomitant diseases: mild anemia of mixed genesis. Acute respiratory infection, rhinopharyngitis. A minor abnormality of the heart development: a functioning oval window, an additional chord of the left ventricle, circulatory insufficiency of the 0 degree.
Upon admission to the intensive care unit, the child's condition is serious. There was weakness in the right limbs, the right arm was falling, and there was almost no support on the right leg.
Magnetic resonance imaging of the brain was performed on the girl: In the basal nuclei of the left hemisphere (shell, posterior femur of the inner capsule, partially the head and body of the caudate nucleus), a site of cytotoxic edema without blood metabolites measuring 20x18x23mm is determined.
Incomplete myelination in the subcortical and periventricular white matter of the cerebral hemispheres.
The ventricles and subarachnoid spaces are not expanded or deformed.
The anterior horns of the lateral ventricles at the level of the Monroe orifice are 5mm; the width of the third ventricle is 3mm; the width of the fourth ventricle is 12mm.
The median structures are shifted to the right by 3mm.
There is no occlusion of the cerebrospinal fluid pathways.
Structures of the facial skull: swelling of the mucous membranes of the cells of the latticed bone and maxillary sinuses on both sides, enlarged pharyngeal tonsils.
Structures of the base of the skull: the pituitary gland is located intracellularly, measuring 7x3x9mm, the pedicle is not displaced, the posterior lobe is differentiated, the structure is homogeneous.
Structures of the posterior cranial fossa: pneumatization of the pyramids (middle ear) and mastoid processes on both sides is reduced, due to a slight swelling of the mucous membranes.
Magnetic Resonance angiography (TOF): without signs of thrombosis of the arterial main vessels of the base of the brain and their visualized branches. The posterior trifurcation of the left internal carotid artery, deviation of the basilar artery and V4 segments of both vertebral arteries is determined; the formation of a transverse sinus on the left from the upper sagittal and rectus sinus, and a transverse sinus on the left from the upper sagittal sinus.
Conclusion: Acute ischemia in the basal nuclei of the left hemisphere of the brain without signs of thrombosis of the arterial main vessels of the base of the brain.
Swelling of the mucous membranes of the paranasal sinuses.
The child underwent coagulogram, blood and urine tests, biochemical blood analysis, blood tests for autoimmune diseases, congenital thrombophilic mutations, and the content of homocysteine in the blood was determined.
Markers of autoimmune diseases : ANA---otp.,a/b2-glycoprotein Ig M---otp, a/cardiolipin Ig M ---otp,a/cardiolipin Ig G ---otp.
Congenital thrombophilic mutations, FV Leiden - otp, FII G 20210A - otp.
The child was examined by a hematologist: no hematological cause of ischemic heart attack was revealed in the volume of studies performed.

An ultrasound examination of the heart was performed: a functioning oval window with a left-right shunt. The dimensions of the chambers and walls of the heart are normal. The valvular apparatus of the heart without structural changes. Regurgitation of the 0-1 degree on the tricuspid valve, pulmonary artery valve. Movable Chiari network of the right atrium cavity. False chord in the cavity of the left ventricle. There is no free fluid in the pericardial cavity. The contractile function of the myocardium of the left ventricle is satisfactory.
Ultrasound examination of the vessels of the lower extremities - veins of both lower extremities of normal anatomy, passable, diameters within the age norm, no intraluminal neoplasms were detected, compression by the sensor is complete, blood flow rates are within the normal range.
The child was consulted by a cardiosurgeon of the State Institution "RNPC of Pediatric Surgery": The closure of the existing functioning window can be shown if its connection with the development of a stroke is established. This is possible only in the presence of a right-left shunt at the level of an open oval window (paradoxical embolism), as well as an embolism substrate (in adult patients, these are blood clots in the varicose veins of the lower extremities).Given the lack of indications for surgical closure of a functioning oval window, the latter is currently not indicated.
The girl received nootropic, vascular drugs, antioxidants in the treatment: ceralin, emoxypine, cytoflavin, vinpocetine, as well as for 1 month -a direct-acting anticoagulant - fragmin under the control of anti-Xa, which was canceled due to the exclusion of hereditary thrombophilia. Due to anemia, she received an iron-containing drug-ferrum FT, as well as folic acid. Physical therapy and massage were started early.
As a result of the treatment, after 1 month, the strength in the right limbs was almost completely restored, the girl began to take toys with her hands, turn on the light, and after 3 weeks she began to walk independently.
After 1.5 months, she underwent a second course of rehabilitation on the basis of the neurological department: medication with neuroprotectors, acupuncture, electrical stimulation, paraffin, ozokerite applications on the right extremities, physical therapy, massage.
As a result, right-sided hemiparesis and lower prosoparesis regressed. The girl is on the dispensary register with a neurologist at her place of residence, if necessary, a hematologist's consultation is indicated, and magnetic resonance imaging of the brain is monitored.

P112

BABY-SHAKEN SYNDROME (CRASH BABY SYNDROME)

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Shaking baby syndrome, shaken baby syndrome – injuries caused to the baby as a result of strong shaking. In total, there are about 27 cases of Baby-Shaken syndrome per 100,000 infants worldwide. Most often, the culprits of shaking are fathers and stepfathers (68-83%), followed by nannies (8-17%) and mothers (9-13%). A constantly crying child can infuriate even a well-balanced adult. A few sudden movements are enough for a child to get a serious injury. The head of a child under the age of one year is too large for a weak neck, it swings intensely and abruptly. Blood vessels can be damaged, leading to hemorrhages, due to the immaturity of the brain, the processes of nerve cells, which in children are not protected by the membrane, break off when shaken. In case of rough shaking of the baby, it is possible to separate the spinal cord from the brain at the level of the brainstem. The visual apparatus in infants is often affected, which is associated with the movement of the layers of the retina of the eye relative to each other. The classic triad of shaken baby syndrome is intracranial hemorrhage (predominantly subdural hematomas), cerebral edema, retinal hemorrhage. In 25% of cases, the shaking syndrome ends in the death of the infant from damage to vital brain centers, severe spinal injuries in the cervical spine. Complications of shaking syndrome include cortical blindness, hydrocephalus, convulsive seizures, cerebral palsy, delayed psychospeech and motor development, learning disabilities, and mental retardation. In the mildest cases, symptoms of severe brain dysfunction remain. In the clinic, we observed a case of Baby-Shaken syndrome in a 4-month-old child. The child was born from a second pregnancy due to grade 1 gestational anemia, colpitis, chronic nicotine intoxication, second vaginal birth at 37 weeks with a weight of 3.100 grams. The child's father is 53 years old, the mother is 29 years old, the mother suffers from epilepsy. From the age of 2 months, the baby began to hold his head. At the age of 4 months, the child was admitted to inpatient treatment with complaints from the parents of a short-term loss of consciousness against the background of crying, similar to a respiratory affective attack. During the examination of the child, no data on cranial nerve damage were revealed, tendon-periosteal reflexes were not altered, a large fontanelle 1.5x1.5 cm, not strained. He holds his head while lying on his stomach well. Support on the forefoot. No changes in blood tests were detected. The child underwent an ultrasound of the brain - an echo picture of a subdural ganglion cyst on the right, an X-ray of the skull in 2 projections - no violation of the integrity of the bones of the cranial vault was revealed. The child underwent an MRI of the brain, revealed subacute chronic subdural liquor-hemorrhagic clusters over both hemispheres of the brain and cerebellum in varying degrees of resolution, the largest in the frontal region - 12 mm thick, in the posterior cranial fossa 2-3 mm thick with a shift of the median structures to the right at the level of the ventricles by 1.5-2 mm without compression of the brain. Mild expansion of the subarachnoid convexital and cisternal spaces of the brain. The ventricles of the brain are not dilated or deformed, the anterior horns of the lateral ventricles are at the level of the foramen of Monroe 6 and 4 mm, the width of the third ventricle is 5 mm, the width of the fourth ventricle is 12 mm. There is no occlusion of the cerebrospinal fluid pathways. He was examined by a neurosurgeon and diagnosed: Bilateral subdural cerebrorogemorrhagic clusters (Baby-Shaken syndrome). Given the absence of focal symptoms and signs of intracranial hypertension, surgical treatment is not currently required. Conservative treatment with glycine and magnetab was carried out. Examined by a VisOD|OS-object vision, the optic nerve discs on the fundus of the eye are normal, no pathology was detected at the time of examination. The child's parents are registered as socially dangerous, for more frequent visits by the district pediatrician and visiting nurses. The inadmissibility of rough shaking and other options for careless treatment of children, the involvement of relatives in caring for the baby, and the help of psychologists are explained.

P113

RISK FACTORS FOR RECURRENT FALLS WITHIN ONE YEAR AFTER FRACTURE IN PATIENTS WITH OSTEOPOROTIC PROXIMAL FEMORAL FRACTURES

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Introduction: In Japan's super-aged society, proximal femoral fractures are projected to reach 320,000 annually by 2040. The fall-preventive effect of Fracture Liaison Services (FLS) remains unclear. This study aimed to identify factors associated with falls within one year post-fracture, highlighting the clinical importance of fall prevention.

Methods: We included 31 patients who sustained a proximal femoral fracture due to a fall between April and December 2022 and were followed for one year. Fall history within one year post-fracture was obtained from patients or their families. Patients were classified into a recurrent fall group (fall group; n = 6) and a non-fall group (n = 25). Age, sex, BMI, American Society of Anesthesiologists Physical Status(ASA-PS), number of medications, and Geriatric Nutritional Risk Index (GNRI) at fracture, as well as gait speed, five-times sit-to-stand test (SS-5), one-leg standing time, grip strength, and cognitive function at one year post-fracture were compared between groups. Multivariate analysis was performed with fall history as the dependent variable and physical function measures as independent variables. Group comparisons were conducted using the Mann–Whitney U test and Fisher's exact test, and binary logistic regression was used for multivariate analysis. All statistical analyses were performed using SPSS version 26 (IBM Corp., Armonk, NY, USA). The significance level was set at 0.05.

Results: The fall group had lower BMI, GNRI, and gait speed, and higher SS-5 than the non-fall group, with SS-5 identified as a significant predictor of falls within one-year post-fracture (OR: 0.719, 95% CI: 0.536–0.963).

Conclusion: Gait speed and the SS-5 reflect quadriceps strength, which is prone to decline within the first-year post-fracture. Nevertheless, some patients were allowed independent ambulation without assistance. These findings emphasize the importance of setting activity levels based on appropriate assessments to guide clinical decision-making and rehabilitation.

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GLYCOGEN STORAGE DISEASE TYPE III AS A CAUSE OF AVASCULAR NECROSIS. A CASE REPORT AND REVIEW OF THE LITERATURE

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Background: Glycogen storage diseases (GSDs) are inherited metabolic disorders caused by deficiencies in glycogen metabolism, leading to symptoms like hypoglycemia and hepatomegaly. Type III Glycogen Storage Disease (Cori Disease) is characterized by enzyme deficiency, affecting glycogen conversion to glucose. This case report explores the novel association of GSD Type III with avascular necrosis.

Case Presentation: A 19-year-old female with GSD Type III presented with prolonged hip pain, muscle weakness, and gastrointestinal issues. Her family history included similar conditions. Examinations revealed hepatomegaly and elevated liver enzymes, while imaging showed liver cirrhosis and avascular necrosis in the right femur. Treatment included lipid-lowering drugs and symptomatic therapy.

Discussion: GSDs can cause various musculoskeletal and neuromuscular symptoms, potentially leading to complications like osteonecrosis. This case highlights the importance of recognizing metabolic diseases as causes of osteonecrosis and the need for early diagnosis and comprehensive management in such cases.

P115

INSIGHTS ON KYPHOPLASTY: A RETROSPECTIVE ANALYSIS OF INTRAOPERATIVE VARIABLES AND PATIENT DEMOGRAPHICS

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Objective: To highlight the relationships between age, sex, and spinal levels treated by kyphoplasty with balloon pressure, volume, and cement volume.

Materials And Methods: Single Surgeon Observation Study: 77 patients with VCF undergoing kyphoplasty over 18 months. Balloon pressure/volume, and cement volume were recorded. The inclusion criteria included acute/subacute osteoporotic fracture; exclusion criteria included non-osteoporotic fractures and previous surgery.

Results: A total of 141 levels were included in this study (54 thoracic, 87 lumbar). There were 77 patients: 61% female, 39% male. There was a statistically significant relationship between age and region (T vs. L spine) (p=.013). Mean inflation pressure was 152.5 PSI for thoracic spine and 147.5 PSI for lumbar spine. There was a significant correlation between age and mean pressure (p=0.0014). There was a statistically significant relationship between anatomic spinal groups and pressure (p=0.044). The mean balloon volume was 2.42 cc for the thoracic spine and 2.89 cc for the lumbar spine. Statistically significant relationships were identified between balloon volume and level (p=0.014) and age (p=0.003). No statistically significant correlation was found between balloon volume and sex. The mean cement volume was 2.27 cc for thoracic spine and 2.92 cc for lumbar spine. Cement volume demonstrated a significant relationship with spinal level (p<.001), sex (p = 0.0255) and age (p=0.034). Advanced age and males required higher cement volumes (p<.0001).

Conclusion: Age, sex, and spinal level significantly influence kyphoplasty components. Both thoracic and lumbar fractures have different procedural requirements, with greater lumbar spine demands. Variations in sex and age emphasize the importance of personalized surgical planning.

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P116

CURE STATE SENSING OF POLYMETHYLMETHACRYLATE USING A VIBRATING AXIAL PROBE

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Introduction: The present means of confirming the cure of intra-operative polymethyl methacrylate (PMMA) cement are to wait for the remaining cement to harden. To our knowledge, there is no available technique to determine the precise moment of cure for in-vivo cement beneath the tibial tray. This study uses a novel means to determine cement curing time. A new axially vibrating sensor based on an audio voice coil transducer and a lead zirconate titanate (PZT) piezoelectric disc microphone was developed as a probe for the measurement of in vitro rheological fluid properties, including curing progress for polymethylmethacrylate (PMMA) mixtures with important uses as bone cement in the field of orthopedics. The measurement of the vibrating axial sensor's acoustic spectra in PMMA undergoing curing can be described by a damped harmonic oscillator formalism and resonant frequency (ca. 180 Hz) shift can be used as an indicator of curing progress, with shifts to the blue by as much as 14 Hz. Resonant frequency peak was measured in 19 different 4.0 g PMMA samples to have a rate of shift of 0.0462 ± 0.00624 Hz·s−1 over a period of 400 s while the PMMA was in a dough state and before the PMMA transitioned to a hard-setting phase. This transition is unambiguously indicated by this sensor technology through the generation of a distinct circa 5 kHz high-Q under-damped ring-down response.

Methods: A probe shaft was mounted to a PZT transducer, which was connected to an audio voice coil transducer and USB Audio interface. The apparatus would monitor resonance frequency during acoustic resonance sweeping. Transducers were connected to an audio power amplifier, which was connected to a computer using REW Acoustic Software. 5 g of Bosworth Duz-All® powder and 5 mL Jet™ Liquid curing acrylic resin were mixed in the sample holding container. Acoustic sweep trials using 20 to 20k Hz trials were accomplished using REW software. Resonance frequency was measured at 10-second intervals. Viscosity, proportional to the resonance frequency (Hz) of the sample vial in its system, was recorded as a function of time. The title (in bold caps), authors, and author affiliations should be centred across the top of the page. Use numerical superscripts to distinguish authors who are from different institutions. The body of the manuscript should be divided into sections specifically titled as follows: Introduction, Methods, Results and Discussion, and Conclusions. Use single line spacing between paragraphs.

Results And Discussion:

Figure 1

Fig. 1: Typical collection of resonance spectra for one test run showing data all the way to fully-cured PMMA. Here, the uncured PMMA (temp < 37.8 C) versus the cured PMMA (temp = 70.2 C) can be seen by the generation of a high Q resonance peak near 5kHz and large reduction of 200 Hz dough state peaks.

Figure 2

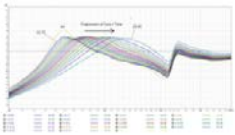

Fig. 2: Closeup of a spectra from test run 19 going through the curing stage. The corresponding temperatures for each curve are shown in the legend. The elapsed time is 17:02.

Figure 3

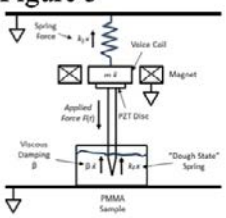

Fig. 3: Schematic diagram of the forces on the 1-dim damped spring mass system. Note the additional term for the "dough state spring" constant resulting from the change in the compliance of the PMMA as it hardens.

Conclusions: A one-dimensional axially vibrating probe acting as a simple harmonic oscillator can be used to sense viscosity changes. A data analysis revealed positive shifts in the sensor resonance frequency with increasing cure time. This frequency shift rate can be used as a parameter to determine the relative changes in viscosity and can also be used to unambiguously determine if the PMMA sample has reached the final cure state by observing clear ring-down behavior near 5 kHz. This theory could be used to develop instruments for use during surgery that will provide the surgeon with the optimal point of PMMA cementing. This ability would enhance the probability of secure fixation and potentially decrease the risk of revision surgery due to mechanical loosening. This technique has potential uses both with PMMA during other surgeries, as well as with other processes that require a precise knowledge of fluid viscosity.

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For comprehensive list of references, please contact acn2152@columbia.edu

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DISCORDANCE BETWEEN SCREENING TOOLS FOR BONE HEALTH IN OLDER OSTEOPENIC ADULTS

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Objective: To examine discordance between femoral strength, OSTA, and FRAX in older osteopenic adults in Singapore.

Material and Methods: We analysed older adults from the PIONEER cohort (n = 2320) in Singapore, stratified into osteoporosis, osteopenia, and normal groups. High-risk status was defined as low tertile femoral strength, FRAX major osteoporotic fracture probability (MOF) ≥9%, or OSTA ≤−1. Overlap between classification tools was visualised using Venn diagrams, and percentages of agreement or discordance were quantified within each subgroup.

Results: Among osteoporotic participants, there was a high degree of overlap in high-risk classification. 67% of participants were consistently flagged as high-risk across all three tools. In the normal BMD group, most individuals were consistently classified as low risk. 56% were jointly classified as low-risk, and fewer than 1% were misclassified as high-risk. Overlap patterns were more heterogeneous in the osteopenic subgroup. Only 18% were concordantly high-risk, while substantial proportions were uniquely flagged by OSTA (23%) or FRAX (21%) (Fig. 1 left). For low-risk classification, **15.4%** were consistently identified as low risk by all tools, but again, large proportions were discordantly flagged as low risk by one or two tools only (Fig. 1 right).

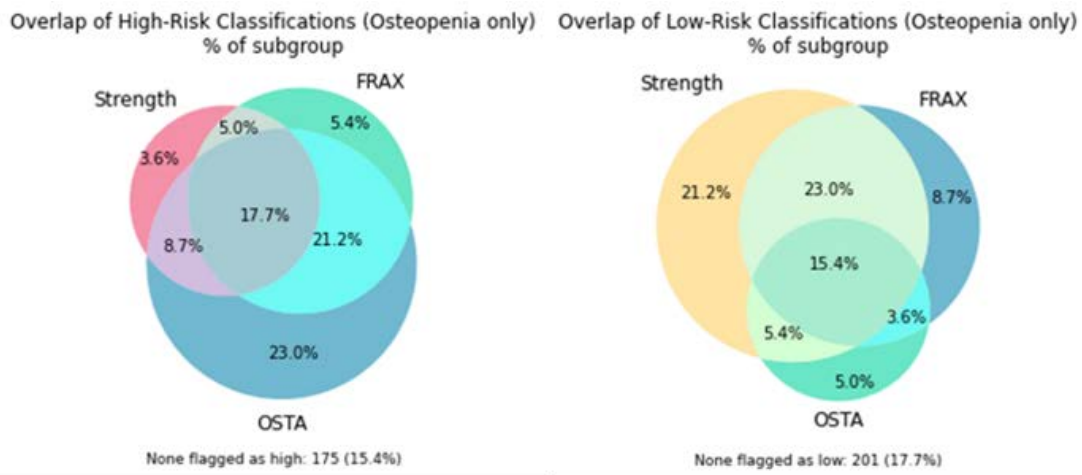

Figure 1: Overlap in high-risk and low-risk classifications among participants with osteopenia.

Conclusions: Osteopenia represents a clinical grey zone: nearly as many fractures occur in people with osteopenia as in those with osteoporosis. Femoral strength, a biomechanical marker derived from finite element analysis, may capture aspects of bone fragility not reflected in clinical tools [1]. Our findings show that while femoral strength,

FRAX, and OSTA classify osteoporosis and normal BMD consistently, they diverge substantially in osteopenia. This variability highlights the limitations of relying solely on a T-score threshold and points to the potential of combining biomechanical and clinical tools to achieve more comprehensive risk stratification.

References:

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Acknowledgements: Funding from National Research Foundation Singapore under the Future Health Technologies programme, and the ETH focus area (PHRT #325 & #430).

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EXPLORING PATIENT CONCERNS AND CARE GAPS AMONG FRAGILITY FRACTURE PATIENTS THROUGH NURSE-LED FOLLOW-UP CALLS: A THEMATIC ANALYSIS

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Background: Older adults with fragility fractures face high risks of complications, readmission, and functional decline after discharge. Studies suggest that nurse-led follow-up calls can reduce readmissions, enhance satisfaction, and address psychosocial needs, yet their role in fragility fracture care remains underexplored in many healthcare settings. **Objective:** To explore patients' experiences, concerns, and support needs following fragility fracture discharge through nurse-led follow-up calls, with the aim of identifying care gaps and enhancing continuity of care. **Methodology:** This retrospective review examined 22 nurse-led follow-up call reports for patients admitted with acute hip fractures at Hospital Sultan Abdul Aziz Shah (HSAAS), Universiti Putra Malaysia. The service, initiated in January 2024 as part of a Fracture Liaison Service (FLS) quality improvement program, provided structured follow-up calls at 3-, 6-, 9- and 12-months post-discharge. A hybrid thematic analysis approach was employed, starting with themes guided by existing literature and then allowing new insights to emerge directly from what patients shared during the follow-up calls. **Results:** Five key themes emerged: (1) Varied Mobility Recovery, ranging from regained independence to reliance on mobility aids; (2) Fear of Falling and Reinjury, leading to avoidance of activity and reluctance toward rehabilitation; (3) Psychosocial Needs and Emotional Well-being including mood changes, grief, and social withdrawal; (4) Appreciation for Support, patients and caregivers valued reassurance from nurse-led follow-up; and (5) Caregiver Concerns and Burden, reflecting the challenges and emotional strain faced by family members in sustaining recovery. **Conclusion:** Nurse-led follow-up calls revealed unmet clinical and psychosocial needs beyond the acute phase. They enabled early detection of problems while offering patients a meaningful sense of connection, particularly for those facing loneliness at home. This hospital-based initiative provides important qualitative insights into fragility fracture follow-up at HSAAS and underscores the potential of structured nurse-led follow-up as a scalable, person-centred model to strengthen continuity of care and improve recovery outcomes.

Keywords: Thematic analysis, post-discharge care, follow-up calls, patient experience, transitional care, Fragility Fracture

P119

ARE WNT SIGNAL INHIBITORS AS BONE MARKERS READY FOR CLINICAL USE FOR OSTEOPOROTIC HIP FRACTURES?

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Objective: Sclerostin and dickkopf-1 (DKK1) are soluble antagonists controlling the Wnt signaling pathway that can directly bind and inhibit the activation of LRP5-6 related signaling, which might be promising biomarkers in assessing bone health both in the general population and bone metabolism-related systemic diseases.

This study aimed to determine the possible association and differences between the serum sclerostin and DKK1 levels in osteoporotic hip fractures, comparing the results of inflammatory markers, bone formation (PINP), and resorption marker (CTX) for risk assessment.

Methods: In Group 1, 125 (80 female/45 male) intertrochanteric fractures (ITK) and in Group 2, 85 (60 female/25 male) collum femoris fractures (COL) in patients aged over 80 years were included in the study. All fractures were due to low-energy trauma, simple falls. Bone mineral density (BMD) measurements were done with Lunar DXA. Serum sclerostin (ng/mL), DKK1 (pg/mL), and beta-catenin (pg/mL) levels were determined by the ELISA (compared to the autoanalyzer) method. Relevant methods with auto analyzers measured routine biochemical markers, hormones, PINP, and CTX by Roche and biosensor.

Results: The statistically significant differences for BMD values were observed between the two groups only at Total T and Z scores ($p<0.029$, $p<0.036$, respectively). No statistically significant difference was observed for sclerostin, DKK1, and beta-catenin levels compared to Groups 1 and 2 ($p>0.05$). However, both parameters were higher than the expected reference levels. Representation of the relationship map between sclerostin and DKK1 according to ITK and COL fracture groups showed a significant relationship between DKK1 and sclerostin in the ITK group ($r=-0.262^*$, $p=0.023$).

Conclusion: Related to inhibiting bone formation and fracture risk, sclerostin and DKK1 levels can increase and inhibit the Wnt-signaling pathway. The relationship map between sclerostin and DKK1 in ITK and COL fracture groups reveals a complex interplay that critically affects fracture healing dynamics. Targeting these pathways holds significant therapeutic potential, especially in optimizing fracture healing in challenging cases. Understanding these relationships allows for a more tailored approach to managing fractures, improving patient outcomes by modulating key molecular regulators of bone healing. Both can be promising biomarkers that provide detailed and comprehensible information.

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THE LOCAL THERAPEUTIC SOLUTION WITH SCLEROSTIN AND DICKOPPF-1 ANTIBODY TO PROMOTE BONE REGENERATION VIA ACTIVATING WNT SIGNAL PATHWAY

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Objectives: The Wnt signaling is one of the most important pathways controlling bone metabolism, and the action of inhibitors of the pathway, such as sclerostin and Dickkopf-related protein 1 (DKK1), has crucial roles in controlling bone formation and resorption. Our aim in designing this study was to investigate the local effect of targeted inhibition of sclerostin and DKK1 by their antibodies to create a balanced stimulation of bone formation in tooth extraction sockets, suppressing the bone resorption mechanism.

Materials and methods: Adult New Zealand albino male rabbits were used for the bilateral tooth extraction experimental model (3-month-old, weight ≈ 3-3.5 kg). Groups were designed for the local administration of an optimized ratio of sclerostin-ab, DKK1-ab, and a mix of sclerostin+DKK1 antibodies for 2 and 4 weeks and compared to control and graft control groups. Related measurements were carried out by histological and radiological (cone beam computed tomography, CBCT) analysis.

Results: The histological results suggested that the various stages of the bone trabeculae formation were especially evident for the mixed antibody-treated group compared to the control, graft, sclerostin, and DKK1 antibody-treated groups. Vascularization and regular bone formation were detected at lower levels in both graft 2 and 4-week groups. In the DKK1-ab 2-week group, new bone formation was observed at a more advanced level than in the graft 2 & 4-week groups. However, bone maturation and the amount of newly formed bone were detected as more limited compared to the sclerostin group. Vascularization was detected, osteoconductive growth was observed, and osteoblasts were available at the periphery of bone tissue fragments. CBCT analysis of a defined mandibular region of interest demonstrated that experimental animals treated with sclerostin and DKK1 mix antibody had higher average mandibular bone volume than other groups. Besides the increased trabecular thickness of alveolar bone, a clinically relevant measure of bone quality related to bone formation.

Conclusion: The dual effect of sclerostin and Dkk1 antibody, which are targeted, used with graft materials during local applications, has the potential as an osteoanabolic agent to alter the bone healing.

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BACILLUS COAGULANS (BC) AMELIORATES INFLAMMATORY BONE LOSS IN GLUCOCORTICOID-INDUCED OSTEOPOROSIS (GIOP)

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Background: Glucocorticoids (GCs) are widely used to treat autoimmune and inflammatory conditions, yet chronic administration induces glucocorticoid-induced osteoporosis (GIOP) in 30-50% of patients. Osteoclasts, derived from monocytes of the innate lineage, drive bone resorption. Our prior research demonstrated the immunoporotic potential of probiotics in primary osteoporosis, but their prophylactic potential on bone loss due to GIOP remains unexplored. This study investigates the plausible osteoprotective role of *Bacillus coagulans* (BC) via modulating osteoimmune parameters in GIOP in mice.

Material and Methods: We established murine GIOP model by administering GCs [2.05mg/kg/day] to C57BL/6 mice. After 60 days, gut permeability was analyzed via FITC-Dextran assay, immune parameters (Bregs, Tregs and Th17) were assessed in primary (Bone Marrow) secondary (Spleen) and mucosal tissues (Lamina Propria), *ex vivo* osteoclast and osteoblast cultures were evaluated, and micro-CT was performed to assess the bone mineral density (BMD).

Results: Chronic GCs increased gut permeability, dysregulated “Bregs-Treg-Th17” cell balance with enhanced RANKL expression on immune cells, promoting inflammatory bone loss. BC attenuated GC’s bone loss promoting effects by restoring gut integrity, modulating “Breg-Treg-Th17” cell axis, reducing activity of monocyte-derived osteoclasts, and improving BMD and gut-barrier functions.

Conclusion: Our findings thus provide compelling evidence for the Immunoporotic potential of probiotic-BC in modulating both the innate and adaptive immune system, thus mitigating the detrimental effects of GCs in murine model of GIOP, thus paving the way for future research and potential clinical applications of BC in clinical settings.

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DETERMINANTS FOR MAINTAINING HEALTHY LEAN MASS DURING AGEING: A 15-YEAR COHORT STUDY

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Background: Progressive loss of lean mass is a key characteristic of confirmed sarcopenia and a significant contributor to functional decline, frailty, and increased morbidity in ageing populations. Although previous studies have identified various determinants of healthy lean mass, there is a need for comprehensive long-term studies over an extended period. This study aimed to identify longitudinal determinants of maintaining healthy lean mass during ageing.

Methods: A total of 6,126 observations from 2,992 male and female participants (ages 20-96y) of the Geelong osteoporosis study (GOS) were analysed using linear mixed-effects models with random intercepts, accounting for repeated measures and within-subject correlation. The model included a wide range of time-varying covariates. Anthropometry and clinical measures, including lean mass and bone mineral density (BMD) by DXA (Lunar) were performed. Appendicular lean mass (ALM) was calculated by summing the lean mass of the arms and legs. Sociodemographic, lifestyles, medication use, and comorbidities were self-reported. Metabolic makers, bone makers, and inflammatory makers were obtained from blood samples. Missing values were imputed using predictive mean matching. Results were tested at 95% confidence intervals. All analyses were conducted using R version 4.3.1.

Results: Over a median 16.7y (IQR 9.7–23.2), ALM declined over time and with increasing age. Women had substantially lower ALM compared to men. Higher lean mass was observed for those from the higher socioeconomic status, physically active participants, and those with higher calcium intake, higher BMD at the hip, higher waist circumference, higher serum triglycerides, higher low-density lipoprotein cholesterol (LDL-C), higher systolic blood pressure and higher serum C-terminal telopeptide of type I collagen (CTX). Conversely, higher high-sensitivity C-reactive protein (hsCRP), stroke, and emphysema contributed significantly to lower lean mass during ageing. Moreover, the use of thyroid hormone medication contributed to the maintenance of lean mass.

Conclusions: Lifestyle and clinical factors independently contributed to longitudinal changes in ALM. Protective factors included higher socioeconomic status, physical activity, dietary calcium intake, better bone health, and use of thyroid hormone medication, while inflammation, cardiometabolic disease, and pulmonary conditions were linked to ALM. These findings highlight modifiable targets for preserving lean mass in ageing populations.

Table: Long-term predictors of healthy lean mass from linear mixed-effects model with time varying covariates.

Predictors	Estimates	CI	p
(Intercept)	20.17	19.33 – 21.02	<0.001
Follow-up time	-0.06	-0.07 – -0.05	<0.001
Age at baseline	-0.08	-0.09 – -0.07	<0.001
Sex [W]	-7.70	-7.93 – -7.46	<0.001
Smoking	0.09	-0.07 – 0.26	0.283
SES [Medium]	0.21	0.02 – 0.41	0.034
SES [High]	0.28	0.10 – 0.46	0.003
Alcohol Intake [Low]	-0.07	-0.25 – 0.11	0.457
Physical activity [Inactive]	-0.38	-0.54 – -0.22	<0.001
Dieatary calcium intake	0.60	0.40 – 0.81	<0.001
High total cholesterol	-0.08	-0.28 – 0.12	0.410
High LDL	0.28	0.08 – 0.48	0.007
Waist Circeumference	0.09	0.08 – 0.10	<0.001
CTx	0.79	0.29 – 1.29	0.002
hsCRP	-0.02	-0.03 – -0.01	<0.001
P1NP	0.00	-0.00 – 0.00	0.737
Low HDL	0.18	-0.02 – 0.38	0.079
Falls	-0.09	-0.24 – 0.07	0.287
Hip BMD	0.48	0.40 – 0.57	<0.001
Systolic BP	0.01	0.00 – 0.01	0.001
Triglycerides	0.18	0.07 – 0.28	0.001
Stroke	-0.50	-0.93 – -0.07	0.024
Cardiac arrhythmias	0.10	-0.27 – 0.46	0.608
Asthma	-0.20	-0.43 – 0.03	0.083
Emphysema	-0.68	-1.25 – -0.12	0.018
Bronchitis	0.04	-0.37 – 0.45	0.845
Cancer	-0.14	-0.35 – 0.07	0.179
Osteoarthritis	-0.04	-0.25 – 0.17	0.714
Oral glucocorticoids	-0.01	-0.51 – 0.48	0.955
Gornadal hormones	0.15	-0.17 – 0.48	0.361
Thyroid hormones	0.69	0.23 – 1.15	0.003
Agent affecting calcium	-0.19	-0.66 – 0.28	0.436

Note: Estimates are regression coefficients. CI = 95% Confidence Interval.
Random effects included subject-level variance. $p < 0.05$ considered statistically significant.
Sex [W] = Women; SES = Socioeconomic status (based on IRSD = Index of Relative Socioeconomic Disadvantage); BMI = Body Mass Index; hip BMD = Bone Mineral Density at femoral neck; BP = Blood pressure; P1NP = Procollagen Type 1 N-Terminal Propeptide; hsCRP = high-sensitivity C-reactive protein; CTx = C-terminal telopeptide of type I collagen.

P123

OSTEOPOROSIS IN A MONASTIC POPULATION: DATA ANALYSIS AND CLINICAL CORRELATIONS

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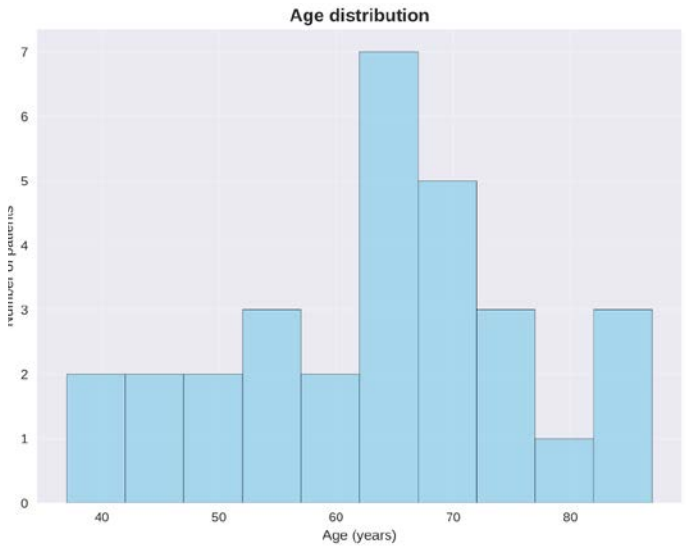
Introduction: Osteoporosis is a systemic skeletal disorder characterized by reduced bone mineral density (BMD) and increased fracture risk. Although it predominantly affects postmenopausal women and elderly men, specific subpopulations, such as monastic communities, represent a unique group due to lifestyle factors, nutrition (low protein, calcium intake), and low healthcare accessibility. In Russia there are about 300 women monasteries with a population of about 10 000 women. The present study analyzes osteoporosis-related clinical parameters in a cohort of 30 individuals living in a monastic setting.

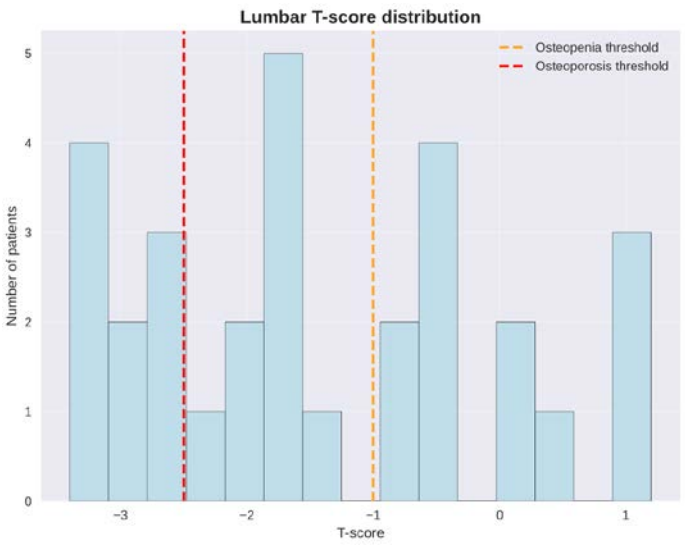
Objective: The objective of this study was to evaluate clinical and lifestyle factors associated with bone health in patients from a monastic population.

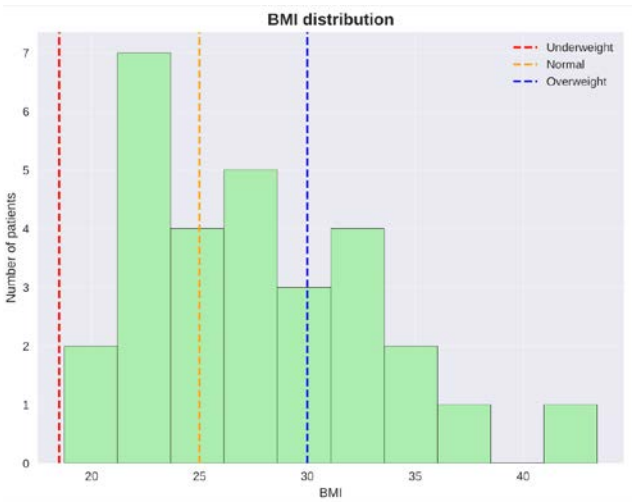
Methods: We retrospectively analyzed medical data from 30 patients (26 women and 4 men). Parameters included: demographics, anthropometry, social factors, medical history, bone mineral density measured by REMS-densitometry, vitamin D status (semi-quantitative express-testing), clinical outcomes (fractures, 10-year fracture risk, femoral neck fracture risk).

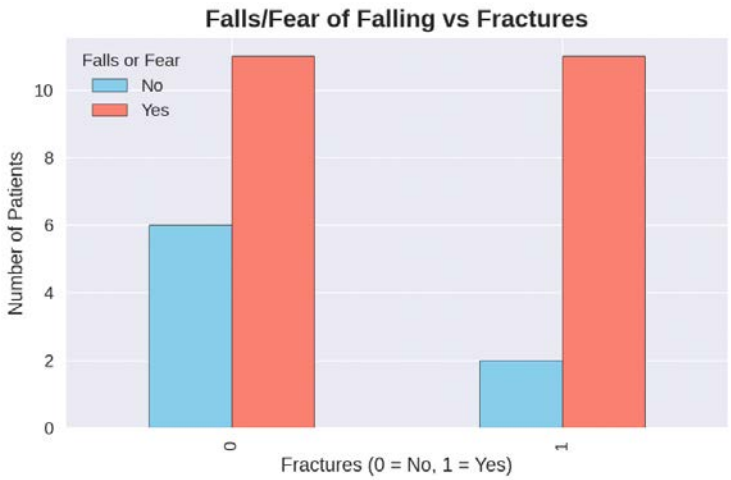
Results: Total patients: 30 (86.7% women, 13.3% men). Mean age: 63.0 years (range: 37–87). The majority of patients were over 50 years, with 56.7% in the 51–65 age group. The average age with fractures was 67 years, without fractures – 59 years. Vitamin D deficiency was observed in 40% of patients. 73% reported fear of falling or falls in the last year. Low-energy fracture prevalence was 46.7% overall. Lumbar spine T-scores ranged from 1.2 to −3.4. Femoral neck T-scores ranged from 0.9 to −3.3. Osteopenia (−1.0 to −2.5) was present in 36.7% of patients, while osteoporosis (≤ −2.5) was detected in 30%. FRAX scores varied widely, with several patients exceeding 43% 10-year fracture probability and 25% femoral neck fracture probability. The mean BMI was within the overweight range. Both underweight (<18.5) and obese (>30) individuals were present.

Conclusion: The analysis demonstrates a considerable burden of osteoporosis in this monastic cohort, with strong associations between vitamin D deficiency, low BMD, and fractures. Regular screening with DXA and FRAX, along with preventive measures such as vitamin D supplementation and lifestyle modifications, should be prioritized in similar populations.


Age distribution
Number of patients
Age (years)


Lumbar T-score distribution
Osteopenia threshold
Osteoporosis threshold
Number of patients
T-score


BMI distribution
Underweight
Normal
Overweight
Number of patients
BMI


Falls/Fear of Falling vs Fractures
Falls or Fear
No
Yes
Number of Patients
Fractures (0 = No, 1 = Yes)

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EVALUATION OF THE RELATIONSHIP BETWEEN SARCOPENIA AND FRAX SCORE IN PATIENTS DIAGNOSED WITH PRIMARY OSTEOPOROSIS

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Objective: Osteoporosis and sarcopenia are common age-related disorders that increase fragility fracture risk. The Fracture Risk Assessment Tool (FRAX) is widely used to estimate fracture probability, but its association with sarcopenia and dynapenia is not clearly established. This study examined the relationship between sarcopenia, dynapenia, and FRAX scores in women with primary osteoporosis.

Material and Methods: This cross-sectional study included 45 women aged 45–75 years with primary osteoporosis. Participants were categorized into sarcopenia, dynapenia, and control groups using the ISarcoPRM algorithm. Assessments included handgrip strength, five times sit-to-stand, six-meter walking, chair rise ability, and ultrasonographic rectus femoris thickness adjusted for body mass index (STAR index). FRAX scores for major osteoporotic and hip fracture risk were calculated using the Turkish-adapted FRAX, and bone mineral density (BMD) was obtained from Dual-energy X-ray absorptiometry.

Results: Major and hip fracture risks by FRAX were significantly higher in the sarcopenia and dynapenia groups compared to the control group ($p=0.005$; $p=0.003$, respectively). Sit-to-stand times were longer in sarcopenia than other groups ($p<0.001$). Walking speed and handgrip strength were reduced in sarcopenia and dynapenia compared with controls ($p=0.004$; $p=0.001$, respectively). The STAR index was lowest in the sarcopenia group ($p<0.001$). ROC analysis showed that FRAX thresholds (major fracture ≥6.8; hip fracture ≥2.0) discriminated sarcopenia and dynapenia from controls with good sensitivity and specificity.

Conclusion: Sarcopenia and dynapenia in women with primary osteoporosis were associated with impaired muscle function and higher FRAX-predicted fracture risk, independent of BMD. Incorporating sarcopenia assessment into routine osteoporosis evaluation may improve fracture risk stratification and support early preventive strategies.

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HYPERPROLACTINEMIA AS A SECONDARY CAUSE OF OSTEOPOROSIS IN YOUNG MALE

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This case report presents a 31-year-old male patient who reported symptoms of persistent and severe lower back pain, which prompted him to seek medical attention and be hospitalized. After a thorough medical evaluation and relevant diagnostics, including a bone mineral density (DEXA) measurement, it was discovered that the patient was suffering from osteoporosis – a condition not uncommon for men of his age. This revealed the need for further investigation to identify a possible secondary cause of osteoporosis.

Laboratory tests revealed that the level of the hormone prolactin in the patient's blood was significantly elevated, leading to the conclusion that he was suffering from hyperprolactinemia. This hormonal disorder is believed to have been the underlying factor contributing to the development of osteoporosis, which then resulted in the chronic lower back pain the patient was experiencing.

The patient's treatment included the use of bromocriptine – a drug used to lower prolactin levels – as well as the administration of nutritional supplements essential for bone health, including calcium, vitamin D3 and bisphosphonates. Thanks to this combined treatment, the patient experienced a significant improvement in pain symptoms, and an increase in bone mineral density was also observed within a short period of time.

This case highlights the importance of considering secondary factors, such as hormonal disorders, when evaluating osteoporosis in young men, who are not typically considered a high-risk group for this disease. Furthermore, this case highlights that in the management of secondary osteoporosis, it is essential to treat the underlying disease in addition to the use of medications aimed solely at improving bone health.

Keywords: Hyperprolactinemia; Osteoporosis; Bone mineral density

P126

MANAGEMENT OF FEMORAL NECK FRACTURE IN ELDERLY PATIENTS - EARLY SURGERY

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Background: Femoral neck fractures in the elderly are a significant cause of morbidity & mortality, requiring prompt management to ensure optimal recovery. This study evaluates the outcomes of surgical intervention as well as conservative medical management in osteoporotic elderly patients with femoral neck fractures.

Methods: A total of 69 elderly patients with femoral neck fractures were managed at our institution from 2021 to 2024. Upon arrival at the emergency department, patients were promptly evaluated by a multidisciplinary team comprising of physicians, anesthesiologist & Orthopedic surgeons. All patients underwent hemi-arthroplasty within 48 hours of admission. Pre-peri-postoperative care was standardized to minimize complications & optimize recovery.

Result: 67 patients tolerated surgery well with no peri -postoperative mortality. Postoperative outcomes were favourable with early mobilization achieved in most cases, except for 1 post-operative infection and 1 deep vein thrombosis. Functional recovery was satisfactory for 67 cases regaining independence in activities of daily living within the expected rehabilitation period.**Conclusion:** Early multidisciplinary assessment, pain management & timely arthroplasty within 48 hours of hospital admission result in excellent functional outcomes & minimal complications in osteoporotic elderly patients with femoral neck fractures. This approach enhances recovery, reduces hospital stay & improves overall prognosis, reinforcing the importance of pain management, tackling comorbidities efficiently, osteoporotic pharmacotherapy & prompt surgical interventions in this population with early rehabilitative measures.

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GLP-1 RECEPTOR AGONISTS AND MUSCULOSKELETAL OUTCOMES: A SYSTEMATIC LITERATURE REVIEW AND META-ANALYSIS

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Introduction: This systematic review/meta-analysis aims to synthesize clinical data on the effects of GLP-1 RAs on key relevant bone, muscle, and joint outcomes. The primary objective is to establish whether these agents are safe for the musculoskeletal system; secondarily, the study examines their potential protective role in mitigating age- and disease-related decline and in improving some key relevant outcomes in musculoskeletal health.

Methods: MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL) (both via Ovid platform) and Embase were searched in March 2025 to identify potentially relevant randomized controlled studies (RCTs) or real-world evidence (RWE) studies to be included. This bibliographic search was completed with manual search. A random effect model meta-analysis was performed for any outcome reported by a minimum of two studies. Subgroup analyses were performed on the type of GLP-1RA, type of comparator used and study design. Sensitivity analyses were performed to test de robustness of the data. This work has been performed in adherence with PRISMA statement. (PROSPERO Record ID: CRD420251024082).

Results: From 1442 potentially relevant references, 57 articles (40 RCTs and 17 RWE studies) met eligibility criteria. Different GLP1-RAs were represented across the panel of studies, i.e. Semaglutide, Liraglutide, Exenatide, Dulaglutide, Albiglutide, Lixisenatide, and SAR425899 (Bamadutide) as well as Tirzepatide (dual agonist GIP/GLP-1). No effect on bone outcomes (i.e. bone mineral density (all sites) and fractures (all sites) was observed when models included the most adjusted effect size. Regarding muscle outcomes, a significant decrease of skeletal lean mass was observed consistently with GLP1-RAs in the global model (k=22, SMD -0.45, 95%CI -0.7;-0.19, I^2 86.5%, p-value for heterogeneity <0.001) but also in subgroup analyses and sensitivity analyses, whereas no reduction of fat-free mass was observed in any of the models. Finaly, regarding joint outcome, models revealed a significant improvement of physical function with GLP-1RAs (k=6, SMD 0.28, 95%CI 0.11;0.44, I^2 77%, p-value for heterogeneity <0.001) as well as a significant improvement of pain (k=3, SMD 0.21, 95%CI 0.01;0.41, I^2 60.3%, p-value for heterogeneity 0.08), not robust to sensitivity analyses, probably due to the low number of studies included in the model.

Conclusion: This meta-analysis is the first to investigate the effects of GLP-1RAs on a large panel of musculoskeletal health outcomes. While no effect on bone outcomes was found, potential positive effects on joint outcomes (i.e. physical function and pain) are observed, that may nevertheless be partly explained by the loss of weight induced by GLP-1RAs. Additional studies in this field using multivariate models accounting for confounding may be needed to better reinforce the models.

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TRADITIONAL CHINESE MEDICINE (TCM) FORMULA ER ZHI WAN (EZW) ENHANCES MUSCLE AND BONE PROPERTIES IN NATURAL AGING OSTEOSARCOPENIC RATS

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Background: The co-existence of osteoporosis and sarcopenia (also known as osteosarcopenia) in older adults contributes to their higher risk for falls and fragility fractures due to reduced support from skeletal muscles. However, pharmaceutical remedies for treatment of osteosarcopenia are currently unavailable. Er Zhi Wan (EZW) is a TCM formula widely used for strengthening tendon and bone, which contains two herbs, *Fructus Ligustri Lucidi* (FLL) and *Ecliptae Herba* (EH) at a ratio of 1:1 (w/w) that might act on multiple organ systems to exert biological effects on skeletal muscle and bone by their actions in nourishing and tonifying "kidney yin".

Objective: The present study aimed to determine if EZW could exert *in vivo* protective effects against aging-induced muscle and bone loss in aging and aged Sprague-Dawley (SD) rats.

Methods: Male and female natural aging and aged Sprague-Dawley (SD) rats at 11- and 24-month-old (n=8 per group) were randomly arranged and treated with EZW at optimal dose, positive controls (HCD (1% calcium in diet) and vitamin D supplementation diet (16.5 IU/g)) or vehicle (saline) for 12 weeks, compared to the young vehicle control group (3-month-old). Grip strength test of rats were performed at week 0 and before sacrifice by using a digital grip strength meter (Harvard Apparatus, USA). The total skeletal muscle mass were evaluated by weighting gastrocnemius, tibialis anterior (TA), extensor digitorum longus (EDL), soleus (SOL) and quadriceps muscles of rats. Effects on age-related bone loss were evaluated by determination of trabecular bone mineral density (BMD) and bone microarchitectural parameters at distal femur and proximal tibia by using Micro-CT (Bruker Skyscan 1276).

Results and conclusions: Our results have demonstrated that EZW could increase BMD at distal femur and proximal tibia ($p<0.05$) and improve the muscle functions by increasing muscle strength ($p<0.01$) and skeletal muscle mass ($p<0.01$) of aging rats. EZW only enhanced muscle strength ($p<0.05$) in aged rats, but not muscle mass. This study provides scientific evidence for supporting the use of EZW for management of age-related osteosarcopenia.

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P129

DIFFERENTIAL GENE EXPRESSION IN SYNOVIAL TISSUE ASSOCIATED WITH KNEE OSTEOARTHRITIS

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Objectives: The main objective of this study is to analyze gene expression in suprapatellar synovial tissue using RT-PCR in patients with knee osteoarthritis. Five genes with the potential to show changes in expression in synovial tissue were selected, according to the data available so far in articles retrieved from PubMed/MEDLINE (https://pubmed.ncbi.nlm.nih.gov) and EMBASE (https://www.embase.com), focusing on studies published between January 2005 and January 2023. The five selected genes are represented by GDF5, MYC, JUN, DUSP1 and NFKBIA.

Material and Methods: A total of 29 patients who presented to the orthopedics and traumatology department of the University Emergency Hospital of Bucharest with knee pain were selected and divided into two groups. Group 1 included 26 patients aged between 59 and 81 years and were diagnosed with KL stage four knee osteoarthritis according to the Kellgren and Lawrence classification and scheduled for total knee arthroplasty. Group 2 included three patients, constituting the control group, being patients aged between 30-45 years, without radiological or MRI signs of knee osteoarthritis who required arthroscopic surgical interventions for pathologies associated with the meniscus or anterior cruciate ligament. The study has been conducted since January 1, 2023, and is still ongoing. The inclusion criteria for group 1 comprised patients aged over 45 with knee pain and radiographic evidence of KOA. The exclusion criteria included patients with recent trauma, indications of active osteoarticular infection, absence of radiological changes in KOA necessitating differential diagnosis, individuals with known rheumatological diseases in the algic phase, and those for whom complete required data could not be obtained.

Results: The heatmap highlighted clear blocks of co-regulation: JUN, DUSP1, and NFKBIA exhibited similar patterns, MYC showed an intermediate expression profile, whereas GDF5 displayed a distinct profile with wide variability across samples.

Overall, the analyses converge on the conclusion that DUSP1 and JUN are consistently downregulated in the synovium of patients with knee osteoarthritis, whereas GDF5 displays a distinct expression profile with weak correlation to the other genes. OA samples formed transcriptomic subgroups, suggesting biological heterogeneity relevant to disease pathogenesis.

Conclusion: Gene expression changes in the suprapatellar synovial tissue support and open new avenues of research into the extent of global knee involvement in osteoarthritis, contributing to a better understanding of the pathophysiology and ultimately to the identification of disease-modifying rather than solely symptomatic drugs.

P130

DENOSUMAB THERAPY BEYOND 10 YEARS: SUBSEQUENT TREATMENT AND DENSITOMETRIC OUTCOMES

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Objectives: We studied the treatment strategy following 20 doses of denosumab in patients with osteoporosis, and reported the BMD trajectory especially among those who continued denosumab beyond 20 doses.

Methods: Osteoporotic patients treated with at least 20 doses of denosumab at the Osteoporosis Centre of Queen Mary Hospital during 2012-2024 were included. Patients who continued denosumab beyond 20 doses, those who transitioned to zoledronic acid or romosozumab were compared. Bone mineral density (BMD) trajectory was examined in a subgroup of patients who did not have delayed dosing of denosumab and had BMD reassessment ≥1 year after last dose of denosumab.

Results: 54 patients received ≥20 doses of denosumab (mean age 72.9 years, 98.1% female). Among them, 2 transitioned to romosozumab, 4 transitioned to zoledronic acid and the rest (n=48) continued denosumab after 20th dose. BMD T-score at 20th dose of denosumab was the major determinant of subsequent treatment strategy. The group that transitioned to zoledronic acid had the highest BMD T-score at 20th dose while the group that transitioned to romosozumab had the lowest BMD T-score. 17 patients were included in the BMD trajectory analysis. Continuation of denosumab led to further gain in BMD over lumbar spine (0.015 g/cm^2 per year after year 10 vs 0.012 in years 3–10, p=0.877) and femoral neck (0.002 vs 0.007, p=0.706), but not total hip (-0.017 vs 0.009, p=0.064). Transitioning to zoledronic acid led to partial loss of BMD gain with denosumab (-6.76% at lumbar spine, -5.54% at femoral neck and -7.40% at total hip). Transitioning to romosozumab led to further gain in BMD over lumbar spine but not femoral neck or total hip. No atypical femoral fracture or osteonecrosis of jaw was reported upon extension of denosumab.

Conclusion: BMD T-score was the main determinant of treatment strategy following 20 doses of denosumab. Continuation of denosumab beyond 10 years appeared to be safe and efficacious.

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IMPACT OF DIABETES ON MORBIDITY, MORTALITY AND OSTEOPOROSIS TREATMENT OUTCOMES IN PATIENTS WITH OSTEOPOROTIC VERTEBRAL FRACTURES: INSIGHTS FROM PROSPECTIVE VERTEBRAL FRACTURE PATHWAY REGISTRY

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Objective: Type 2 diabetes (T2D) is associated with increased risk of osteoporotic vertebral fractures (OVF). We studied the impact of T2D on various outcomes among patients with OVF, where data are limited in the literature.

Methods: Consecutive patients admitted for symptomatic OVF and enrolled into the prospective OVF pathway registry in an academic centre in Hong Kong during 2015-2023 were reviewed, and stratified according to diabetes status on admission. All patients were followed up for complications during hospitalization (cardiovascular, kidney and infective), mortality, osteoporosis treatment and refractures till May 2025. Multivariable regressions were used to identify independent factors associated with these outcomes, adjusted for age, sex and Charlson comorbidity index.

Results: 1113 individuals with OVF were included: 28.8% had diabetes (all T2D); age 82.3±8.2years; 80.1% female. Upon median follow-up of 51 months, 153 (13.7%) developed complications during hospitalization, 479 (43.0%) died upon follow-up (one-year mortality was 8.4%). T2D was associated with increased risk of complications during hospitalization (adjusted OR=1.46, 95%CI=1.02–2.10, p=0.039) and increased mortality (adjusted HR=1.30, 95%CI=1.07–1.58, p=0.008). While the prescription rate of anti-osteoporosis treatment upon discharge (81.4%) was comparable between diabetes and non-diabetes, individuals with T2D were less likely to continue anti-osteoporosis treatment during subsequent follow-up at endocrinology clinics (adjusted OR=0.71, 95%CI=0.54–0.94, p=0.017). Within the diabetes sub-cohort, compared to better glycaemic control (HbA1c<8.5%), suboptimal glycaemic control (HbA1c ≥8.5%) was associated with worse outcomes: numerically higher rates of complications (25.0% vs 16.6%, p=0.294), increased one-year mortality (adjusted OR=2.94, p=0.052), and rate of re-fracture at 2 years (adjusted OR=3.09, p=0.039).

Conclusion: T2D was associated with increased rates of complications and mortality among individuals with OVF. In particular, suboptimal glycaemic control was associated with increased one-year mortality and refractures. Our results highlighted the relevance of optimising diabetes screening and management to address issues around bone fragility in diabetes.

P132

COMBINED AEROBIC AND RESISTANCE EXERCISE REMODELS BONE MICROARCHITECTURE AND GENE NETWORKS IN MICE

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Objective: To investigate the effects of combined aerobic and resistance exercise on bone microarchitecture and gene expression in early adult mice, thereby elucidating molecular mechanisms underlying exercise-induced bone adaptation.

Material and Methods: Sixteen female C57BL/6J mice (17 weeks) were randomly assigned to control (CON, n=8) or combined exercise (EXE, n=8) groups. The 12-week intervention included treadmill running and ladder climbing (3 sessions each/week). Physical performance (grip strength, rotarod, exhaustion test) was assessed pre- and post-training. Tibial bone mineral density (BMD) and microarchitecture were evaluated by dual-energy X-ray absorptiometry and μCT. Femoral bone tissue underwent microarray-based transcriptomic analysis. Differentially expressed genes (DEGs) were identified (≥2-fold, $p < 0.05$), followed by Gene Ontology (GO) and KEGG pathway analyses.

Results: EXE mice showed significant improvements in grip strength (+66%) and endurance (+33.3%), but not in coordination. μCT revealed enhanced trabecular bone parameters in EXE (BV/TV +105%, Tb.Th +15.5%, Tb.N +76.4%, Tb.Sp −15%) without cortical bone changes. Transcriptomic profiling identified 660 DEGs (109 upregulated, 551 downregulated). GO terms were enriched in muscle cell differentiation, contraction, and calcium/ion regulation. KEGG pathway analysis highlighted upregulation of Pax1 and Dcstamp and downregulation of Fgf18, Scx, and Tnfrsf11b, implicating pathways of bone development, remodeling, and resorption.

Conclusions: Combined aerobic and resistance training enhances trabecular bone microarchitecture and modulates gene expression networks linked to bone metabolism. These findings suggest exercise during early adulthood promotes molecular adaptations supporting long-term skeletal health and osteoporosis prevention.
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DEVELOPMENT AND VALIDATION OF SEX-SPECIFIC MORTALITY PREDICTION MODELS AMONG HIP FRACTURE PATIENTS: A MACHINE LEARNING STUDY

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Objectives: To develop and validate sex-specific machine learning models in predicting 1-, 3-, and 5-year mortality risks for hip fracture patients using readily available electronic health record (EHR) data.

Methods: In this retrospective cohort study, a total of 68,713 patients aged 65 or above with newly diagnosed hip fractures between January 1st, 2006 and December 31st, 2019 were identified using the Hong Kong territory-wide EHR database (Clinical Data Analysis and Reporting System). The cohort was stratified by sex and each sex-specific sub-cohorts were randomly divided into 70% training (model development) and 30% testing sets (model validation). Five prediction models: logistic regression (LR), gradient boosting machine (GBM), random forest (RF), eXtreme gradient boosting (XGBoost), and neural networks (NN), were trained with 289 potential predictors including age, laboratory measurements, diagnosis, and drug prescription records. Model performances were evaluated using discriminative and calibration metrics.

Results: For 1-year mortality in both sexes, the GBM model achieved the highest AUC (Female: 0.776, 95% Confidence interval [CI]: 0.765-0.787; Male: 0.756, 95% CI: 0.743-0.769). For 3- and 5-year mortality in both sexes, the XGBoost model achieved the highest AUC (3-yr: Female: 0.761, 95% CI: 0.753-0.770; Male: 0.757, 95% CI: 0.745-0.769) (5-yr: Female: 0.778, 95% CI: 0.770-0.785; Male: 0.776, 95% CI: 0.765-0.788). Both GBM and XGBoost models outperformed other models in calibration performance for their respective years.

Conclusions: The advanced machine learning models, particularly GBM and XGBoost, showed promising predictive and calibration performance. These models could provide objective support for clinicians in assessing mortality risk, thereby aiding resource allocation and decision-making process for prescribing treatments like anti-osteoporosis medications.

Acknowledgement: The study received funding support from the Health and Medical Research Fund, Food and Health Bureau, The Government of the Hong Kong Special Administrative Region (Reference 18192451).

P134

PROLONGED USE AND RESPONSIVENESS TO ERYTHROPOIESIS-STIMULATING AGENTS ELEVATED RISK OF OSTEOPOROTIC FRACTURE AMONG CHRONIC KIDNEY DISEASE PATIENTS IN HONG KONG: A TERRITORY-WIDE NESTED CASE-CONTROL STUDY

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Objective: The relationship between erythropoiesis-stimulating agent (ESA) use and osteoporotic fractures in patients with chronic kidney disease (CKD) remains uncertain. This study evaluates the risk of osteoporotic fractures associated with ESA therapy in CKD patients.

Material and Methods: In a nested case-control study, we identified 19,720 patients newly diagnosed with CKD between 2005 and 2017 who received ESA treatment before December 31, 2022, using a territory-wide electronic health record database in Hong Kong. We matched 959 fracture cases with up to 10 fracture-free controls (n=9,262) by age, sex, and fracture year. ESA exposure was assessed by treatment duration, cumulative defined daily dose (DDD), and average dose (DDD/day). Responsiveness to ESA was defined as a hemoglobin increase of ≥1 g/dL within two months of treatment initiation. Conditional logistic regression models estimated odds ratios (ORs), adjusted for CKD duration, comorbidities, fracture-related medications, frailty, CKD-related procedures, and laboratory parameters.

Results: Longer ESA treatment duration, but not cumulative or average dose, was independently associated with an increased risk of overall fracture (OR per year increase = 1.31; 95% CI = 1.23–1.39) and hip fracture (OR = 1.28; 95% CI = 1.18–1.39). These findings persisted after adjustments for anemia severity, exclusion of patients with hyperparathyroidism, and in subgroup analyses. Notably, ESA responders exhibited a significantly higher fracture risk compared to non-responders (OR = 1.36; 95% CI = 1.14–1.63).

Conclusion: Prolonged ESA use and ESA responsiveness are associated with an elevated risk of osteoporotic fractures in CKD patients. These findings underscore the need to optimize anemia management in CKD to balance therapeutic benefits with fracture risk.

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SEX-SPECIFIC ASSOCIATION BETWEEN OSTEOPOROSIS AND AGE-RELATED CATARACTS: UK BIOBANK AND HONG KONG OSTEOPOROSIS STUDY

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Objective: Age-related cataracts and osteoporosis are two common comorbidities in the older population. This study aimed to examine the association between osteoporosis, bone mineral density (BMD), and the risk of age-related cataracts in the UK Biobank and Hong Kong Osteoporosis Study (HKOS) cohorts.

Materials and Methods: We studied participants aged 40 years and older without cataracts at baseline: 337,952 from the UK Biobank and 4,935 from HKOS. Incident age-related cataracts were identified using International Classification of Diseases, Tenth Revision (ICD-10) code H25 in the UK Biobank and Ninth Revision (ICD-9) code 366.1 in HKOS. Cox proportional hazard models assessed the association of BMD and osteoporosis with cataract risk. BMD was measured using dual-energy X-ray absorptiometry (DXA) at the lumbar spine, femoral neck, and total hip in HKOS, and estimated from quantitative heel ultrasound (eBMD) in the UK Biobank. Mediation analyses explored potential protein mediators in the UK Biobank.

Results: In the UK Biobank (median follow-up: 13.5 years), higher eBMD T-score quartiles were associated with a reduced risk of age-related cataracts, while an osteoporosis diagnosis was linked to an increased risk (HR = 1.16; 95% CI = 1.08–1.25). In HKOS (median follow-up: 18.5 years), BMD T-scores between -2.5 and -1 (HR = 1.24; 95% CI = 1.05–1.45) and ≤ -2.5 (HR = 1.34; 95% CI = 1.09–1.66) were associated with a significantly higher cataract risk compared to T-scores ≥ -1. Subgroup analyses indicated a female-specific association in both cohorts. Mediation analysis in the UK Biobank identified five potential protein mediators: Matrix Extracellular Phosphoglycoprotein (MEPE), Growth Differentiation Factor 15 (GDF15), Transcobalamin 2 (TCN2), CUB Domain-Containing Protein 1 (CDCP1), and Sialoadhesin (SIGLEC1).

Conclusions: This study reveals a female-specific association between low BMD, osteoporosis, and an increased risk of age-related cataracts. The heightened cataract risk may further exacerbate fracture risk in osteoporotic patients. Timely ophthalmic evaluation and intervention are recommended for individuals with low BMD to mitigate these risks.

P136

CLINICAL OUTCOMES OF A COORDINATOR-BASED FRACTURE LIAISON SERVICE FOR HIP FRACTURES IN KOREA

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Objectives: This study aimed to evaluate the clinical impact of a newly introduced coordinator-based FLS in elderly hip fracture patients.

Materials and Methods: This prospective cohort study included patients aged 65 and older who were admitted with a hip fracture to a single tertiary hospital between June 2022 and February 2024. Patients were divided into two groups: those who received FLS after July 2023 (n=105) and those who did not (n=168). Clinical data were collected during hospitalization and at 6 weeks, 3 months, 6 months, and 1 year postoperatively. Variables included time to surgery, length of hospital stay, mortality, refracture rate, osteoporosis treatment rates, functional and nutritional outcomes, and patient satisfaction.

Results: The FLS group had significantly shorter time to surgery (2.5 ± 2.3 vs. 4.4 ± 5.5 days, $P < 0.001$) and hospital stay (20.0 ± 11.3 vs. 24.7 ± 18.0 days, $P = 0.010$). In-hospital mortality (1.0% vs. 4.2%), 6-month (4.8% vs. 6.5%), and 1-year mortality (8.6% vs. 12.5%) were all lower in the FLS group ($P < 0.05$). Refracture rates at 6 months (2.8% vs. 7.1%) and 1 year (5.7% vs. 10.7%) were also significantly lower in the FLS group ($P < 0.05$). Osteoporosis medication prescription (68.6% vs. 48.8%) and calcium/vitamin D supplementation (63.8% vs. 15.9%) were significantly higher in the FLS group ($P < 0.001$). Although no significant differences were observed in functional recovery, the FLS group showed a significant increase in serum albumin over 1 year ($P = 0.022$). Patient satisfaction exceeded 90% at all follow-up intervals.

Conclusions: The coordinator-based FLS service reduces the length of hospital stay and time from admission to surgery in elderly hip fracture patients, while also lowering the risk of postoperative mortality and refracture. It increases the prescription rate of osteoporosis medications and can improve patients' nutritional status. However, further research is needed to assess functional improvement.

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ROMOSOZUMAB NOT ONLY ENHANCED BONE MINERAL DENSITY BUT ALSO IMPROVE BACK PAIN AND LIFE QUALITY

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Background: Osteoporotic fractures lead to acute pain, increased morbidity and mortality and ultimately a lower quality of life. Anabolic agents are potent for optimized bone health. The Asian and Latin America Fracture Observational Study (ALAFOS) study showed postmenopausal women with osteoporosis who were at high risk of fracture had a significant reduction in the rate of fragility fractures after the first 6 months of teriparatide treatment and concurrent improvements in back pain, and health-related quality of life (HRQoL). In this study we evaluated the clinical effects of Romosozumab in postmenopausal women with osteoporosis.

Methods: This retrospective, observational, outpatient, single-arm retrospective study was conducted at Kaohsiung Medical University Hospital and Kaohsiung Municipal Ta-Tung Hospital. Patients who received full course of Romosozumab for 1 year were included. The bone mineral density (BMD) was done before and after treatment within 3 months. Back pain and activity of daily life were also evaluated.

Results: From Jan 2021 to Aug 2022, 115 post-menopausal women were enrolled. The mean age is 72.5 year old. All except 2 patients were reimbursed by National Health Insurance. Romosozumab increased BMD at 12 months by 14.7% at the lumbar spine, 6.7% at the total hip. Seventy-three (63%) patients experience improve in back pain and/or daily activity and/or HRQoL. No severe adverse effects were noted during the treatment course.

Conclusions: Romosozumab increased BMD at 12 months by 13.7% at the lumbar spine, 6.2% at the total hip in the ARCH study. The response in this study is similar to the results in the ARCH study. Anabolic agent, teriparatide improve back pain, and HRQoL. We also found Romosozumab can improve back pain, daily activity and HRQoL. A prospective, observational, multiple center study in Taiwan should be conducted to have clear answers in the effects on back pain and HRQoL.

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HUMAN UMBILICAL CORD MESENCHYMAL STEM CELL-DERIVED EXOSOMES AMELIORATE KNEE FUNCTION AND OSTEOARTHRITIS PROGRESSION IN A PRE-CLINICAL ANIMAL MODEL

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Aim: Mesenchymal stem cells (MSCs) have been tested in the treatment of osteoarthritis (OA). However, only few MSCs can be harvested from patients. Umbilical cord mesenchymal stem cells (UCMSCs) proliferate better than many MSCs, it still require ex vivo expansion to get enough number for treatment. Exosomes are good alternative for OA treatment. One promising approach is to use exosomes from human UCMSCs for OA treatment.

Methods: We harvested human UCMSCs-derived exosomes (UCMSCs-Exos) and characterized by nanoparticle tracking analysis. The in vitro effects of UCMSCs-Exos were assayed by mRNA expression, Alcian blue staining in chondrocytes after interleukin-1 (IL) treatment. The in vivo of UCMSCs-Exos were evaluated by knee function test and histological studies after anterior cruciate ligament transection.

Results: UCMSCs-Exos can decrease the catabolic markers including IL-1β, MMP-3 and collagen type X and increase the anabolic markers including TIMP-1, aggrecan, and collagen type II in mRNA expression. Intra-articular UCMSC-EVs can alleviate knee OA progression in gross knee morphology and histolopathologic cartilage degeneration by increasing glycosaminoglycans and type II collagen and decreasing MMP13. In addition, UCMSC-EVs can improve knee function by increasing weight bearing ratio and running endurance in the treadmill test.

Conclusion: Human UCMSCs-Exos can alleviate the effects of chondrocyte inflammation induced by IL-1β. Human UCMSCs-Exos could increase the expression of Col II and GAG and decrease expression of MMP13, showing anti-inflammatory effects on chondrocytes and articular cartilage. Eventually, UCMSCs-Exo can improve knee function after ACLT. Our study indicated human UCMSCs-Exos to be a novel approach for treatment of OA.

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RISK OF ONJ AND MRONJ IN OSTEOPOROSIS PATIENTS: A POPULATION-BASED COHORT STUDY IN TAIWAN

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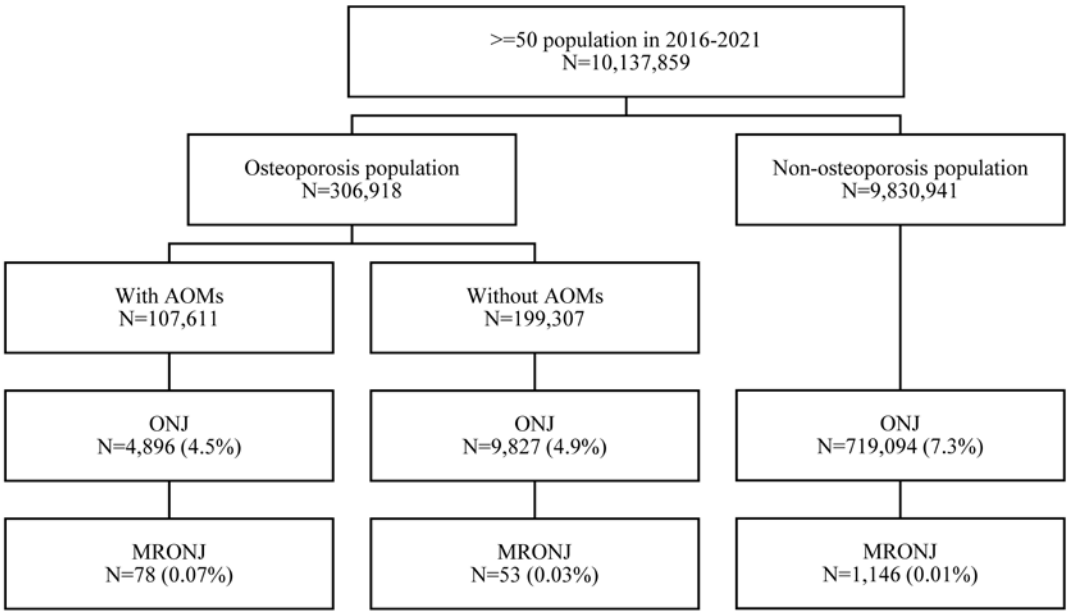
Objective: Long-term usage of anti-osteoporosis medications (AOMs) may lead to rare but clinical significance of the medication-related osteonecrosis of the jaw (MRONJ). However, the incidence or prevalence of MRONJ are limitedly reported. This study investigated the epidemiology of ONJ and MRONJ in both osteoporosis and non-osteoporosis populations to provide real-world evidence.

Material and Methods: This study utilized the Taiwan National Health Insurance database, which covers 99.9% of the Taiwanese population (over 23 million population). Patients aged 50 years and older diagnosed with osteoporosis two times during outpatient visits per year between 2016 and 2021 were included, excluding those with head and neck malignancy or Paget's disease. Meanwhile, we assessed those who had ever received AOMs treatment, diagnosed code with ONJ or MRONJ during follow up. All the diagnosis were identified based on the ICD-10-CM codes registered by health professionals from the outpatient visit.

Results: Of the individuals aged ≥50 between 2016 and 2021 (n=10,137,859), the cumulative incidence of ONJ was 7.3% (n=719,094) in the non-osteoporosis group (n=9,830,941) and 4.8% (n=14,723) in the osteoporosis group (n=306,918), respectively. This difference was statistically significant (χ^2=2809.06, p<0.0001). Within the osteoporosis population, patients receiving AOMs (n=107,611) showed a lower incidence of ONJ (n=4,896, 4.5%) compared with those never receiving AOMs (n=9,827, 4.9%). This difference was also statistically significant (χ^2=22.11, p<0.0001). Regarding the rare MRONJ, 78 cases were identified among AOMs treated patients (0.07%) compared with 53 cases among AOMs untreated patients (0.03%). The incidence of MRONJ was significantly higher in patients receiving AOMs (χ^2=33.43, p<0.0001).

Conclusions: In a population-based epidemiological survey, the cumulative incidence of registered ONJ in osteoporosis group is not higher than the non-osteoporosis group. The registered ONJ was also not significantly higher in AOMs user than AOMs non-user. However, despite the very low incidence of MRONJ, the risk of MRONJ was significantly higher in AOMs treated patients compared with untreated patients. These findings suggest that osteoporosis may be a risk factor for ONJ per se, even in the absence of AOMs. These contradictory findings may deserve further study in the future.

Figure 1. Flowchart with cumulative incidence of ONJ/MRONJ in this study



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STAGED POSTERIOR INSTRUMENTATION AND ANTERIOR VERTEBRAL RECONSTRUCTION ACHIEVED SATISFACTORY OUTCOMES IN TREATING OSTEOPOROTIC THORACOLUMBAR FRACTURES WITHOUT INCREASING COMPLICATIONS

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Objective: Direct decompression by anterior corpectomy is supposed to be the first choice for achieving optimal preservation of neurological function in osteoporotic thoracolumbar spinal fractures with neurological deficit, especially with progression. However, it remains controversial that one-stage or staged procedures should be recommended.

Materials and Methods: Forth patients were equally divided into group I and II according to one-stage and staged procedures respectively from Jan 2015 to Dec 2022. Except gender distribution was 6male/14female and 7male/13female in group I and II respectively, no significant difference in other demographic parameters and injury severity pre-operatively.

Results: No significant difference was noticed in total anesthetic time, operative time, blood loss, or immediate complication. However, the amount of morphine for pain control through patient-controlled analgesia was less in group II, but not statistically significant. The hospital days were shorter in group I 12.5 days than group II 14.5 days. The correction of kyphosis and improvement of neurological symptoms maintained well at last follow-up in all patients by 2 years postoperatively.

Conclusion: Considering increased anesthetic risk caused by extended operative time, controversy was therefore aroused between one stage or staged conduction of anterior vertebral reconstruction with posterior instrumentation. Comparable outcomes, either clinical or radiological were demonstrated between one stage and staged procedures, except shorter hospital days in patients by one stage operation and less morphine consumption for pain control in patients by staged procedures.

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THE ASSOCIATION BETWEEN HANDGRIP STRENGTH AND SELF-ASSESSMENT OF OSTEOPOROSIS AMONG PATIENTS VISITING REFERRAL HOSPITALS IN MONGOLIA

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Objective: Recent studies have identified handgrip strength (HGS) decline as a risk factor for osteoporosis. In Mongolia, there has been no research related to self-assessment of osteoporosis with hand grip strength.

The aim of this study is to investigate the association between handgrip strength and Osteoporosis Self-Assessment Tool (OST) among aged 40 and over visiting the Ulaanbaatar city's health units.

Material and Methods: The study was conducted from June to September 2024 using a cross-sectional design. Participants included individuals aged 40 and over attending health units in the Chingeltei and Songinokhairkhan districts. The Osteoporosis Self-Assessment Tool (OSTA) score was calculated to assess the risk of osteoporosis. An OSTA score ranging from -20 to -4 was classified as high risk, from -4 to -1 as moderate risk, and from -1 to 20 as low risk. Handgrip strength (HGS) was measured using a dynamometer (TKK-5101; Takei Scientific Instruments, Tokyo, Japan). HGS was considered weak if it was below 28 kg for men and below 18 kg for women.

Results: A total of 356 participants (200 men and 156 women) were included in the study. Age, body mass index (BMI), and height loss of more than 4 cm were significantly associated with OSTA score in females and males. Also, comorbidity (rheumatoid arthritis, hypertension) was significantly associated with osteoporosis in both genders. However, regular exercise and alcohol consumption were not significantly associated with OSTA score. After adjusting for age, odds ratios (OR) for OSTA remained significantly associated with low HGS in both genders (OR, 2,32; p=0.001; 95% Confidence Interval (CI) (1,22-1,43). However, rheumatoid arthritis (OR, 0,63; p=0.427; 95% CI (0,21-1,92), hypertension (OR, 1.006; p=0.992; 95% CI (0,316-3,202), and height loss of more than 4 cm (OR, 0,51; p=0.102; 95% CI (0,21-1,39) had not a significant effect on osteoporosis in participants.

Conclusion: Low HGS was significantly associated with higher risk of osteoporosis of Mongolian population.

Keywords: bone density, fracture, muscle weakness

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KNOWLEDGE, SELF-EFFICACY, AND ASSOCIATED FACTORS OF BONE HEALTH AMONG THE ELDERLY

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Introduction: Osteoporosis is a silent disease with an increasing prevalence due to the global ageing population. Decreased bone strength and quality are the hallmarks of osteoporosis, leading to an increased risk of fragility fractures in the elderly. The rising morbidity and mortality from osteoporosis impose major healthcare burdens on individuals, families, and society. Adequate knowledge and a positive attitude towards the disease, along with engagement in osteoprotective activities, may help prevent osteoporosis; however, comprehensive studies verifying this hypothesis remain limited in Malaysia.

Objective: This study aimed to determine the level of knowledge and self-efficacy regarding bone health among the elderly, and to identify associated factors influencing the maintenance of bone health.

Methods: A cross-sectional survey was conducted among older adults. Convenience sampling was used to recruit respondents, and data were collected using the Osteoporosis Prevention and Awareness Tool (OPAAT) and a Self-Efficacy Questionnaire.

Results: A total of 207 respondents participated, with a response rate of 99%. Overall, 57.5% demonstrated adequate knowledge, while 66.2% reported poor self-efficacy. Significant associations were found between self-efficacy and age ($p = 0.036$), gender ($p = 0.043$), and level of education ($p = 0.042$).

Conclusion: Although knowledge about bone health among the elderly was generally adequate, self-efficacy in maintaining bone health was poor. Being male, widowed, or having a low level of education were factors associated with poor self-efficacy, which warrants greater attention from healthcare providers. Increasing awareness that osteoporosis is preventable may serve as an effective strategy to encourage elderly to accept and comply with health education messages on osteoporosis prevention.

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DXA-BASED BIOFIDELIC FINITE ELEMENT MODELLING PREDICTION OF HIP FRACTURE RISK: COMPARISON WITH FRAX® IN OLDER ASIAN ADULTS

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Objective(s): To introduce a new dual-energy X-ray absorptiometry (DXA)-based finite-element (FE) modelling biomechanical marker - PFx (the probability of hip fracture given a fall) and compare it with FRAX® for fracture risk classification in an older Asian cohort.

Material and Methods: Data from 700 participants (Chinese, Indian, Malay ethnicities) enrolled in the PIONEER study were analysed. FRAX® scores with bone mineral density, obtained from DXA reports, were calculated using the Singapore model, with a high Hip Fracture (HF) risk defined as a 10-year probability ≥ 2% [1]. PFx was derived using a DXA scan-based FE model (Figure 1A) [2] and high PFx risk was defined as the top tertile (≥8%), as no standard threshold exists.

Results: Complete DXA and FRAX® data were obtained from 684 participants (364 females and 320 males), with a mean age of 71.4 years. Figure 1B illustrates the distribution of PFx relative to FRAX® stratified by femoral neck T-scores. FRAX® classified 60% of the cohort as high risk, while PFx identified 32% as high risk. Among osteoporotic subjects, FRAX® flagged 100%, while PFx flagged 75% as high risk. Among osteopenic subjects, FRAX® labelled 68% as at-risk, vs 28% by PFx, with only 22% classified as high risk by both.

Conclusions: FRAX® captures long-term clinical risk factors, while PFx directly assesses biomechanical strength during a fall. The limited overlap, particularly in osteopenia suggests PFx and FRAX® identify different at-risk subgroups. This divergence suggests the two measures offer distinct perspectives. Prospective studies are needed to test whether integrating them improves fracture prediction.

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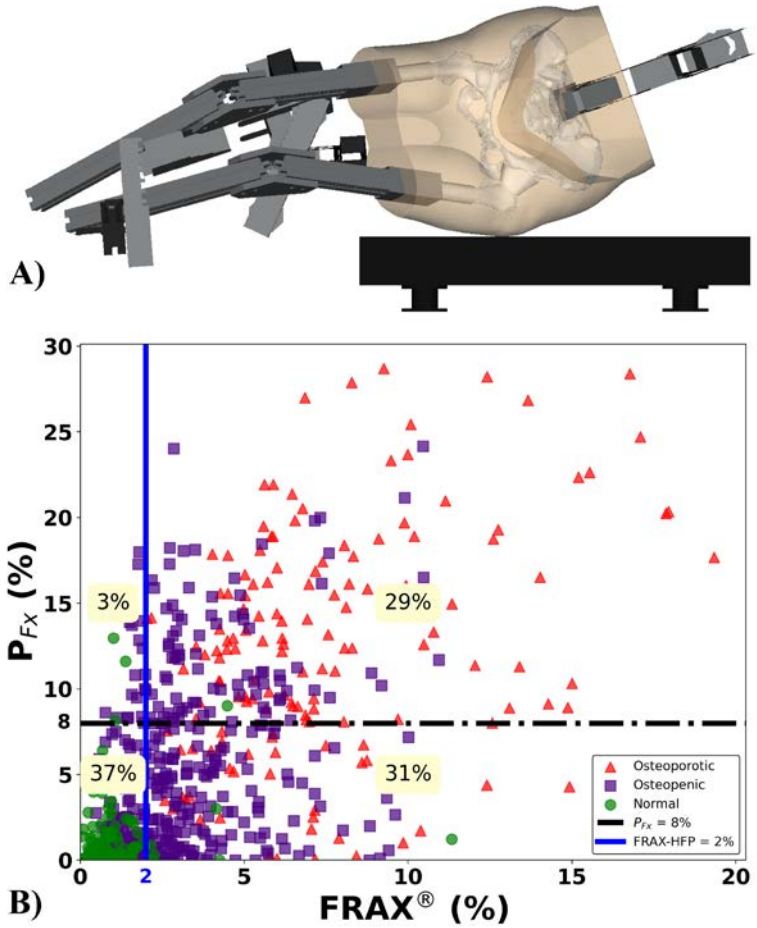

Figure 1: A) DXA-based biofidelic model; B) Plot comparing P_{Fx} and FRAX®, with subjects stratified by T-scores. Arrows indicate respective high-risk regions.

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A COMPETENCY FRAMEWORK FOR SECONDARY FRAGILITY FRACTURE PREVENTION (SFFP)

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Objective: The objective of this project was to enhance and test a Competency Framework for health professionals (HPs) working in SFFP settings, aiming to guide them in understanding their learning needs towards excellence in SFFP interventions.

Material and Methods: The Framework was tested through a) a survey of HPs to assess the Framework's appropriateness and acceptability; b) interviews with consumers to assess appropriateness from their viewpoint; and c) a pilot study to evaluate content, effectiveness and ease of use.

Results: A total of 174 HPs from 39 countries and eight consumers from six countries participated in the first two activities. HPs who practice SFFP from eight countries (Argentina, Australia, Japan, Norway, Spain, Taiwan, Thailand, and the United Kingdom) participated in the pilot. This resulted in 231 responses from a variety of disciplines working in primary care, secondary care, and in public and private care settings. Data from five of the eight sites - 89 responses - reveals 58.4% agreed/ strongly agreed the Framework is helpful, 29.2% were neutral, 2.3% disagreed and 10.1% did not respond regarding helpfulness. Disagreement rates were low and did not vary by discipline (p>0.4). Norwegian (27.8%) and Thai (21.4%) respondents found the Framework too long compared to other countries (0-5%), p=0.02)

Conclusion: The Framework for SFFP was found to be effective, appropriate and easy to use. Consumers agree the Framework should be implemented in SFFP services. Localised plans for the Framework to guide enhancement of SFFP services are now underway in countries such as Australia, Japan, Norway, Taiwan, Thailand and the UK. The Framework can be found at https://fragilityfracturenetwork.org/resources_list/the-ffn-secondary-fragility-fracture-prevention-competency-framework/

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HEALTH SEEKING-BEHAVIORS IN HOSPITALIZATION AMONG FILIPINO PATIENTS WITH FRAGILITY FRACTURES OF THE HIP: A MIXED METHOD STUDY

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Objective(s): To identify facilitators and barriers in health-seeking among patients with acute fragility hip fractures by contrasting demographics of early versus delayed hospitalization and characterizing themes that enable or impede timely care.

Material and Methods: Prospective mixed-methods at a tertiary hospital (May 2024–May 2025); convenience sample of 30 participants. We recorded pathway intervals (injury→decision, decision→first consult, first consult→admission, admission→surgery, injury→surgery), travel, and insurance. Interviews were dual-coded, thematically analyzed, and integrated with quantitative data.

Results: Pathways were prolonged. Delays (days): injury→surgery 11.4; injury→admission 7.6; first consult→admission 5.4; admission→surgery ≈3–4. Travel averaged ~27.5 km and ~78 minutes. PhilHealth was common, yet limited cash and lack of private insurance constrained access. Four clusters summarized barriers and, where present, facilitators: socioeconomic barriers or facilitators (income, out-of-pocket costs, caregiver availability); cultural beliefs and practices (perceived urgency, alternative care vs hospital treatment); health infrastructure and accessibility (distance/transport, beds, imaging, implants, specialty services); healthcare system efficiency (queues, paperwork, diagnostic timing, bed and OR scheduling, coordination).

Conclusion(s): Delays to consultation, admission, and surgery are substantial and multifactorial. Context-fit solutions—transport/navigation support, point-of-care financial aid, family counseling, decentralized fracture pathways, and prioritized OR access within an orthogeriatric bundle—may shorten time to surgery and improve outcomes.

Acknowledgments: UP-PGH Orthogeriatric Multidisciplinary Fracture Management model and Fracture Liaison Service.

References: Available on request.

Disclosures: None.

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KNEE STABILITY AND FUNCTION IN MONGOLIAN PATIENTS WHO HAVE UNDERGONE TOTAL KNEE ARTHROPLASTY

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Objectives: Total knee replacement arthroplasty (TKA) is an essential surgical treatment method performed when the cartilage surfaces of the knee joint undergo irreversible changes due to aging, trauma, genetics, and lifestyle factors. In Mongolia, there has been no research knee stability and function among patients who have undergone TKA. To evaluate the relationship between the Lysholm score and other factors influencing patients undergoing TKA.

Materials and Methods: This study was conducted using a cross-sectional study. The research was carried out at the First Central Hospital of Mongolia, involving 185 patients who visited the Department of Joint Center from January 2007 to May 2023. Participants provided demographic data, information on comorbidities, alcohol and tobacco use, physical activity, and lifestyle factors through a 56-question survey. Knee stability and function of the knee joint were assessed using the Lysholm assessment. A score of 95-100 indicated excellent, 84-94 good, 65-83 moderate, and less than 65 poor. Relationship between variables was assessed by Pearson's linear correlation coefficient. Statistical analysis of the results was performed using SPSS version 26.0.

Results: Out of 185 participants, the mean age was 71.83±7.83 years, with 18.9% (n=35) males and 81.1% (n=150) females. The average Lysholm score was 92 (range, 31-100). The demographic factors such as gender, age group, BMI, and years after surgery were significantly associated with knee stability and function (p=0.001). Age (r=0.237, p<0.001) and using using glucocorticoids (r=0.661, p<0.035) were significantly correlated with Lysholm score (r=0.237, p<0.001). A strong positive correlation was found between years after surgery and Lysholm scores (r=0.728, p<0.021). However, previous fracture, BMI, gender was not significantly correlated with knee stability and function.

Conclusions: The number of years after TKA and patient age significantly correlated Lysholm evaluation scores.

Keywords: knee, aging, arthroplasty

P148

PROBIOTIC SUPPLEMENTATION WITH LIGILACTOBACILLUS SALIVARIUS SBT2687 MODULATES GUT MICROBIOME AND AMELIORATES SYMPTOMS OF PRE-OSTEOARTHRITIS: A RANDOMIZED CONTROLLED TRIAL

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Objective: This study investigates the effects of probiotic supplementation with *Ligilactobacillus salivarius* SBT2687 (LS2687) on knee symptoms and gut microbiome in community-dwelling adults with pre-osteoarthritis (pre-OA).

Material and Methods: We conducted a randomized, double-blind, placebo-controlled trial in Osaka, Japan. Participants were equally allocated into LS2687 and placebo groups and took three capsules every day for 12 weeks. The primary outcome was the change in knee pain intensity measured by a visual analogue scale (VAS) from baseline to 12 weeks post-supplementation. Additionally, we analyzed fecal samples to evaluate gut microbiome composition, specifically assessing the proportion of *Lactobacillus salivarius* within the *Lactobacillus* genus.

Results: A total of 108 participants completed the study without any adverse events associated with the LS2687 intervention. The LS2687 group showed a reduction in the change of VAS scores for knee pain at wakeup (-2.9 ± 6.1 mm vs -1.7 ± 4.8 mm for LS2687 and placebo, p=0.048, Mann-Whitney U-test). Similarly, improvements were also observed in knee stiffness and discomfort scores in the LS2687 group. Gut microbiome analysis indicated a increase in the change of relative abundance of *Lactobacillus salivarius* within the *Lactobacillus* species in the LS2687 group (0.27 ± 0.42 vs -0.0019 ± 0.26 for LS2687 and placebo, p<0.001, Mann-Whitney U-test).

Conclusion: Probiotic supplementation with LS2687 was well tolerated and could alleviate subjective symptoms in pre-OA participants by modulating the gut microbiome. These findings highlight the potential role of probiotics in managing pre-OA symptoms.

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THE RELATIONSHIP BETWEEN PLATELET INDICES, PLATELET-BASED RATIOS AND FRAGILITY FRACTURES

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Objectives: This study aimed to investigate (1) whether platelet count, platelet indices and platelet-based ratios differ between osteoporotic patients with and without fragility fractures, and (2) whether these parameters vary according to fracture type (vertebral, non-vertebral).

Material and Methods: Medical records of 111 female patients (>45 years old) registered at the Osteoporosis Clinic between September 2022 and August 2025 were retrospectively reviewed. Patients with secondary osteoporosis or on steroid therapy were excluded. Patients were classified as having fragility fractures (n=41) or not (n=70). Fragility fracture patients were further divided into vertebral (n=16) and non-vertebral (n=23) fracture groups; two patients with both fracture types were excluded. Demographic data, FRAX scores, Bone Mineral Densitometry and complete blood counts (Platelet, MPV, PDW, PCT) were collected. The systemic immune-inflammation index (SII), the ratios of platelet to lymphocyte (PLR), platelet to neutrophil (PNR) and MPV to platelet (MPR) were calculated.

Results: Fragility fracture patients had significantly lower PCT (p=0.032). Patients with non-vertebral fractures had higher PNR (p=0.015). Other platelet indices and ratios were similar between all groups (Table 1).

Table 1. Platelet Indices and Ratios Between Patients

	Patients with fragility fracture (n=41)	Patients without fragility fracture (n=70)	P value
PCT	0,24±0,05	0,27±0,07	0,032
	Patients with vertebral fracture (n=16)	Patients with non-vertebral fracture (n=23)	P value
PNR	55,18 (45,41-69,40)	73,74 (56,12-88,26)	0,015

Conclusion: Our findings indicate that among platelet indices, only PCT was associated with fragility fractures, irrespective of fracture type. While PNR was similar between patients with and without fragility fractures, it was lower in patients with vertebral fractures compared to non-vertebral fractures. This may reflect differences in systemic inflammatory responses associated with fracture location.

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THE EFFECT OF 4-WEEK COMBINED VOLITIONAL AND REACTIVE STEP TRAINING IN REDUCING FALLS RISK IN COMMUNITY-DWELLING OLDER FALLERS: A RANDOMISED CONTROLLED TRIAL

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Objective(s): To examine the effects of combined volitional and reactive step training on fall risk in community-dwelling older fallers.

Material and Methods: Ninety-five older people (77 women, mean age: 70.5 [4.2]) with a fall history in the past year were recruited from the community, and randomly allocated to either (1) the intervention group (IG), which received 1-hour combined volitional and reactive step training twice a week for 4 weeks, or (2) the control group (CG), which received stretching, simple balance and strength training with the same training duration and frequency. The primary outcomes were volitional (Choice Step Reaction Time (CSRT)) and reactive stepping performance (Spring Scale Test (SST)). Secondary outcomes included the Mini Balance Evaluation System Test (miniBEST), Motor Control Test (MCT), Falls Efficacy Scale-International (FES-I), and Trail-Making Test (TMT). Two-way repeated measures ANOVA was used to evaluate the difference in changes across groups before and immediately after intervention.

Results: Demographics and physical functions were comparable at baseline across groups. Significant group by time interactions were found on CSRT (mean change [95%-Confident intervals], IG: -0.13s [-0.16, -0.10] versus CG: -0.04s [-0.06, -0.01], $P<0.001$), CSRT with inhibition task (IG: -0.10s [-0.14, -0.06], versus CG: -0.04s [-0.07, -0.006], $P=0.012$) and SST (IG: 2.8kg [1.6, 4.0], versus CG: 0.9kg [-0.2, 2.0], $P=0.018$). For secondary outcomes, significant interactions were found on MiniBEST (IG: 2.4 [1.6, 3.2], versus CG: 1.3 [0.6, 1.9], $P=0.027$) and MCT in forward perturbation (IG: -5.6ms [-9.0, -2.1], versus CG: 0.2ms [-2.7, 3.2], $P=0.011$), but not on FES-I ($P=0.784$), and TMT ($P=0.744$).

Conclusions: Four-week combined volitional and reactive step training significantly improved volitional and reactive stepping performance, balance and reaction time upon forward perturbation compared with active control.

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FINITE ELEMENT ANALYSIS OF PATELLOFEMORAL CONTACT MECHANICS: EFFECTS OF TIBIAL TUBEROSITY LATERALIZATION AND TROCHLEAR DYSPLASIA ON EXTENSOR MECHANISM STABILITY

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Background: Patellofemoral instability is driven by the interplay between trochlear morphology and extensor mechanism alignment. While each factor has been well described, their combined effects on contact mechanics and stability remain poorly quantified.

Objective: To investigate how lateral trochlear inclination (LTI) and tibial tuberosity lateralisation interact to influence patellofemoral contact mechanics and stability across clinically relevant knee flexion angles.

Methods: A subject-specific finite element (FE) model of the femur–patella–tibia complex was reconstructed from high-resolution CT data. Cortical and cancellous bone, patellar cartilage, the medial patellofemoral ligament (MPFL), and patellar tendon were included. Three trochlear morphologies (LTI = 15°, 10°, 5°) were simulated under native alignment and after 10 mm lateral tibial tuberosity translation. Flexion angles of 30°, 60°, and 90° were applied. Outcomes included contact pressure, contact area, MPFL stress, and lateral patellar translation. Instability was defined as >5 mm lateral translation or >50% loss of contact area. The model was validated against cadaveric pressure data, and sensitivity testing assessed material property variation.

Results: The FE model reproduced experimental peak pressures within 9% accuracy. Decreasing LTI enlarged the contact area and lowered mean pressures but markedly increased MPFL stress. Lateralisation of the tibial tuberosity further reduced pressures, yet when combined with shallow trochlear slopes (≤8°), resulted in >5 mm lateral translation and near-complete loss of contact by 60°, simulating lateral dislocation. Sensitivity analysis confirmed robustness of these findings.

Conclusion: Shallow trochlear inclination dissipates articular load but compromises patellar stability, an effect exacerbated by tibial tuberosity lateralisation. These results highlight biomechanical thresholds where instability arises and provide quantitative insight into the interplay of osseous morphology and extensor alignment. While based on a single-subject model and intended as hypothesis-generating, the study lays the groundwork for broader validation across multiple geometries and loading conditions, with potential relevance for surgical decision-making in patellofemoral instability.

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GOLGI APPARATUS DYSFUNCTION AND OSTEOPOROSIS: MOLECULAR MECHANISMS LINKING PROTEIN TRAFFICKING DEFECTS TO BONE FRAGILITY

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Background: Osteoporosis poses a significant public health challenge, affecting over 200 million people in the world. It is traditionally attributed to hormonal disturbance, calcium and vitamin D deficiency, and aging but recent studies have proposed that intracellular mechanisms, notably Golgi apparatus dysfunction, may be important mediators of compromised bone structure.

Objective: To illustrate the relevance of Golgi matrix proteins and vesicular trafficking defects in the pathogenesis of osteoporosis and related skeletal diseases.

Methods: A narrative review of recent preclinical and clinical studies was conducted, specifically concerning Golgi-associated proteins in bone homeostasis. Genetic mutations affecting vesicular transport, glycosylation, and protein sorting that occur in osteoblasts, osteoclasts and chondrocytes, are highlighted.

Results: The Golgi apparatus, involved in protein trafficking and processing, is essential in osteoblast function and bone matrix production. GORAB mutations cause perturbed COPI-mediated recycling from the trans-Golgi and perturbed glycosylation manifesting as Gerodermia osteodysplastica, a syndrome characterized by osteoporosis. GMAP-210 (TRIP11) mutations alter cis-Golgi tethering and protein trafficking leading to skeletal deformity as seen in achondrogenesis 1A. Loss-of-function mutations in COPB2 lead to compromised COPII trafficking from the endoplasmic reticulum to the Golgi apparatus resulting in coatopathies including osteoporosis, developmental delay, and abnormal protein secretion. All together, these studies help illustrate how defective vesicular trafficking and glycosylation lead to diminished bone matrix deposition, calcium instability, and skeletal fragility.

Conclusion: Apart from the established endocrine and nutritional factors, osteoporosis may arise from Golgi apparatus impairment and impaired intracellular protein trafficking. A clearer understanding of the molecular underpinnings of these rare genetic disorders provides an expanded view on bone fragility and offers new possible targets for therapy. By coupling cellular process findings to clinical presentations this framework expands our understanding of osteoporosis from being simply a complication of systemic factors to consideration of intracellular organelle dysfunction.

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IMPLANTATION OF CORE TRACT AUTOLOGOUS BONE INTO DECOMPRESSED LESION IN THE CORE DECOMPRESSION FOR OSTEONECROSIS OF THE FEMORAL HEAD

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Purpose: Core decompression (CD) is a treatment modality used to prevent progression of subchondral collapse and arthritic change in osteonecrosis of the femoral head (ONFH). We implanted autologous bone obtained from core tract to promote rapid bone formation and early postoperative ambulation during CD. This study aimed to evaluate the outcomes of this procedure.

Methods: This study included 13 patients who received CD for ONFH (≤ 2mm head collapse) with a minimum follow-up of two years. We implanted autologous bone blocks obtained from the decompression tract into the decompressed necrotic area, and the remaining space was filled with 5–10 cc of allograft bone chips or left empty. We then evaluated patients' clinical and radiographical outcomes.

Results: The mean visual analog scale improved from 4.7 at admission to 3.1 at the latest follow-up (P=0.039). The mean modified Harris hip score also improved from 59.8 to 73.2 (P=0.027). Mild osteoarthritic changes were noted in most patients (11/13, 84.6%), and the hip survival rate (no further surgeries required) was 76.9%. Three patients underwent total hip arthroplasty due to residual hip pain (mean time to reoperation, 12.7 months).

Conclusions: Core decompression combined with implantation of core tract autologous bone into decompressed lesion showed favorable clinical outcomes without any surgery-related complications. This technique may be recommended for the treatment of ONFH.

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THE APPROPRIATE SITE FOR BONE MINERAL DENSITY MEASUREMENT IN POLIO SURVIVORS

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Objectives: To determine the prevalence of osteoporosis in polio survivors and to compare the diagnostic value of lumbar spine and hip bone mineral density (BMD) measurements.

Material and Methods: Adult polio survivors underwent clinical and functional assessment, including demographics, anthropometry, paralysis characteristics, muscle strength, and dual x-ray absorptiometry (DXA) evaluation of both lumbar spine and hip. Prevalence of osteoporosis was compared between sites, and the relationship between muscle parameters and BMD was explored.**Results**: Osteoporosis prevalence was significantly higher when defined by hip BMD than by lumbar spine BMD. Hip BMD identified more patients with low bone mass who were not detected by spine DXA. Paralyzed limb lean mass showed significant correlations with hip BMD. Lumbar spine BMD was less sensitive, likely due to spinal degenerative changes.

Conclusion: In polio survivors, hip DXA is superior to lumbar spine DXA in detecting osteoporosis and may better reflect clinically relevant bone fragility. Routine hip BMD assessment should be prioritized in this population to improve diagnosis and prevention strategies.

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Table 1. Baseline Characteristics of Polio Survivors (N=69)

Variable	Total (N=69)
Age, yr	50.5±7.2
Sex, n (%)	
Men	22 (31.9%)
Women	47 (68.1%)
Hight, cm	156.6±9.3
Weight, kg	59.5±13.9
BMI, kg/m^2	24.5±3.6
Age at polio diagnosis, yr	2.3±1.3
Paralysis site, n (%)	
Unilateral	46 (66.7%)
Bilateral	23 (33.3%)
Symptoms with post-polio, n (%)	57 (82.6%)
Orthosis use, n (%)	32 (46.4%)
Multiple fall history, n (%)	51 (73.9%)

Table 2. Bone Mineral Density and Osteoporosis Prevalence by Site

Site	T-score, mean±SD	Normal/Osteopenia/Osteoporosis, n (%)
Lumbar spine (L1-L4)	-0.048±1.504	50/16/3 (71.4%/22.9%/4.3%)
Spine region	-0.568±1.501	43/21/5 (61.4%/30.0%/7.1%)
Hip, total	-0.822±1.422	34/29/6 (48.6%/41.4%/8.6%)
Femur neck	-1.561±1.282	23/31/15 (32.9%/44.3%/21.4%)

Table 3. Compare Between Lumbar Spine and Hip DXA

Osteoporosis or osteopenia by both spine and hip	15 (21.7%)
Osteoporosis or osteopenia by hip only	29 (42.0%)
Osteoporosis or osteopenia by spine only	5 (7.2%)
Normal	20 (29.0%)

Table 4. Correlation Between Muscle Parameters and Hip BMD

Variable	Hip BMD (r, p)
Age	-0.168 (0.167)
Sex	-0.177 (0.145)
BMI	0.060 (0.623)
Paralyzed limb – isokinetic knee extensor	0.177 (0.153)
Paralyzed limb – lean mass	0.394 (0.007)

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SECONDAY FRAGILITY FRACTURE PREVENTION - IMPROVING OUTCOMES

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Secondary Fracture Prevention: (Rapid secondary prevention after first fracture to prevent future fractures) Rapid secondary fracture prevention after first occurrence of all fragility fractures, including those in younger people as well as those in older persons, to prevent future fractures.

Background: Since 1 July 2021, NZ FLS have delivered IOF-accredited services through the Capture the Fracture® Best Practice Framework. Funding from the Accident Compensation Corporation (ACC) has supported a coordinated, multi-disciplinary model of care for secondary fracture prevention, improving patient outcomes.

To sustain FLS performance, the focus in the current funding model is on using ANZ Fragility Fracture Registry (ANZFFR) data to drive quality improvement. Feedback helped develop a common-language template for all FLS. Each FLS must produce a quality improvement plan to reach top-tier performance, aligning with the ANZFFR Annual Report. FLS created a tailored Plan-Do-Study-Act (PDSA) cycle to test changes. Meetings now follow a regional format to enhance collaboration, networking, and facilitate efficiency in adopting best practices.

Methods: Contracting model with dedicated funding for the FLS. Attendance at annual Fracture Fest. Contracting model that emphasises continuous quality improvement with specific KPI identification rates and treatment adherence/uptake.

Results:

- 90% coverage across the country.72% fragility fractures identified.
- 62% of patients recommended treatment, and they have commenced and/or continue with osteoporosis specific treatment within 16-weeks of index fracture, and still on treatment at 52-weeks.
- 80% or more complete data entered into the NZ arm of the ANZFFR.
- 80% or more complete data entered into the NZ arm of the ANZ Hip Fracture Registry.

Conclusions: In a complex system, dedicated clinical resource, supported by a national registry with real time feedback is enabling rapid expansion and integration of the IOF Capture the Fracture® Best Practice Framework across the NZ health system.

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EFFECTS OF A MULTIDOMAIN INTERVENTION ON BONE HEALTH AMONG OLDER ADULTS POST-ACUTE STROKE (BOUNCE) IN MALAYSIA: A FEASIBILITY RANDOMIZED CONTROLLED TRIAL

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Objective: To examine the effects and feasibility of the BOUNCE protocol among older adults post-acute stroke.

Material and methods: This single-blinded, feasibility randomized controlled trial was conducted at Hospital Sultan Abdul Aziz Shah, Malaysia. Adults aged ≥50 years with a Modified Rankin score (MRS) of 2 or 3, within 90 days of an acute stroke, were invited to participate from March 2023 to December 2024. The BOUNCE group received a 24-week multicomponent moderate to high-intensity, high-impact exercise, as well as nutritional intervention focusing on bone health and standard care, compared with standard care alone. The primary outcome was changes in areal bone mineral density (BMD) at the femoral neck (NOF). Secondary outcomes included serums C-telopeptide-cross-linked type I Collagen (CTx), Procollagen Type I N-terminal propeptide (PINP), 25(OH) Vitamin D, feasibility, falls, and fractures. Descriptive analysis was used to examine the baseline characteristics of participants, and intention-to-treat analysis using Generalized Estimating Equations was used to examine the outcomes. Data analysis was done via SPSS Version 30.

Result: Sixty older adults were recruited and randomized (30 each group) out of 189 screened (32%), with a mean age of 64.6±7.7 years. Twenty-two were women (36.7%) and 56 were Malay (93.3%). The retention rate at 6 months was 70% (21/30) in both groups. The significant Group × Time interaction effect was seen at the BMD of the hemiplegic side's NOF (p=0.007). The intervention group demonstrated a mean BMD increase compared to bone loss in the control (+0.008 g/cm² versus -0.022 g/cm, respectively), representing a clinically meaningful difference of 0.03 g/cm². There were two falls in each group, which occurred outside the exercise period, and no fractures were documented.

Conclusion: BOUNCE was found to improve BMD at the hemiplegic NOF at 6 months, which is the commonest side for fracture in chronic post-stroke survivors. The lack of significant changes in the biochemical bone health parameters could signify that the intervention has a targeted effect on the hemiplegic NOF and warrants a future biomechanical study.

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RETROSPECTIVE THREE-YEAR ANALYSIS OF PATIENTS WITH ASYMPTOMATIC AND SYMPTOMATIC PRIMARY HYPERPARATHYROIDISM AT RIGA EAST UNIVERSITY HOSPITAL

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Objectives. With the advent of routine calcium testing, the asymptomatic phenotype of primary hyperparathyroidism (PHPT) has emerged as the most prevalent form of the disease. Although factors underlying asymptomatic disease remain largely unclear, many patients in this category qualify for surgical intervention, highlighting the necessity of comparing them with symptomatic patients. This study aimed to analyse and compare clinical, biochemical, and comorbidity profiles of asymptomatic and symptomatic patients with PHPT.

Materials and methods. This 3-year retrospective study included 177 patients diagnosed with PHPT from January 2021 to January 2024. Clinical characteristics, biochemical parameters, and comorbidities were extracted from medical records and compared between asymptomatic and symptomatic patients.

Results. Among 177 patients, 85 (48.0%) were asymptomatic. Among them, 48 patients (56.5%) fulfilled at least one surgical criterion, with elevated calcium levels being the most common. Asymptomatic patients tended to be younger, while symptomatic patients had higher median concentration of intact parathyroid hormone (iPTH) (>212 pg/ml; p=0.004) and lower glomerular filtration rate (GFR) values (p=0.047). No significant differences were observed in serum calcium (p=0.083) or vitamin D concentration. Factors associated with the asymptomatic group included age under 65 years (OR=0.52, CI 0.28–0.94, p=0.030), lower calcium levels (<2.85 mmol/L; OR=0.41, 95% CI 0.22–0.75; p=0.040), and lower iPTH levels (<212 pg/ml; OR=0.54, CI 0.29–0.99, p=0.046). Conversely, a reduced GFR (<60 ml/min) was associated with an increased likelihood of being symptomatic (OR=2.70, CI 1.00–7.29, p=0.043). Additional comorbidities such as thyroid nodules, chronic autoimmune thyroiditis, and diabetes mellitus were more prevalent in the symptomatic group (all p<0.01).

Conclusions. Asymptomatic patients with incidentally detected PHPT require thorough evaluation, as more than half qualify for surgical intervention. Notably, serum calcium levels did not differ significantly between the groups, indicating that both cohorts experience a comparable disease burden. Together, these results underscore the importance of making timely surgical decisions, even in the absence of classic symptoms.

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UNUSUALLY LOW IPTH: DIAGNOSTIC PITFALL OR TRUE HYPOPARATHYROIDISM? A LABORATORY-BASED ROOT CAUSE ANALYSIS

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Introduction: Intact Parathyroid Hormone (iPTH) has a short half-life i.e. two to four minutes therefore the sampling regimen has to pass through a stringent pre-analytical process control. The aim of this study was to identify the causes of apparently falsely low iPTH encountered while signing out Laboratory reports by Clinical Chemistry professionals.

Material and methods: This report was conducted at the section of Clinical Chemistry, The Aga Khan University Hospital (AKUH) Karachi Pakistan from July to December 2017. Audit tool utilized was Plan-Do-Check-Act Cycle. After correlating with available clinical details and lab parameters, all low iPTH values (<16 pg/ml) were investigated by phone interview. A fresh sample was requested for non-correlating cases. Appropriate interventions were undertaken, and a re-assessment was done from January to March 2018.

Results: During the audit, 2559 iPTH samples were analyzed. 110 (4.3%) were identified as apparently falsely low. After recollection, the above 110 samples were immediately centrifuged, and cold chain maintained until re-analysis. 60 (2.4%) resulted in normal or elevated levels. The causes identified were poor compliance of staff with pre-analytical steps including delayed sample separation and unfavorable temperature chain maintenance. Interventions included online meetings with the staff country-wide and circulation of flyers detailing the pre-analytical steps via emails and hard copies. Re-audit showed reduction in number of apparently falsely low results to 30 out of a total of 1448 samples and 14 (0.96%) were investigated to be falsely low.

Conclusion: Stringent pre-analytical process control is vital for quality reporting and patient safety.

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BONE STATUS INDICES IN MULTIPLE MYELOMA: ANALYTICAL VALIDATION AND CLINICAL INSIGHTS FROM A CASE–CONTROL STUDY

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Objectives: This study aimed to perform analytical validation of osteocalcin, procollagen type 1 N-terminal propeptide (P1NP), and C-terminal telopeptide of type I collagen (CTx) assays and compare bone status indices (BSIs) between patients with multiple myeloma (MM) and healthy controls (HC) to assess the impact of multiple myeloma on bone health in the local population.

Material and Methods: This retrospective case–control study was conducted at the Section of Chemical Pathology, Aga Khan University Hospital, Karachi, Pakistan. De-identified residual serum and urine samples from patients with MM, confirmed by serum and urine protein electrophoresis and immunofixation electrophoresis, along with samples from HC stored in the laboratory biorepository, were retrieved for analysis between August and October 2024. Clinical data and demographic variables were extracted from the integrated laboratory information management system. Before sample analysis, osteocalcin, P1NP, and CTx assays underwent analytical validation: precision was assessed using two-level quality controls (L1, L2) and expressed as coefficient of variation (CV%); accuracy, reportable range and linearity were evaluated across the measured ranges for each analyte. After validation, BSIs were measured in case and control samples. Statistical analyses were performed in SPSS v.23

Results: A total of 46 multiple myeloma patients (29 males, 63%; 17 females, 37%) with a median age of 57.5 years (46.8–67.8) and 45 HC were included. Analytical validation showed acceptable precision (CTx CV%: 5.2 at L1, 5.1 at L2; osteocalcin: 4.3 at L1, 10.5 at L2; P1NP: 4.9 at L1, 7.3 at L2), while accuracy and linearity confirmed reliable assay performance across clinically relevant ranges. Median BSI levels in MM patients were: osteocalcin 6.64 (3.02–15.5) ng/mL, P1NP 60.25 (29.7–93.2) ng/mL, and β-CTX 0.04 (0.02–0.09) ng/mL. In 40 healthy controls, the corresponding medians were osteocalcin 7.48 (5.8–10.5) ng/mL, P1NP 45.95 (34.2–54.8) ng/mL, and β-CTX 0.03 (0.01–0.05) ng/mL. Mann–Whitney U test revealed significantly higher β-CTX in MM patients ($p = 0.03$), whereas osteocalcin ($p = 0.80$) and P1NP ($p = 0.12$) did not differ significantly.

Conclusion: Based on the findings, β-CTX levels were significantly elevated in patients with multiple myeloma compared to healthy controls, suggesting altered bone resorption in this population.

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OPTIMISING FRAGILITY HIP FRACTURE OUTCOMES THROUGH COLLABORATIVE DATA USE: A MULTICENTRE STUDY IN A RESOURCE-LIMITED HEALTHCARE SETTING

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Objective: To report baseline outcomes from the first nationwide online fragility hip fracture registry in the Philippines and examine the feasibility of collaborative, multicentre data collection in a resource-limited setting.

Design: Prospective cohort study conducted across 14 orthopaedic training institutions between March 2021 and March 2024.

Setting: Nationwide, Philippines.

Participants: Adults aged ≥60 years admitted with fragility hip fractures from low-energy trauma.

Main outcome measures: Time to surgery, rates of surgical intervention and early mobilisation, 30- and 120-day morbidity and mortality, and loss to follow-up.

Results: Among 1,018 participants (mean age 72.7 years, 83.3% female), 95.1% received definitive treatment. Mean time from admission to surgery was 478 hours; only 38.9% underwent surgery within 48 hours. At 120 days, 89.0% were alive without complications; mortality was 1.2%. Early mobilisation by postoperative day one occurred in 39.8%. Loss to follow-up at 120 days was 22.5%.

Conclusions: Multicentre collaborative data collection is feasible in resource-limited settings and highlights urgent needs to improve timely surgery and multidisciplinary orthogeriatric care. This registry establishes a foundation for quality improvement in fragility hip fracture outcomes in the Philippines.

Strengths and limitations of this study:

\ First multicentre, prospective registry capturing nationwide fragility hip fracture data in a low-resource setting.

\ Use of a standardised, modified Minimum Common Dataset tailored for low- and middle-income countries.

\ High data completeness and follow-up rates despite pandemic and infrastructural challenges.

\ Limitations include incomplete follow-up especially in rural areas and variable application of multidisciplinary care due to resource constraints.

\ Observational design limits causal inference but provides critical real-world evidence for health system improvements.

P161

ANTI-OSTEOPOROTIC POTENTIAL OF A PROBIOTIC MIXTURE CONTAINING LIMOSILACTOBACILLUS REUTERI AND WEISSELLA CIBARIA IN OVARIECTOMIZED RATS

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Introduction: Postmenopausal osteoporosis poses a significant clinical challenge, as conventional therapies are often ineffective or poorly tolerated owing to adverse effects or underlying health conditions, underscoring the need for alternative treatments. This study investigated the anti-osteoporotic effects of a novel probiotic mixture combining Limosilactobacillus reuteri MGE 3301 (LR) and Weissella cibaria MGE 3110 (WC), which were selected for their anti-inflammatory properties and ability to modulate bone metabolism, in an ovariectomized rat model.

Methods: Thirty-five female Wistar rats were randomly assigned to five groups: Sham, Ovariectomy (OVX), OVX with LR supplementation (OVX/LR), OVX with WC (OVX/WC), and OVX with a combination of LR and WC (OVX/LR/WC), under ARRIVE guidelines and ethical approval. Each probiotic group received 1 × 10^9 CFU/mL/day for 16 weeks starting at 5 weeks post-OVX.

Results: Micro-computed tomography and histopathological analyses revealed that the OVX/LR/WC group had superior trabecular bone preservation compared with that in the OVX control group, with significant improvements in bone mineral density (+ 54.2%), bone volume fraction (+ 24.8%), trabecular thickness (+ 13.6%), and trabecular number (+ 20%), along with decreased trabecular separation (− 8.1%; $p < 0.05$). RT-qPCR analysis of bone marrow demonstrated that LR/WC suppressed osteoclastogenic mediators (RANKL: −1.35-fold; TNF-α: −2.5-fold; IL-6: −1.9-fold) while elevating osteoprotective osteoprotegerin expression (+ 3.14-fold; $p < 0.05$). Serum analysis showed reduced CTX-I (− 38.9%) and elevated calcium (+ 30.8%) levels in OVX/LR/WC versus OVX rats ($p < 0.05$), indicating suppressed bone resorption and enhanced mineral homeostasis. These findings indicate that LR/WC probiotic supplementation attenuates OVX-induced bone loss by modulating bone turnover markers and inflammatory cytokines. To our knowledge, this is the first study to assess the combined effects of LR and WC in an osteoporosis animal model, highlighting its potential as an adjunctive therapeutic candidate for osteoporosis. However, few notable imitations include undefined human dosing and the unassessed long-term safety of probiotics.

Conclusion: Future clinical trials must validate the efficacy, elucidate mechanisms (e.g., gut-bone axis interactions), and assess safety in postmenopausal women to advance therapeutic applicability.

Keywords Postmenopausal osteoporosis, Ovariectomized rats, Probiotics, Bone turnover markers, Inflammatory and osteoclastogenic markers

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GENERATIVE MODEL-BASED TIME-SERIES IMPUTATION FOR PROGNOSTIC PREDICTION IN HIP FRACTURE PATIENTS

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Hip fracture (HF) is a common condition among older adults and is considered a major public health issue due to its high morbidity and mortality rates, reduced mobility, loss of functional independence, and increased socioeconomic burden. With the rapid growth of the global aging population, the incidence of hip fractures has been rising at an alarming rate, often leading to long-term disability and repeated hospitalizations, making the observation of long-term prognosis essential. Although clinical data on hip fracture patients continue to accumulate in healthcare settings, missing values frequently occur when patients are unable to visit hospitals regularly. To address this issue, we applied the Generative Adversarial Imputation Network (GAIN) to time-series clinical data of hip fracture patients. However, previous applications of GAIN have shown limitations such as training instability and mode collapse. To overcome these drawbacks, we incorporated the Unrolled GAN training technique into GAIN. As a result, the proposed model demonstrated superior performance compared to conventional methods, achieving an accuracy of 0.5800 and an AUC of 0.5994, with the lowest errors (RMSE 0.5587, MAE 0.4467). This study demonstrates that generative model–based imputation can effectively address the issue of missing values in longitudinal clinical datasets of hip fracture patients.This research was supported by a grant of Korean ARPA-H Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number: RS-2024-00512374).

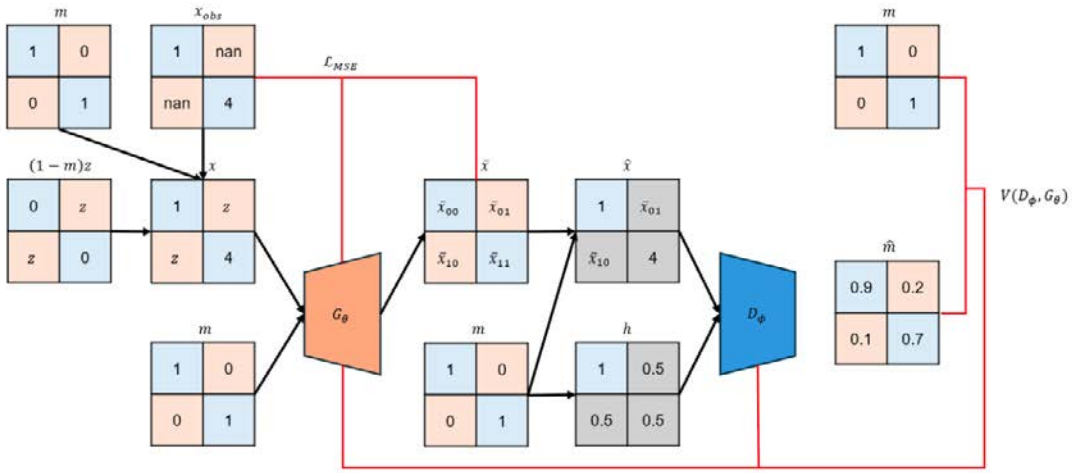

Fig 1. Overall structure of GAIN. Generator and Discriminator estimate the tabular data by single entry.

Algorithm	RMSE	MAE
MissForest	1.1613	0.7858
MICE	1.1567	0.9275
GP-VAE	0.8805	0.7368
BiGRU	<u>0.6343</u>	<u>0.4569</u>
URGAIN	**0.5587**	**0.4467**

Table 1. Overall performance of existing imputation methodologies. Bold means best performance and underline is second best performance.

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SEVERE OSTEOPOROSIS IMPROVED WITH ROMOSOZUMAB THERAPY IN A YOUNG MALE WITH HYPERMOBILE EHLERS-DANLOS SYNDROME AND TYPE 1 DIABETES

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Hypermobile Ehlers-Danlos syndrome (EDS) is a heterogenous genetic disorder that affects collagen synthesis and is associated with increased bone fragility and low bone mass due to abnormal bone microarchitecture. Currently, no therapeutic guidelines exist with regards to screening and managing skeletal fragility in patients with EDS. The efficacy of sclerostin inhibitors such as romosozumab has not been determined. Here we present a rare case of a 23-year-old male with congenital hypermobile EDS and a 10-year history of reasonably controlled type 1 diabetes with no established complications presenting with severe osteoporosis managed with romosozumab.

The patient initially presented with acute back pain following a hypoglycaemic seizure, prompting further investigation to reveal an osteofragility fracture of his thoracic vertebrae. Physical examination revealed marked joint hypermobility, hyperelastic skin, and reduced muscle strength. Bone densitometry confirmed osteoporosis with a significantly reduced bone mineral density at the lumbar spine of 0.748g/cm² (Z-score -4.1) and total hip 0.702g/cm² (Z-score -2.9). Laboratory analysis revealed 25-OH vitamin D deficiency (32nmol/L), elevated bone turnover (CTx 940ng/L, RR:400-900ng/L) and reasonable diabetic control (Hba1c 7.4%). Coeliac and myeloma screening were negative.

Osteoporosis therapy was initiated with oral colecalciferol 5000IU daily and privately-funded romosozumab 210mg monthly subcutaneous injections. Follow-up at six months showed a significant 12.6% increase in his lumbar spine bone mineral density to 0.842g/cm² (Z-score -3.0) and a 13.1% increase in bone density of his total hip 0.785/cm² (Z-score -2.3). CTx bone turnover marker also improved (490ng/L). Diabetic management was achieved using a Tandem t:slim insulin pump with Dexcom G6 continuous glucose monitoring as well as dietary adjustments to avoid hypoglycaemia.

This case highlights the complex nature of osteofragility fractures in young adults with EDS as well as our patient's marked response to romosozumab. It warrants further investigation as a potential treatment option for patients with EDS and osteoporosis.

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EVALUATING THE COST-EFFECTIVENESS OF AI-ENHANCED OSTEOPOROSIS SCREENING IN MEN AND WOMEN USING ROUTINE CHEST RADIOGRAPHS IN SOUTH KOREA

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Objective: South Korea, now a "super-aged" society, faces a rising burden of fragility fractures, yet underdiagnosis remains a major barrier, with limited DXA access restricting early detection. Artificial intelligence (AI) applied to routine chest radiographs enables opportunistic screening. In March 2025, the deep learning tool *Osteo Signal*, developed in South Korea, received regulatory approval for use in both men and women. Unlike prior evaluations in women only, this study assessed its cost-effectiveness in adults aged ≥50 years of both sexes.

Methods: A model estimated the cost per quality-adjusted life year (QALY) gained (2025 Korean Won, KRW) from opportunistic AI-assisted chest radiograph screening versus no screening. Model inputs included osteoporosis prevalence (37% in women, 7.5% in men), diagnostic performance of *Osteo Signal*, and realistic probabilities of DXA confirmation, treatment initiation, and medication persistence. Patients were assumed to receive alendronate or denosumab. Analyses were performed in the overall population and by sex.

Results: Screening improved outcomes, preventing 46 fractures, gaining 21 life years and 36 QALYs per 10,000 adults, while increasing treatment expenditures. The incremental cost-effectiveness ratio (ICER) was KRW 12,096,960 (~USD 8,650) per QALY in the overall population, below South Korea's willingness-to-pay threshold (KRW 30 million). Subgroup ICERs were KRW 8,910,449 for women and KRW 44,746,862 for men. Assuming a realistic male osteoporosis prevalence of 15%, the ICER for men dropped below KRW 30 million, confirming the intervention's cost-effectiveness for both sexes.

Conclusion: AI-enhanced chest radiograph screening is cost-effective for South Korean adults aged ≥50 years when evaluated across both men and women. While sex-specific differences exist, the combined analysis highlights meaningful population-level value, supporting adoption to reduce the national burden of osteoporosis and fractures.

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STANDARDISATION OF THE ASSESSMENT OF REHABILITATION POTENTIAL AND REHABILITATION PROGNOSIS IN PATIENTS WITH PELVIC ORGAN DYSFUNCTIONS

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Criteria for evaluating the rehabilitation potential (RP) and rehabilitation forecast in patients with impaired pelvic organs (NFTO) with stenosis of the spinal canal (SPK), chest and lumbar spine or spinal spinal trauma (PSMT), recommended for the use of co-social examination in copper-social examination (ITU) and in assessing the effectiveness of the stages of medical rehabilitation (MR). A clinical and functional assessment of the condition of 65 patients with disabilities was carried out (the first disability group is 18 people, 27.7%; the second disability group is 12 people, 18.5%; the third group of disability is 35, 53.8%) with NFTO, due to the SPC, PSMT at the level of the thoracic and lumbar spine: 40 40 (61.5%, CI: 49,1-72.4) men and 25 (38.5%, DI: 27.6-50.6) women. The age distribution of patients showed that most of the following men were represented in groups: 41-50 years-19 people. (47.5%, DI: 33.0-62.5) and up to 40 years-13 people. (32.5%, DI: 20.1-48.0). Most of the examined women (48.0%) were in the age range of 41-50 years (12 people, DI: 30.0-66.5). According to the duration of the disease, patients were distributed as follows: up to one year - 26 people. (40.0%; DI: 29.0-52,1); From 1 year to 3 years-22 people. (33.8%, CI: 23.5-46.0); From 3 to 10 years-17 people. (26.2%, DI: 17.0-38.0). According to the etiological factor, the distribution of patients in the group studied was as follows: NFTO at 65 SEC at the level of the chest and (or) lumbar spine - 34 people. (52.3%, DI: 40.4-64.0), PSMT of the thoracic and (or) lumbar spine-15 people. (23.1%, DI: 14.5-34.7), a combination of PSMT and the post of traumatic SEC-16 people. (24.6%, DI: 15.8-36.3). Disorders of the statodynamic function in patients due to the reza (central spastic, sluggish peripheral, combined) varying severity were detected in 63 cases (96.9%, DI: 89.5-99.2). Along with impaired dysfunctions (100% of cases) and status of dynamic function, mental disorders (22 people, 33.9%, CI: 23.5-46.0), circulatory functions (31 people, 47.7%, DI: 36.0-59.6) were often observed. In 56.9% of the examined patients (37 people, CI: 44.8-68.2), RP is estimated as high, in 15.4% (10 people, DI: 8.6-26.1)-average, in 27.7% (18 people, DI: 18.3-39.6)-low.

When analyzing the functional status, the degree of severity of the NFTO, changes in the state of health at all stages of MR and ITU, in patients with PSMT and SPK, scales and questionnaires were used, taking into account the letter-cyphprous system “International classification of functioning, limitations of life and health” (MKF). During the study in the implementation of expert-rehabilitation diagnostics, the assessment of the RP and rehabilitation forecast in patients with pelvic disorders due to the SPK, the PSMT at the level of the chest and lumbar, a comprehensive analysis of the influence of medical, psychological and social factors, taking into account changes in the functions, structures, activity and participation, determinants of the “implementation” and “sales” and “kapatit”, influence on the functional status of concomitant pathology and context factors in accordance with the provisions of the ICF.

The criterion of the high RP was the forecasting as a result of the MR of the complete restoration of the impaired functions of the organs and systems of the body or partial restoration of the impaired functions of the organs and systems of the body to violations of not higher than the mild severity, leading to the elimination of limitations of the basic categories of vital activity (primarily self -care, independent movement) not higher than the functional

class of FC 1. It was forecasting as a result of the MR partial restoration of impaired functions of the patient's organs and systems of the patient to disorders not higher than the moderate severity, leading to the restrictions of the patient's basic categories of the patient not higher than FC 2. The criterion of the low RP was the prediction of a partial restoration of the impaired body and systems of the patient's body to no higher degree of pronounced degree. 66 to limit the basic categories of the patient's life, no higher than FC 3. The criterion of the extremely low RP is the prediction of a minor improvement, adaptation of impaired (slight compensation for lost) functions of the patient's organs and systems of the patient's body to impaired degree, leading to a limitation of one or more basic categories of life in the framework of FC 4. Rehabilitation The prognosis of examined patients was defined as favorable, dubious, unfavorable and assessed taking into account the probability of implementing the goals of the MR, mainly in accordance with the degree of severity of the NFTO, accompanying disorders of the statodynamic function, the presence of algic and muscle-tonic syndromes, the ability to independently move and self-care.

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CRITERIA FOR EVALUATING PAIN IN PATIENTS WITH PELVIC DISORDERS IN POST -TRAUMATIC AND DEGENERATIVE STENOSIS OF THE SPINAL CANAL

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The criteria for evaluating the pain syndrome (BS) in patients with dysfunctions of the pelvic organs (NFTO) with stenosis of the vertebral canal (SEC), as a result of an injury or degenerative-dystrophic process of the thoracic and (or) lumbar spine, recommended for use in the medical and social examination) Rehabilitation (MR). A clinical and functional assessment of the condition of 65 NFTO patients under SEC: 40 (61.5%, CI: 49.1-72.4) men and 25 (38.5%, CI: 27.6-50.6) women. The age distribution of patients according to it seemed that most examined men were represented in groups: 41-50 years-19 people. (47.5%, DI: 33.0-62.5) and up to 40 years-13 people. (32.5%, DI: 20.1-48.0). Most of the examined women (48.0%) were in the age range of 41-50 years (12 people, DI: 30.0-66.5). According to the duration of the disease, patients were distributed as follows: up to one year - 26 people. (40.0%; DI: 29.0-52,1); From 1 year to 3 years-22 people. (33.8%, CI: 23.5-46.0); From 3 to 10 years-17 people. (26.2%, DI: 17.0-38.0). According to the etiological factor, the distribution of patients in the studied group was as follows: NFTO at the SEC at the level of the chest and (or) lumbar spine - 34 people. (52.3%, DI: 40.4-64.0), PSMT of the thoracic and (or) lumbar spine-15 people. (23.1%, DI: 14.5-34.7), a combination of PSMT and post-traumatic SPK-16 people. (24.6%, DI: 15.8-36.3).

Disorders of the statodynamic function in patients due to the reza (central spastic, sluggish peripheral, combined) varying severity were detected in 63 cases (96.9%, DI: 89.5-99.2). Along with impaired distinguishing functions (100% of cases) and statodynamic function, mental disorders (22 people, 33.9%, CI: 23.5-46.0), and blood circulation functions were often observed. (47.7%, CI: 36.0-59.6). BS of varying degrees of severity was detected in 63.0%, other types of disorders, partially exacerbating the severity of life restrictions: violations of surface, as well as deep sensitivity, neurotrophic disorders - in 69.9%. When analyzing the functional status, the degree of severity of the NFTO, changes in the state of health at all stages of the MR and ITU in patients with PSMT and SPK, scales and questionnaires were used.

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SERUM PER- AND POLYFLUOROALKYL SUBSTANCES AND BONE MINERAL DENSITY IN NORWEGIAN ADOLESCENTS: THE FIT FUTURES 1

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Objective: To evaluate associations between serum per- and polyfluoroalkyl substances (PFAS) and areal bone mineral density (aBMD) in Norwegian adolescents, and to explore potential sex differences and PFAS-mixture effects on bones.

Material and Methods: We used cross-sectional data from Fit Futures 1 (2010–2011). Participants with valid PFAS and DXA were included (n=924; 441 girls, 483 boys). Twenty-four PFAS were measured by UHPLC–MS/MS; PFAS with a detection rate >70% were included in the analysis. aBMD Z-scores were derived for femoral neck (FN), total hip (TH), and total body (TB). Associations were estimated using multivariable linear regression (PFAS log2-transformed; continuous and quartiles), generalized additive models, and two mixture approaches: quantile g-computation (qgcomp) and Bayesian kernel machine regression (BKMR). Sensitivity analyses additionally adjusted for lean and fat mass index and pubertal development.

Results: Of 24 PFAS, 11 had detection rates >70%. Median concentrations were highest for PFOS (6.22 ng/mL); boys had higher ΣPFOS than girls (6.58 vs 5.84 ng/mL). In pooled single-PFAS models, each doubling of PFNA and PFDA was associated with lower TB aBMD Z-scores (both β=−0.14). In girls, PFOA was inversely associated with FN (β=−0.18) and TH (β=−0.19). In boys, PFDA was inversely associated with FN (β=−0.20) and TH (β=−0.19). Most sex-specific effects attenuated after additional adjustment for lean mass. Mixture analyses (qgcomp, BKMR) showed small, non-significant overall effects; weights indicated ΣPFOS and PFDA as principal negative contributors. Evidence for sex modification was modest, with a more negative mixture direction in boys for FN; other sites showed weak or null interactions.

Conclusion: In this population-based adolescent sample, certain PFAS—particularly PFNA and PFDA—were weak but consistently associated with lower TB aBMD, while mixture-level effects were small. Adjustment for body composition and pubertal timing influenced estimates. Findings support cautious concern for long-chain PFAS and potential male susceptibility and warrant longitudinal studies with repeated exposure and bone assessments to establish temporality and mechanisms.

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DIAGNOSTIC PERFORMANCE OF AI-BASED X-RAY ANALYSIS VERSUS TRADITIONAL QUESTIONNAIRES FOR PREDICTING BONE MINERAL DENSITY IN THE COMMUNITY

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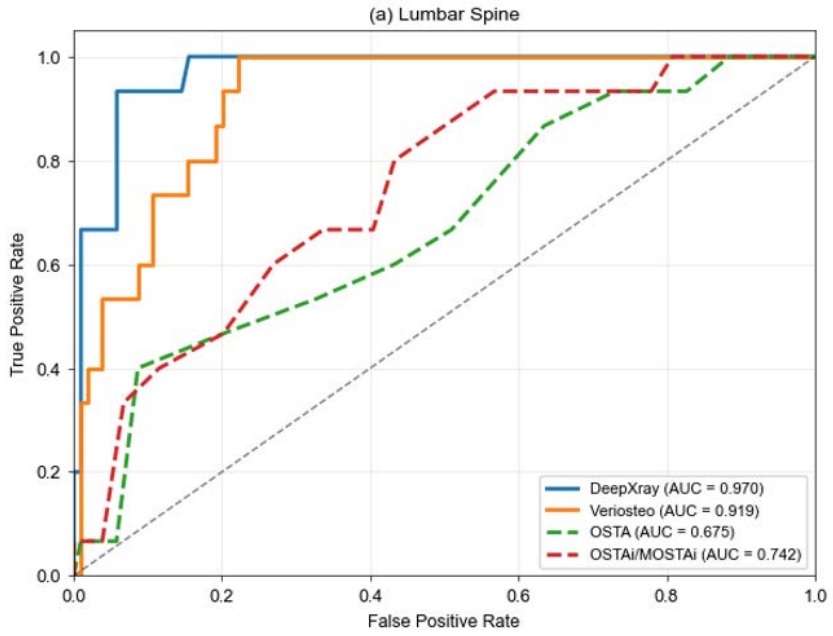
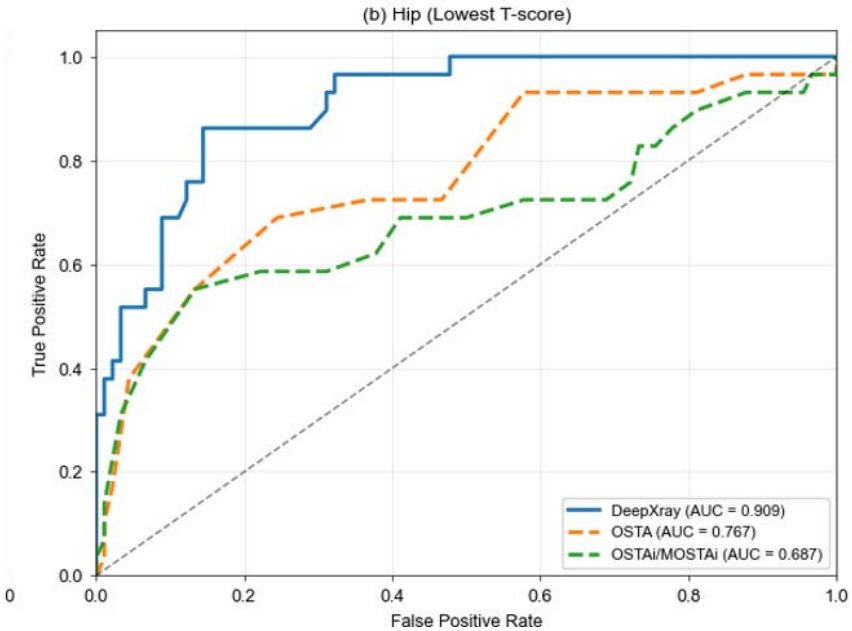
Objectives: This study aimed to compare the diagnostic accuracy of two artificial intelligence (AI)-based tools, DeepXray and VeriOsteo, in predicting bone mineral density (BMD) from chest, lumbar spine, and pelvic radiographs, with that of three traditional osteoporosis risk assessment questionnaires: OSTA, OSTAi, and MOSTAi.

Materials and Methods: A total of 357 participants from community (249 women, 108 men; mean age, 60.9 ± 10.8 years) who underwent both plain radiography and dual-energy X-ray absorptiometry (DXA) were retrospectively analyzed. AI models estimated BMD from X-rays, while questionnaire scores were derived from demographic and clinical data. DXA served as the reference standard for lumbar spine osteoporosis (T-score ≤ −2.5). Diagnostic performance was evaluated using sensitivity, specificity, and area under the receiver operating characteristic curve (AUC).

Results: Among the participants, 15 cases (12.6%) had lumbar spine osteoporosis confirmed by DXA. DeepXray showed a strong correlation with DXA measurements ($r = 0.919$, $P < .001$), outperforming VeriOsteo ($r = 0.786$, $P < .001$). For lumbar spine osteoporosis detection, DeepXray achieved a sensitivity of 33.3%, specificity of 99.0%, and AUC of 0.970, whereas VeriOsteo demonstrated a sensitivity of 20.0%, specificity of 99.0%, and AUC of 0.919. In comparison, OSTA and OSTAi/MOSTAi yielded higher sensitivities but substantially lower specificities, with AUCs of 0.675 and 0.742, respectively. AI tools demonstrated superior overall diagnostic accuracy but tended to underestimate disease severity, particularly in older patients.

Conclusion: AI-based X-ray analysis, especially DeepXray, provides excellent specificity and strong agreement with DXA, outperforming traditional questionnaires in discriminating osteoporosis. However, the lower sensitivity of AI models suggests that combining AI-based screening with conventional risk assessment tools may optimize early detection and improve individualized osteoporosis management.


(a) Lumbar Spine
True Positive Rate
False Positive Rate
DeepXray (AUC = 0.970)
Veriosteo (AUC = 0.919)
OSTA (AUC = 0.675)
OSTAi/MOSTAi (AUC = 0.742)


(b) Hip (Lowest T-score)
True Positive Rate
False Positive Rate
DeepXray (AUC = 0.909)
OSTA (AUC = 0.767)
OSTAi/MOSTAi (AUC = 0.687)

P169

TWO-STAGE OSTEOPOROSIS SCREENING USING AI FROM LUMBAR SPINE, PELVIC, AND CHEST RADIOGRAPHS COMBINED WITH OSTA: A RETROSPECTIVE STUDY

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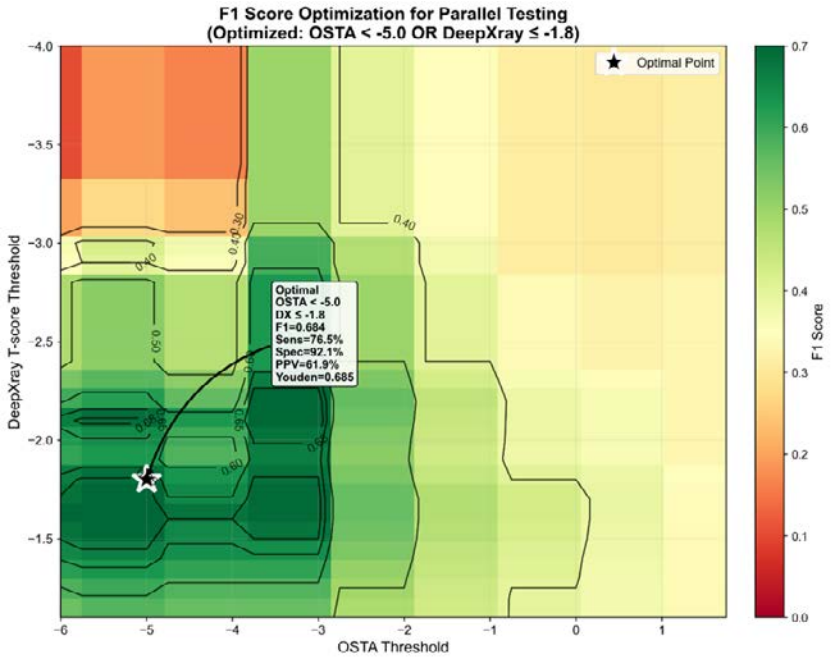
Background: In settings with constrained DXA capacity, pragmatic two-stage screening is needed to balance early case-finding with referral burden. Questionnaire tools such as OSTA are simple but imprecise, whereas AI can estimate BMD from routine radiographs. We compared OSTA, AI models, and combined strategies, explicitly evaluating an AI model that analyzes lumbar spine and pelvic radiographs (DeepXray) or CXR (VeriOsteo).

Methods: We retrospectively included 119 adults who had DXA and radiographs available. Osteoporosis was defined as the lowest T-score ≤ −2.5 at the lumbar spine, total hip, or femoral neck. We assessed OSTA, two AI models (DeepXray and Veriosteo), and three combination logics (serial, parallel, and an optimized rule) for sensitivity, specificity, predictive values, F1 score, Youden index, and DXA referral rate.

Results: Osteoporosis prevalence was 14.4%. OSTA showed moderate sensitivity (58.8%) with lower specificity (68.6%), yielding a 35.3% DXA referral rate. DeepXray achieved excellent specificity (99.0%) but limited sensitivity (29.4). A parallel strategy (OSTA OR DeepXray) improved sensitivity to 70.6% but increased referrals to 36.4%. An optimized threshold rule (OSTA < −5 OR DeepXray ≤ −1.8) provided the best balance: sensitivity 76.5%, specificity 92.1%, F1 score 0.684, Youden index 0.685, and a reduced referral rate of 17.8%—about half that of standard parallel testing while exceeding the sensitivity of either tool alone.

Conclusion: Integrating AI-derived BMD estimates from lumbar spine and pelvic radiographs with OSTA enables a high-performance, low-burden two-stage screening pathway. This approach can substantially reduce unnecessary DXA referrals while preserving case detection, supporting scalable implementation across community and hospital workflows.


F1 Score Optimization for Parallel Testing
(Optimized: OSTA < -5.0 OR DeepXray ≤ -1.8)
Optimal Point
Optimal
OSTA < -5.0
DX ≤ -1.8
F1=0.684
Sens=76.5%
Spec=92.1%
PPV=61.9%
Youden=0.685
DeepXray T-score Threshold
OSTA Threshold
F1 Score

P170

PERIMENOPAUSAL BONE MINERAL DENSITY BUT NOT RATE OF BONE LOSS IS ASSOCIATED WITH INCIDENT FRACTURE

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Objective(s): Bone loss following menopause has been well described. There are fewer studies examining associations between bone mineral density (BMD) around the time of menopause, and incident fracture. This study investigated associations between BMD values, BMD loss around menopause, and fracture.

Material and Methods: Participants (n=287, aged 50-56yr) were women who self-reported recent menopause (≥12 months to <5yr since last menstrual period) for at least one assessment phase of the Geelong Osteoporosis Study. BMD was measured at the femoral neck, lumbar spine, ultra-distal forearm and mid-forearm using Lunar DPX-L and GE-Prodigy densitometers. Incident fractures were ascertained by examination of radiological reports.

Cox proportional hazard models were used to examine associations between BMD and incident fracture. BMD was assessed as: i) T scores and ii) percentage change in BMD per year from first report of menopause to the next follow-up phase attended (median 2.1, IQR 1.9-3.3 yr). Models were adjusted for anthropometric measurements, lifestyle factors and medication use including menopausal hormone therapy.

Results: Mean(±SD) age at menopause was 50.3±4.5 years. During a median of 16.1 (IQR 8.7-21.7) years follow-up, 71 women sustained at least one fracture. Sites of fracture included forearm n=14, spine n=10, ankle n=10, rib n=8, humerus n=8, foot n=7, hand n=4, scapula n=3, hip n=2, tibia/fibula n=2, pelvis n=1, clavicle n=1 and patella n=1.

In adjusted models, greater femoral neck and lumbar spine BMD T scores around menopause were associated with a lower risk of incident fracture (HR 0.78; 0.62, 0.98, p=0.031 and 0.79; 0.65, 0.97, p=0.024, respectively).

No other associations were observed.

Conclusion(s): Greater BMD T scores at the femoral neck and lumbar spine around the time of menopause were associated with a lower risk of incident fracture. No associations were observed for BMD measurements at the forearm, or for bone loss around the time of menopause.

P171

ASSOCIATIONS BETWEEN "PEAK BONE MASS" AND LATER LIFE BONE DENSITY: DATA FROM THE GEELONG OSTEOPOROSIS STUDY

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Purpose: Bone mass is accrued during childhood and adolescence until “peak bone mass” is achieved during early adulthood. It is presumed that attaining greater peak bone mass will result in better bone health in later life, but few studies have been capable of directly assessing this relationship. This study aimed to explore associations between bone mineral density (BMD) in young adulthood and later life in a representative cohort of Australian women.

Methods: Dual x-ray absorptiometry (Lunar DPX-L, then later Prodigy) was measured at two time-points (baseline and 25yr follow-up) of the Geelong Osteoporosis Study. BMD T-scores for L2-L4 lumbar spine, femoral neck and total hip were calculated using local reference data. Participants aged between 20-30y at baseline and who returned at follow-up were included. Pearsons correlations between BMD T-scores at each time point were calculated and linear regressions modelled including age, height, weight and other clinical confounders. Each site was modelled separately. **Results:** Participants were 61 women (median age 25.9y, IQR 23.6-28.6), followed for a median 28.4y (IQR 28.0-28.5). Baseline BMD was strongly correlated with follow up BMD at all sites (spine: r=0.763; femoral neck: r=0.649; total hip: r=0.678, all p<0.001). Baseline lumbar spine T-score predicted follow-up T-score, independent of age and height (β=0.938, *p*<0.001). Trends were similar for femoral neck (β=0.665, *p*<0.001) and total hip (β=0.710, *p*<0.001), but age and height did not reach significance in these models.

Conclusions: This work confirms theoretical understandings of the relationship between peak bone mass and bone health in older life and supports future research targeting interventions at young adults.

P172

FRACTURE RATES DECLINE DURING COVID-19 LOCKDOWNS

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Objective: This study aimed to investigate fracture rates at a major regional tertiary hospital in Victoria during the 2020 COVID-19 lockdown in comparison to respective dates in 2019, and explore emerging trends.

Material and Methods: This retrospective cohort study assessed radiological reports of women attending Barwon Medical Imaging, which directly services the University Hospital Geelong, during the initial COVID-19 lockdown from 31 March to 8 July 2020, and comparable dates in 2019. Information was collected regarding patient age, fracture site date and cause of fracture. Rates per 1,000/person-years (py) in each age group were calculated and age-standardised to the broader Australian population. The overall percentage change in fracture rates across both years was also determined.

Results: Fracture rates were lower in 2020 across all age groups except ages 60-69 and 70-79 years. Ages 80+ years had the highest fracture rates with 47.8 (95% confidence interval [CI] 42.8-65.8) in 2019 and 36.1 fractures per 1,000/py (95% CI 31.8-40.3) in 2020. Ages 30-39 years, however, had the lowest fracture rates in both years with rates of 6.4 (95% CI 5.2-7.6) and 4.4 (95% CI 3.4-5.3), respectively. A statistically significant decline in fractures was observed for ages 10-19, 30-39, 40-49 and 80+ years during 2020 ($p<0.01$, $p=0.01$, $p=0.02$, $p<0.01$, respectively). Overall, fracture rates reduced by 10.9% during the pandemic ($p<0.01$), with age-standardised rates decreasing from 14.6 (95% CI 13.9-15.2) to 12.7 (95% CI 12.1-13.3) fractures per 1,000/py ($p<0.01$).

Conclusion: Nationwide lockdowns to address the rise of COVID-19 in Victoria, Australia during 2020 restricted public gatherings, work movements and outdoor activities. These changes were associated with lower fracture rates. Further research is needed to determine whether the decrease in fracture rates is applicable to the whole Australian population, including men.

P173

SARCOPENIA AND ESTIMATES OF FRACTURE RISK AMONG OLDER ADULTS

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Objective(s): Age-related decline of the musculoskeletal system is manifested as sarcopenia and osteoporosis. Fracture risk increases with decreasing bone mineral density (BMD), but it is not clear whether sarcopenia is associated with increased fracture risk. We aimed to compare estimates of fracture risk for older adults with and without sarcopenia.

Materials and Methods: Participants (303 men, 308 women; ages 60-90y) were from the Geelong Osteoporosis Study. Maximum handgrip strength (HGS) was identified from triplicate measures in each hand using a handheld dynamometer. Appendicular lean mass (ALM) and BMD at the femoral neck were assessed by DXA (Lunar). Probable sarcopenia was identified by low HGS (<27kg men, <16kg women) and confirmed by low relative lean mass (ALM/h^2 <7.0kg/m^2 men, <5.5kg/m^2 women). Ten-year probabilities (%) for hip and major osteoporotic fractures were calculated using FRAX(Aus) with and without BMD. Differences in FRAX scores for those with and without sarcopenia were identified using the Mann-Whitney test for non-parametric data.

Results: The 37 (6.1%) participants with probable sarcopenia were older (mean±SD), 78.6±7.5-vs-70.5±7.4 y (p<0.001), had similar BMI, 28.2±5.8-vs-28.5±4.9 kg/m^2 (p=0.758) and lower BMD, 0.787±0.098-vs-0.892±0.135 g/cm^2 (p<0.001) than those without sarcopenia. Probable sarcopenia was associated with higher FRAX scores for hip fracture calculated with BMD (median (IQR)), 3.8(2.3-6.3)-vs-1.0(0.4-2.4) and without BMD, 7.5(4.5-13.0)-vs-1.8(0.7-4.4), (both p<0.001). A similar pattern was observed for major osteoporotic fractures, both with BMD, 11.0(7.5-17.0)-vs-4.2(2.7-6.9) and without BMD, 16.0(9.2-28.0)-vs-5.2(2.9-8.9), (both p<0.001). Only four adults had confirmed sarcopenia - too few for separate analyses.

Conclusion(s): We report that sarcopenia is associated with higher FRAX scores for hip and major osteoporotic fractures among older adults. Sarcopenia was associated with higher fracture risk estimates that are based on age and BMD. This finding supports the notion of increased fracture risk attributable to osteosarcopenia.

P174

INCREASED INTAKE OF SATURATED FATTY ACIDS DURING ADOLESCENCE IMPACTS THE ENDOPLASMIC RETICULUM TO INDUCE INSULIN RESISTANCE AND COMPROMISED BONE MINERAL DENSITY

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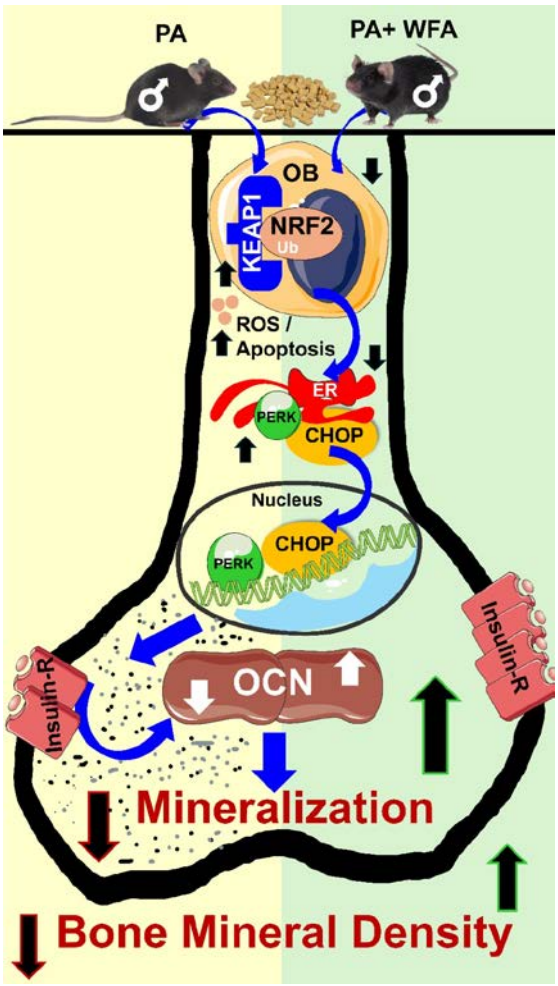
Objective: Excessive consumption of saturated fatty acids, especially in adolescence, which is a peak growth period, disrupts the body's metabolic functions. GeneCards has associated palmitic acid (PA), a prevalent saturated fatty acid, with lipotoxicity. This study aimed to investigate the impact of PA on bone-forming cells and skeletal health, and to evaluate the protective effect of Withaferin A (WFA), a steroidal lactone.

Materials and Methods: Lipotoxic conditions were emulated in vivo in growing (adolescent) C57BL/6J mice after PA administration for 15 days. Subsequent GC-MS analysis of the serum was performed to assess alterations in the metabolic profiles of fatty acids. Cellular and molecular assessments included evaluation of oxidative stress, apoptosis, ER stress, and regulation of the osteogenic Wnt/β-catenin pathway.

Results: PA intake impaired the function of bone-forming cells by suppressing cellular defense against oxidative markers, leading to apoptosis and increased ER stress. Excess PA also dysregulated glucose homeostasis by altering GLUT4 (insulin-regulated glucose transporter) and compromised skeletal health. Serum GC-MS showed critical metabolic changes in fatty acids, but structural analysis proved the impaired bone volume/tissue volume and disrupted bone microarchitecture. These diminished the bone mineral density (BMD) and damaged the mechanical qualities. These results were supported by pronounced reductions in serum biomarkers, i.e., P1NP, osteocalcin, and insulin. Still, WFA countered these actions by restoring the osteogenic Wnt/β-catenin signalling pathway.

Conclusions: Our results emphasise the harmful consequences of PA overload within the window of accelerated skeletal growth, resulting in lipid deposition, metabolic disturbance, and impaired bone modelling. WFA mitigated these adverse effects, underscoring its therapeutic potential in protecting skeletal health under lipotoxic conditions.

Keywords: Adolescence / Bone mineralization / Glucose homeostasis / Osteoblasts / Palmitic acid / Apoptosis / Bone modeling


PA
PA+ WFA
OB
KEAP1
NRF2
Ub
ROS /
Apoptosis
ER
PERK
CHOP
Nucleus
PERK
CHOP
Insulin-R
Insulin-R
OCN
Mineralization
Bone Mineral Density

P175

PREGNANCY AND LACTATION-ASSOCIATED OSTEOPOROSIS

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Objective: To present a case of pregnancy- and lactation-associated osteoporosis (PLO).

Methods: To describe a case of PLO, including presenting features, investigation findings, and management.

Results: A 33-year-old exclusively breastfeeding female presented with atraumatic back pain starting one month postpartum. Examination revealed tenderness over T11/T12 vertebrae. Radiographs showed a T11 vertebral crush fracture with >20% height loss. Dual-energy X-ray absorptiometry (DXA) revealed osteoporosis with T-scores of -1.5 at the left femoral neck and -2.6 at the lumbar spine. She had no personal or family history of metabolic bone disease, was vitamin D replete, but had suboptimal dairy intake. Secondary osteoporosis workup was unremarkable. She was diagnosed with PLO and managed with calcium supplementation, dietary advice to increase dairy intake, and encouragement to wean breastfeeding. Pain improved at four-week follow-up.

Conclusion: PLO is rare, typically affecting primiparous women in the third trimester or postpartum. Vertebral fractures causing back pain are common, with DXA often showing lower spine than femur bone density due to trabecular bone loss.[1] Pathophysiological mechanisms include hypoestrogenism secondary to hyperprolactinemia, release of parathyroid hormone-related peptide from the breast and placenta, and increased lordosis with reduced physical activity during pregnancy.[2] First-line management involves calcium and vitamin D supplementation and cessation of breastfeeding,[1] with bone density usually improving within 6–12 months post-weaning without pharmacotherapy. Antiresorptives or teriparatide may improve bone density, but long-term safety and effects on future pregnancies require consideration[3]. Early recognition of PLO is crucial to prevent morbidity.

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MANAGEMENT OF RESISTANT HYPERCALCAEMIA OF MALIGNANCY: THE ROLE OF ANTIRESORPTIVE AGENTS

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Objectives: To highlight the therapeutic challenges of managing resistant hypercalcaemia of malignancy (HCM) and to illustrate the role of antiresorptive agents.

Methods: To describe the clinical course of a patient with metastatic breast cancer who developed refractory hypercalcaemia and received sequential antiresorptive therapies.

Results: A 63-year-old female with ER-positive breast cancer metastatic to bone, lung, and liver presented with symptomatic hypercalcaemia. She had been receiving denosumab 120 mg subcutaneously every 4 weeks for prevention of skeletal-related events associated with bone metastases. On admission, corrected calcium (CorrCa) was 3.54 mmol/L (reference 2.10–2.60 mmol/L), with suppressed parathyroid hormone (0.8 pmol/L; reference 2.0–6.0 pmol/L), consistent with non–PTH-mediated hypercalcaemia. Intravenous (IV) fluid therapy over 2 days produced only transient improvement. A single 4 mg dose of IV zoledronic acid was ineffective, necessitating escalation to weekly IV zoledronic acid alongside ongoing denosumab. Adjunctive measures included IV frusemide and calcitonin, the latter providing only short-lived benefit due to tachyphylaxis. Despite intensive therapy, calcium levels remained above 2.90 mmol/L, and the patient succumbed to progressive disease after six weeks.

Conclusion: HCM carries a poor prognosis and remains a therapeutic challenge. IV hydration and antiresorptive therapy are central to management, yet resistance can occur despite combined or sequential use of denosumab and bisphosphonates. This case underscores the need for multimodal management strategies and further research to optimise antiresorptive therapy in resistant cases. Robust randomised controlled trials are currently lacking, and future studies are needed to determine the most effective sequencing of therapies for HCM.

P177

PEP UP YOUR BONES: EARLY IMPACT OF PURPLE EDGE PROGRAM (PEP) ON STRENGTH AND PERFORMANCE IN FEMALE ADOLESCENT ATHLETES

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Objective(s): This prospective pilot study evaluated the feasibility, safety, and preliminary outcomes of a novel, multi-modal training protocol, the Purple Edge Program (PEP), designed to enhance bone and muscle health, flexibility, and performance in female high school baseball players aged 15-17. The program's design was aimed at preventing common injuries and fractures.

Material and Methods: Twenty female high school baseball players completed six supervised training sessions between May 2025 and September 2025. The PEP integrated several cutting-edge modalities: bioDensity (low-impact, high-intensity, self-applied osteogenic loading), PowerPlate (whole-body vibration), and red light therapy and Neuradiant 1070 (transcranial near-infrared photobiomodulation) for supporting focus, reaction time, recovery, and resilience to fatigue. Baseline and post-intervention measurements included: maximal isometric force production via bioDensity, bone mineral density (BMD) using Radiofrequency Echographic Multispectrometry (REMS), body composition, toe muscle strength, grip strength, and screenings for the Female Athlete Triad and menstrual cycle status.

Results: All participants had BMD within the normal, healthy range at baseline, a meaningful finding for this young athletic population. After six sessions, bioDensity force production increased by 72.5% in the upper body ($p<0.001$) and by 65.3% in the lower body ($p<0.001$), demonstrating significant improvements in muscular strength. Subjective improvements reported by athletes included increased throwing and batting velocity, enhanced balance, prevention of ankle injuries, and reduced fatigue during stair-climbing training. No significant changes in BMD were observed over this short-term period. The program was well tolerated with no adverse events and a 95% satisfaction rate. This study represents one of the first prospective datasets of serial REMS BMD assessments in young female athletes.

Conclusion(s): This study demonstrates that PEP is a safe, well-tolerated, and effective intervention for enhancing muscular strength and performance in adolescent female baseball players. While a significant increase in BMD was not observed, the program successfully improved markers of muscular strength crucial for long-term skeletal health. The inclusion of regular BMD monitoring in this population offers a unique opportunity to detect changes during a critical period of peak bone mass accrual. Longer-term follow-up with quarterly BMD monitoring will be necessary to clarify whether the PEP can help optimize peak bone mass in female athletes.

Disclosure: *K.N. is the founder and representative director of BEYOND KAMPO Inc., which provided partial funding for this study. All other authors declare no competing interests.*

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BRIDGING THE GAPS: OSTEOPOROSIS CARE AFTER DISTAL RADIUS FRACTURES IN ACUTE-CARE COMMUNITY HOSPITALS IN JAPAN

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Objective: Distal radius fractures (DRFs) are common in relatively younger elderly people and older adults and often indicate underlying osteoporosis, making them an important opportunity for bone health assessment and intervention. However, studies consistently show that both DXA (dual-energy X-ray absorptiometry) screening rates and invitation rates for osteoporosis treatment remain low even after these fractures. This retrospective study evaluated the proportion of patients with DRFs at a municipal hospital in Japan who received diagnostic evaluation or treatment for osteoporosis within 1 year.

Methods: Patients aged over 50 years who received treatment for low-energy distal radius fractures at our hospital between 2022 and 2025 were analyzed for initiation of osteoporosis medications and performance of DXA testing within 1 year post-injury.

Results: A total of 183 patients (mean age 75.4 years, 81.4% female) were included. Within 1 year, DXA testing was performed in 29.5% of patients, and osteoporosis medication was initiated in 20.8% of patients. Female were significantly more likely than men to receive osteoporosis medication (24.2% vs 5.9%, P = 0.018). Hospitalized patients received osteoporosis treatment more frequently than outpatients (22.6% vs 16.0%), and patients underwent surgery received it more frequently than those treated conservatively (21.4% vs 17.2%). A similar trend was observed in DXA testing rates, but these differences were not statistically significant. The mean time to testing and treatment initiation was 7.5 and 10.0 weeks, respectively.

Conclusions: In this single- institution study, only small number of DRF patients received osteoporosis intervention within 1 year. Orthopedic surgeons should recognize the potential for underlying osteoporosis and the opportunity for treatment intervention when managing DRFs. These findings highlight missed opportunities for secondary prevention and underscore the need for interventions, such as fracture liaison services, to close the treatment gap in community-based healthcare settings.

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PREDICTION OF BONE MINERAL DENSITY FROM RADIOGRAPHIC OF LUMBAR AND HIP JOINT IN JAPANESE FEMALES USING ARTIFICIAL INTELLIGENCE

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Objective: Dual energy x-ray absorptiometry (DXA) is used worldwide as gold standard of detection method of bone mineral density (BMD) for osteoporosis diagnosis, whereas this is unsuitable for screening to detect the case with osteoporosis risk from large populations. In recent years, a new method has been developed to estimate BMD using easily available X-ray images with the assistance of artificial intelligence (AI). The aim of this study was to investigate the predictability of BMD by the new method (X-ray&AI) by comparing two methodologies.

Material and Methods: Participants were Japanese females who had undergone both DXA and X-ray examinations of lumbar and/or hip joint. Exclusion criteria were the participants with implant placement or severe bone deformity. BMDs of lumbar and hip joint by DXA were measured by using a Horizon (R) System (Hologic, Inc., USA). In X-ray&AI, frontal radiographs of lumbar and hip joint were recorded using a digital radiography system (AeroDR SYSTEM, CONIKA MINOLTA, Inc., Japan), and BMD from the image was estimated using an osteoporosis diagnostic solution with AI (DeepXray (TM) Spina, Coxa, Alpha Intelligence Manifolds, Inc., Taiwon). Agreement in BMD between X-ray&AI and DXA was assessed by Pearson's product-moment correlation coefficient r (α=5%). Prediction error was evaluated by root mean square (RMS). Furthermore, the regression coefficient of X-ray&AI on DXA was calculated.

Results: Excluding the X-ray&AI detection errors, subjects were 208 females (75.2 ± 11.0 years) in lumbar and 212 females (78.3 ± 10.7 years) in hip joint. The r was 0.914 (p <0.01) in lumber (L1 to L4), 0.886 (p <0.01) in femoral neck, and 0.906 (p <0.01) in total hip. The RMS errors in all parts were more than 0.075. The regression coefficients in all parts were less than 0.781.

Conclusion: Although BMD estimated by X-ray&AI was very close to that predicted by DXA, that was lower than that predicted by DXA. Although X-ray&AI tend to be predicted as a positive diagnosis of osteoporosis, the case detected osteoporosis risk by X-ray&AI can be confirmed by DXA. Thus, X-ray&AI will be useful for screening to detect the case with osteoporosis risk from large populations.

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DEVELOPMENT OF A GERIATRIC FRACTURE RISK ASSESSMENT TOOL IN COMPARISON TO FRACTURE RISK ASSESSMENT TOOL (FRAX)

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Background: Fractures in elderly are common and some major osteoporotic fractures (MOF), particular hip fractures, carry high mortality rates. Both bone mineral density (BMD) measurement by means of dual-energy X-ray absorptiometry (DXA) and FRAX scores have long been integral tools for fracture risk prediction. Although BMD exhibits a crucial role in identifying elderly at risk of fractures, varying availability of DXA across public or subsidized healthcare settings limits its utilization as a primary screening tool in routine practice. While FRAX exhibits reasonably good prediction power of fractures in its target general adult population, such prediction ability within elderly subgroup remains less clear to date. In such context, some geriatric-based parameters, such as muscle strength and function, attract increasing attention on their values in fracture prediction in older population.

Method: We investigated participants from the Mr. and Ms. OS (Hong Kong) cohorts consisting of 65 years or above older Chinese population through standardized questionnaires and physical measurements (particularly body weight, height, grip strength and gait speed) conducted by research assistants during visits, and data retrieval from past health records. We identified those parameters which were statistically significantly different between fracture and non-fracture groups. They were put into a newly developed elderly fracture prediction model (namely “alternative model”), in which the association between all testing variables and fracture incidence was assessed by multivariate Cox proportion hazards model. The predictive accuracy of the alternative model and the FRAX-Hip score were evaluated by comparison of the areas under the receiver operating characteristic curve (AUC). The AUC difference between the alternative model and FRAX-Hip score was tested by a non-parametric method.

Results: Among all 4,000 (2,000 females) subjects from the cohort, there were totally 132 (69 females) hip fractures and 353 (221 females) MOF cases after the 10-year follow-up period. Besides low femoral BMD, advanced age, low body mass index (BMI), positive fracture history in 12 months, smaller grip strength and diminished gait speed were the additional significant parameters to predict hip fractures and MOF. Putting all these parameters into our alternative geriatric fracture prediction model, the AUCs of this model were greater than those of FRAX-Hip scores among both hip fractures and MOF, both after 5-year and 10-year follow-up periods. The AUC differences among male subgroup also reached statistical significance ($p < 0.05$ level).**Conclusion:** Our study illustrates that our alternative model is a promising alternative to FRAX on prediction of fractures (hip fractures and MOF) among elderly population, with or without BMD measurement. Hopefully our findings can add insights to the management, in particular primary prevention, of fractures among elderly population.

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CLOSING THE GAP IN OSTEOPOROSIS SCREENING: A QUALITY IMPROVEMENT INITIATIVE FOR HOSPITALIZED POSTMENOPAUSAL WOMEN

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Background: Osteoporosis is a significant public health concern, particularly among postmenopausal women, with fragility fractures leading to increased morbidity, mortality, and healthcare costs. Despite guidelines recommending opportunistic screening using the Osteoporosis Screening Tool for Asians (OSTA) and bone mineral density (BMD) testing, adherence remains low in inpatient settings. This clinical practice improvement project (CPIP) aimed to increase BMD screening rates among moderate-to-high-risk postmenopausal women admitted to a general medicine ward in Khoo Teck Puat Hospital (KTPH), Singapore, from a baseline of 9.1% to 60% over six months.

Methods: A multidisciplinary team implemented Plan-Do-Study-Act (PDSA) cycles to address barriers identified through root cause analysis, including lack of physician prioritization, inconsistent screening practices, and patient misconceptions. Interventions included awareness meetings for staff, integration of an OSTA-based smart phrase into the electronic health record (Epic), and regular reminders by nurses and senior doctors. Data were collected prospectively from June 2024 to January 2025, tracking BMD performance rates among eligible patients.

Results: Post-intervention, BMD screening rates improved significantly. After PDSA 1.0 (awareness meetings), rates rose to 41.65%. PDSA 1.1 (smart phrase implementation) further increased rates to 71.43% by January 2025. High-risk patients showed a 75% osteoporosis detection rate when screened. Key challenges included workflow disruptions and staff turnover, mitigated by sustained education and system-level prompts.

Conclusions: Systematic interventions, including staff education and electronic reminders, effectively improved inpatient osteoporosis screening rates. Sustainability requires ongoing training, multidisciplinary collaboration, and integration of automated prompts into clinical workflows. This project highlights the potential for scalable, guideline-concordant osteoporosis management in acute care settings.

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SEQUENTIAL OSTEOPOROSIS TREATMENT IN AN ELDERLY MALE WITH STAGE 3B CKD: STRATEGIC USE OF ZOLEDRONIC ACID WITH DEFERRED DENOSUMAB

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Objective: To present a structured osteoporosis treatment approach in a patient with stage 3b CKD, prioritizing renal safety and long-term therapeutic flexibility.

Material and Methods: A 78-year-old male with hypertension and stage 3b chronic kidney disease (creatinine clearance 36 mL/min) sustained a low-trauma vertebral fracture. Bone mineral density evaluation showed a lumbar spine T-score of -3.2. Intravenous zoledronic acid was selected as initial therapy based on its renal safety profile and anti-fracture efficacy, with denosumab reserved as a second-line option due to concerns regarding rebound vertebral fracture risk upon discontinuation.

Results: Zoledronic acid was well tolerated with no deterioration in renal function or significant acute-phase reaction. At one year post-treatment, the patient remained fracture-free and clinically stable. Plans for a follow-up DXA scan and repeat infusion are in place. Laboratory monitoring and renal function surveillance will continue alongside with BMD assessments. Should bone density response remain suboptimal, a planned transition to denosumab will be considered with close monitoring to mitigate discontinuation risk.

Conclusion: This case supports a renal-conscious, stepwise osteoporosis treatment strategy in elderly CKD patients. Beginning with zoledronic acid and deferring denosumab maintains clinical efficacy, preserves future treatment options, and minimizes long-term risk. This approach provides a practical and adaptable framework for managing osteoporosis in patients with renal impairment. Future work should explore longitudinal outcomes of such sequencing strategies in real-world CKD populations.

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SIDE-TO-SIDE DIFFERENCES IN HIP BONE MINERAL DENSITY AND RELATED FACTORS

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Objectives: Previous studies have reported side-to-side differences in hip bone mineral density (BMD) and suggested that measuring both hips improves the accuracy of osteoporosis detection. However, these studies used dual-energy X-ray absorptiometry (DXA), in which measurement errors are inevitable. Moreover, substantial side-to-side differences in femoral morphology have been documented even in morphologically normal hips, potentially influencing DXA-based BMD assessments. Therefore, this study aimed to quantify side-to-side differences in hip BMD using quantitative CT (qCT) and to analyze factors associated with these differences.

Materials and Methods: We prospectively enrolled 105 participants (23 men; mean age, 73±12 years; mean height, 157±17 cm; mean weight, 55±11 kg). The absence of osteoarthritis was confirmed by hip radiographs. Bilateral hip BMD (total region) was automatically assessed with a previously developed and validated deep-learning-based qCT method. The absolute % differences in side-to-side BMD were calculated. Potentially related factors—including demographics (sex, height, and weight), morphological parameters (femoral anteversion and neck-shaft angle), and gluteal muscle volume—were evaluated using univariate and multivariate analyses.

Results: The mean BMD of the right and left hips was 0.739±0.120 g/cm^2 and 0.736±0.122 g/cm^2, respectively ($p=0.27$). The median absolute % difference was 3.2%. Among the analyzed factors, only the difference in gluteal muscle volume was significantly associated with the side-to-side BMD difference in both univariate and multivariate analyses (both $p<0.01$).

Conclusions: Based on qCT, we identified a 3.2% side-to-side difference in hip BMD, which was significantly correlated with differences in gluteal muscle volume. These findings suggest that asymmetry in weight loading, mediated by gluteal muscle function, contributes to side-to-side BMD differences.

P184

COST-EFFECTIVENESS OF FRAX®-BASED INTERVENTION THRESHOLDS FOR MANAGEMENT OF OSTEOPOROSIS IN BANGLADESH

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Objective: FRAX®-based intervention thresholds (ITs) have not yet been established in Bangladesh. This study aimed to evaluate which ITs could be cost-effective in Bangladeshi women aged 50 years and older.

Materials and methods: A Markov microsimulation model was adapted to estimate the lifetime healthcare costs (BDT 2025) per quality adjusted life-years (QALY) of oral alendronate compared with no treatment. Cost-effectiveness of age-dependent FRAX® major osteoporotic fracture (MOF) ITs and hip fracture (HF) ITs was estimated. Cost data was obtained from a public tertiary care hospital in Bangladesh. The base-case analysis incorporated the price of generic alendronate and assumed no long-term costs following fractures. A cost-effectiveness threshold of BDT 314,693/QALY gained was used, based conservatively on one time the Bangladesh GDP per capita.

Results: Alendronate was shown to be cost-effective at MOF ITs from the ages of 60 and 70 years under full and real-world adherence and HF ITs from the ages of 55 and 65 years under full and real-world adherence respectively (Table 1).

Conclusion: This study suggests that the treatment of Bangladeshi women with alendronate is cost-effective at age-dependent FRAX® intervention thresholds from 65 years or older for HF and 70 years or older for MOF. Offering cost-effective access to therapy for individuals with high fracture probabilities, as determined by FRAX®, holds significant potential in mitigating the escalating burden of osteoporotic fractures in Bangladesh.

Table 1: ICER expressed in costs BDT per QALY gained of alendronate compared with no treatment at different age dependent major osteoporotic fracture intervention thresholds (MOF ITs) and hip fracture thresholds (HF ITs) in Bangladesh

I GDP = 314,693 (https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=BD)

Years - MOF ITs	Full medication adherence	Real world adherence
50 years- 2.8%	1,147,708	8,695,387
55 years-4.6%	386,340	4,115,736
60 years-8%	Dominant	1,459,012
65 years-13%	Dominant	434,289
70 years-17%	Dominant	68,387
75 years-20%	Dominant	Dominant
80 years-21%	Dominant	Dominant
85 years-22%	Dominant	Dominant
90 years-22%	Dominant	Dominant
Years - HF ITs	Full medication adherence	Real world adherence
50 years-0.6%	470,050	5,510,242
55 years-1.2%	81207	2,213,588
60 years-2.6%	Dominant	907,850
65 years-4.8%	Dominant	256,328
70 years-7.2%	Dominant	Dominant
75 years-9.5%	Dominant	Dominant
80 years-12%	Dominant	Dominant
85 years-13%	Dominant	Dominant
90 years-12%	Dominant	Dominant

* Cost effectiveness threshold: BDT 314,693 / QALY gained

HF: Hip fracture; IT: Intervention threshold; MOF: Major osteoporotic fracture; QALY: Quality-adjusted life-year, ICER: Incremental Cost Effectiveness Ratio

Dominant: Describes the situation where an intervention is more effective and less costly

1USD= 121.85 Bangladeshi Taka (BDT)

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COST-EFFECTIVENESS OF A FRACTURE LIAISON SERVICE IN CHINA

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Objective: Osteoporotic fractures are associated with increased mortality, reduced health-related quality of life, and a heightened risk of secondary fractures. Fracture Liaison Services (FLSs) have demonstrated significant benefits in improving health outcomes for patients with fragility fractures. Since their introduction in China in 2021, FLSs have grown rapidly; however, economic evaluations in the Chinese setting remain lacking. This study aimed to evaluate the cost-effectiveness of an FLS combined with online home nursing care for patients with fragility hip fractures in China.

Methods: A microsimulation Markov model was developed to estimate the lifetime costs and quality-adjusted life years (QALYs) of hip fracture patients receiving the combined FLS and online home care, compared to standard care. Model parameters were informed by a comparative effectiveness pilot study[1]. The hypothetical cohort included patients aged 50 years, with 65% being female. Analyses were conducted from the healthcare system perspective using a 1-year cycle and lifetime horizon. Included costs comprised hospitalisation for fracture treatment, post-discharge medications, long-term care, intervention costs and other direct healthcare costs. Costs and QALYs were discounted at 5% annually. The cost-effectiveness threshold of $37,118 USD[2] was applied. Sensitivity analyses, including one-way, scenario, and probabilistic sensitivity analyses, were conducted to test the robustness of the results.

Results: In the base-case analysis, the FLS group showed $88,152 in lifetime costs and 10.82 QALYs, compared to $86,182 and 10.64 QALYs for standard care. The incremental cost-effectiveness ratio (ICER) was $10,944 per QALY gained, which was below the cost-effectiveness threshold. The probabilistic sensitivity analysis showed a 99.85% probability of FLS being cost-effective. One-way sensitivity analyses confirmed the robustness of results across variations in hospitalisation costs, secondary fracture risk, female proportion, and discount rate. Scenario analyses showed that starting ages of 60, 70, and 80 years resulted in ICERs of $8172, $7026, and $6467 per QALY, respectively, with cost-effectiveness probabilities exceeding 99.5% in all scenarios.

Conclusion: The FLS integrated with online home nursing care for hip fracture patients in China is cost-effective compared to standard care. This study demonstrated the economic value of the FLS, supporting its potential prioritisation in healthcare resource allocation for fragility hip fracture management.

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Acknowledgements

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A CORRELATION OF FRAX SCORE AND VERTEBRAL BODY HEIGHT LOSS MEASURED IN RADIOGRAPHS AMONG ELDERLY PATIENTS WITH BACK PAIN: A CROSS-SECTIONAL STUDY IN A TERTIARY INSTITUTION

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Objectives: To determine the correlation between FRAX (Fracture Risk Assessment Tool) scores and vertebral body height loss in elderly patients with back pain.

Materials and Methods: Patients who fulfill the inclusion criteria at first consult at the OPD will undergo FRAX scoring calculation with lumbosacral radiographs taken. The Data Sheet for each patient contains only the age, gender, FRAX score and Vertebral Body Height Loss. Genant's semi-quantitative system for vertebral fractures will be used for stratification of the vertebral body height loss. Statistical analysis or treatment will be calculated using the Pearson correlation analysis for the FRAX score and Vertebral Body Height Loss.

Result: A total of 52 patients aged 60 years and above were included with a median age of 70 years (range: 60–84 years). The study population had a male-to-female ratio of 1:3, indicating a predominance of female participants. The mean FRAX score was 8.04, reflecting a moderate estimated risk of osteoporotic fractures in the study cohort. Based on Genant's semi-quantitative classification system, 22 patients were classified as grade 3 and 12, 16 and 2 patients were classified as grades 2, 1 and 0 respectively. Pearson correlation analysis between FRAX scores and vertebral body height loss revealed an R value of 0.7067, indicating a moderate positive correlation between these variables. Furthermore, statistical analysis yielded a P-value<0.00001, confirming that the observed correlation was highly significant at both $p<0.01$ and $p<0.05$ levels.

Conclusion: This study demonstrates a moderate positive correlation between FRAX scores and vertebral body height loss among elderly patients with back pain. The statistically significant relationship suggests that FRAX may serve as a valuable screening tool for assessing osteoporosis-related vertebral fractures, particularly in settings where DEXA scans are not feasible.

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Acknowledgement: None

Disclosure: None

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BONETRACK: DEVELOPMENT OF A DYNAMIC DIGITAL DASHBOARD FOR COMPREHENSIVE BONE HEALTH BIOMARKER SURVEILLANCE AT A NATIONWIDE TERTIARY CARE LABORATORY NETWORK IN PAKISTAN

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Objective: To create a dynamic digital dashboard for nationwide bone health biomarker surveillance, enabling early detection of trends and timely clinical intervention in Pakistan.

Material and Methods: This health informatics study involved the design, development, and implementation of a clinically integrated bone health monitoring dashboard. Data from over 1.8 million test requests covering five key bone health biomarkers collected across 300+ laboratory collection points nationwide for last 15 years were extracted, with ongoing monthly prospective data updates.

Clinical classification frameworks were integrated into the dashboard for six parathyroid disorder phenotypes, and nomogram-based evaluation: Expected PTH (maxPTH) was calculated via the nomogram and compared to measured iPTH to assess secretory capacity and detect subtle dysfunction.[1,2]

Results: The resulting dashboard provides an interactive visualization of nationwide bone health biomarker data. Users can explore temporal trends and geospatial distribution of over 1.84 million test requests, stratified by over ten customizable variables. Biomarkers can be viewed individually or in combination, enabling detection of patterns for various bone health disorders. Integrated clinical classification algorithms further allow automated categorization of biochemical profiles into defined phenotypes, facilitating targeted surveillance and early intervention.

Conclusions: The developed dashboard will be used in the laboratory and integrated in bone health clinics. The user-friendly and visually appealing dashboard will enable healthcare professionals to make data driven decisions on their personal computers/cell phones, based on the most recent data from across the country. This will aid in integrating nationwide bone health data for LMIC and also improve clinical decision making and hence overall patient care.

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Chemical Pathology Dashboard
Gender
Result
Visit Type
Age Range
Prefix
Visit Location
Date Range
Test Description
1,25 DIHYDROXY VITAMIN D
25-HYDROXY VITAMIN D
CALCIUM
PARATHORMONE *
PHOSPHORUS
S.CALCIUM
Total Specimen Split by Gender
Total Specimens by Patient Age
Total Specimens by Result type
1.64
Average TAT Days
MNEMONIC
Average TAT Days
VITAMIN-D 2.30
PTH 4.33
PH 1.12
CA19-9 5.41
CA-15-3 1.67
CA-125 2.10
CA 1.45
1-25-VITAMIN-D 6.94
Total 2.09
Total Unique Patients by MNEMON
Total Unique Patients by Location
AFGHANISTAN
PAKISTAN
INDIA
Go back
Page 1
Chemical pathology Dashboar...
Data updated 04/04/23

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LOW VITAMIN D METABOLITE RATIO PREDICTS METABOLIC SYNDROME IN ARAB ADOLESCENT BOYS

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Background: The vitamin D metabolite ratio (VMR), which reflects the percentage of 24,25-dihydroxyvitamin D (24,25$(OH)_2$D) from the total 25-hydroxyvitamin D (25(OH)D), has become a useful marker for vitamin D metabolism. However, the data related to the association of VMR with metabolic syndrome (MetS) and its risk components is limited in adolescents, especially in Middle Eastern populations. This study aimed to address this research gap.

Methods: This cross-sectional study employed data from the Biochemical Osteomalacia database curated by the Chair for Biomarkers of Chronic Diseases (CBCD) at King Saud University. We took anthropometric, biochemical, and blood pressure measurements for a random sample of 932 adolescents aged 12 to 17 years in the database. A validated LC–MS/MS method was used to measure the levels of vitamin D metabolites in serum. The definition of MetS utilized sex- and age-specific pediatric cut-offs derived from the National Cholesterol Education Program (NCEP) criteria. Logistic regression models evaluated the relationships between vitamin D metabolites and MetS, controlling for age and sex.

Results: In total, the prevalence of MetS was seen in 9.4% (N=88) of the study participants. A sex-specific association of VMR with MetS and its individual components was observed. Specifically, boys with VMR ≤4% vs. VMR>4% had higher odds of elevated waist circumference (OR 8.34; 95% CI: 1.1–63.1; p = 0.041), elevated blood pressure (adjusted OR 1.85; 95% CI: 1.1–3.1; p = 0.019), and low HDL-C (adjusted OR 1.69; 95% CI: 1.1–2.6; p = 0.018). A VMR of ≤4% was strongly linked to full MetS in boys (age-adjusted OR: 3.29; 95% CI: 1.4–8.0, p=0.009), but not in girls. Conversely, the total 25(OH)D exhibited weaker and statistically insignificant associations with MetS in both genders.

Conclusion: The results suggest VMR to be a better biomarker than total vitamin D in identifying adolescents who are at risk of MetS, especially boys. These results recommend the integration of VMR into pediatric risk assessment and highlight the necessity for mechanistic and longitudinal studies to better understand sex-specific pathways in vitamin D metabolism and cardiometabolic health.

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LC-MS/MS-BASED VITAMIN D METABOLITE PROFILING AND NUTRITION-ACQUIRED BIOCHEMICAL OSTEOMALACIA IN ADOLESCENTS

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We previously reported a high prevalence of biochemical osteomalacia among apparently healthy Arab adolescents using combined mineralization markers. This study examined whether advanced LC-MS/MS–based vitamin D metabolite profiling, including the vitamin D metabolite ratio (VMR), can serve as indicators of biochemical osteomalacia in Arab adolescents. A total of 949 age- and body mass index-matched adolescents (513 girls, mean age 14.9 ± 1.8 years, body mass index, BMI 23.0 ± 5.9; 436 boys, mean age 14.9 ± 1.7 years, BMI 23.7 ± 5.8) were included in this cross-sectional study. Anthropometrics and biochemical parameters [glucose, lipid profile, calcium (Ca), inorganic phosphorus (Pi), alkaline phosphatase (ALP)] were measured using routine assays. Circulating vitamin D metabolites [24,25$(OH)_2$D (24, 25 VD), VD2, VD3, total VD] were quantified using LC-MS/MS, and VMR calculated as [24,25 VD/VD] × 100. Deficiency cut-offs were: VD <30 nmol/L, 24,25 VD <3.0 nmol/L, VMR <4%. Biochemical osteomalacia was defined as ≥ 2 abnormal markers (low VD, high ALP, low Ca, or low Pi). All vitamin D metabolites were significantly lower in the biochemical osteomalacia group. Overall, VD showed the highest predictive value (AUC 0.71, Youden index 0.40). Stratified analyses revealed VMR as a modest marker in girls (AUC 0.60), while VD3 performed best in boys (AUC 0.77, Youden index 0.60). VD metabolites as a single test are modest predictors of biochemical osteomalacia in adolescents and differ in accuracy according to sex.

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BEYOND CLINICAL TRIALS. ROMOSOZUMAB IN SOUTHEAST ASIA: FIRST REAL-WORLD DATA SHOW POWERFUL SPINE GAINS BUT SMALLER HIP AND FEMORAL NECK RESPONSES

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Background: Romosozumab (Romo) accelerates BMD gains in RCTs, but real-world Southeast Asian outcomes are unknown.

Methods: We audited consecutive postmenopausal women receiving Romo 210 mg SC monthly. Age, BMD values, fracture history, Bone turnover markers (BTMs) and prior osteoporosis therapy were recorded. Outcomes were % change in BMD (lumbar spine (LS), total hip (TH), femoral neck (FN)) and paired change in BTMs (CTX, P1NP) from baseline to 12 months. Analyses: one-sample t-tests (mean %Δ BMD vs 0), paired t-tests (BTMs), Welch's two-sample t-tests (prior vs no prior therapy), and correlation of prior-therapy duration with response (Pearson and Spearman).

Results: 36 women completed 12 months. Paired baseline–12m DXA was analyzable in 34 at each skeletal site (spine, hip, neck), as two had prostheses precluding comparison. Mean age was 72 y; >70% had severe osteoporosis; >60% had prior fragility fracture; >65% had prior therapy (mean duration ~7 y). Mean (95% CI) %Δ BMD were: LS +13.9% (5.0–22.9; p=0.003), TH +2.4% (0.9–4.0; p=0.003), FN +5.3% (2.8–7.8; p<0.001). Mean ΔBTMs: CTX −0.089 µg/L (−0.27 to +0.09; p=0.31), P1NP +28.1 µg/L (−11.6 to +67.9; p=0.15). Prior therapy did not alter response (Welch p=0.61 LS, 0.56 TH, 0.59 FN). Correlation analysis (Pearson's r and Spearman's ρ [rho]) between prior-therapy duration and response showed LS r=−0.006, ρ=−0.057 (p=0.98/0.75); TH r=−0.041, ρ=−0.183 (p=0.82/0.31) and FN r=−0.156, ρ=−0.125 (p=0.38/0.49), with TH and FN showing nonsignificant negative trends.

Conclusions: This first Southeast Asian real-world cohort confirms Romo's hallmark spine gains with hip and neck increments however smaller than in RCTs and other Asian series. Differences were not explained by prior therapy or baseline factors. Romo drives strong spine gains, while hip and neck responses are more modest, a signal uniquely revealed by real-world data.

References: FRAME (Cosman et al., NEJM 2016); Park et al., J Clin Med 2025; Yi et al., JBMR Plus 2022.

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FRACTURE TYPE AND DXA-BASED OSTEOPOROSIS PREVALENCE IN HOSPITALIZED VERTEBRAL FRACTURE PATIENTS: A STUDY OF 120 PATIENTS FROM NORTHERN CHINA

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Background: Vertebral fractures are a common manifestation of osteoporosis and lead to serious complications and morbidity. Data from northern China, particularly Inner Mongolia, are scarce.

Methods: We retrospectively analyzed 120 patients hospitalized with vertebral fractures at a tertiary orthopedic hospital (2020-2024). Demographic information, length of stay (LOS), fracture level (T10-L5), and bone mineral density (BMD) data were extracted. Lumbar spine T-scores were pooled as the lowest value and categorized according to the World Health Organization (WHO) criteria.

Results: The mean patient age was 68.1 ± 9.2 years; 75.0% were female. The median length of stay was 8.2 days (IQR 4.9-13.2). Fractures were concentrated at L1 (24 patients, 20.0%), T12 (15 patients, 12.5%), and T11 (14 patients, 11.7%). Among 74 patients (61.7%) with available T-scores, 81.1% met criteria for osteoporosis (≤-2.5) and 18.9% met criteria for osteopenia; no normal BMD was observed.

Conclusion: In this sample of 120 patients, vertebral fractures primarily affected elderly women and the thoracolumbar junction. The prevalence of osteoporosis is high in people with available T-scores. These findings highlight the urgent need to improve fracture liaison services and post-fracture osteoporosis management in northern China.

Keywords: vertebral fracture, osteoporosis, T-score, DXA, Inner Mongolia

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OSTEOPOROSIS CARE GAPS AFTER FRAGILITY FRACTURES: A HOSPITAL STUDY IN NORTHERN CHINA

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Background: Fragility fractures are the most serious clinical consequences of osteoporosis, yet many patients remain undiagnosed and untreated. This study aimed to assess the rates of diagnosis, bone mineral density (BMD) testing, biochemical bone turnover marker (BTM) testing, and anti-osteoporosis treatment in patients aged ≥50 years with major osteoporotic fractures.

Methods: We conducted a retrospective cross-sectional analysis of clinical data from patients with vertebral, hip, proximal humerus, and distal radius fractures treated at an orthopedic hospital in northern China. We patients aged ≥50 years with major osteoporotic fractures during 2023-2024 years. Key variables included age, prior fracture history, proportion undergoing DXA assessment, diagnosis of osteoporosis, BTM testing rates, and pharmacologic treatment patterns. Subgroup analyses were performed by age group and fracture site.

Results: Among 17,774 patients (mean age: 64 years), a total of 6,931 fragility fractures were identified. The overall proportion of patients undergoing dual-energy X-ray absorptiometry (DXA) was 36%. Osteoporosis was diagnosed in 33.7% of patients. Despite the high disease burden, only 3.6% of patients received standardized anti-osteoporosis treatment. Among those treated, denosumab was the most frequently prescribed medication (52.3%), followed by injectable bisphosphonates (38.1%) and oral bisphosphonates (9.6%). Bone turnover marker (BTM) testing was performed in 19% of patients. Notably, treatment rates were significantly lower in patients with humeral or distal radius fractures compared with those with vertebral and hip fractures. Overall, substantial diagnostic and therapeutic gaps were observed, particularly among patients aged ≥65 years.

Conclusion: Despite the high risk of refracture and complications, a substantial proportion of fragility fracture patients do not undergo DXA or receive guideline-recommended anti-osteoporosis therapy. These findings highlight the urgent need to establish structured post-fracture care pathways improve clinician awareness of secondary fracture prevention strategies.

Keywords: Fragility fracture; Osteoporosis; DXA; Bone turnover markers; Treatment gap;

P194

COMPARATIVE EFFICACY OF DIFFERENT CHINESE EXCERCISES ON BONE MINERAL DENSITY: NETWORK META-ANALYSIS

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Objective: To compare four traditional Chinese exercises (Baduanjin, Taiji, Wuqinxi, Yijinjing) for improving BMD at the lumbar spine, femoral neck, greater trochanter, and Ward's triangle.

Methods: We conducted a network meta-analysis of 33 randomized controlled trials (RCTs); bias was assessed by the Cochrane RoB2 tool. Treatments were ranked by SUCRA, and consistency and heterogeneity were evaluated.

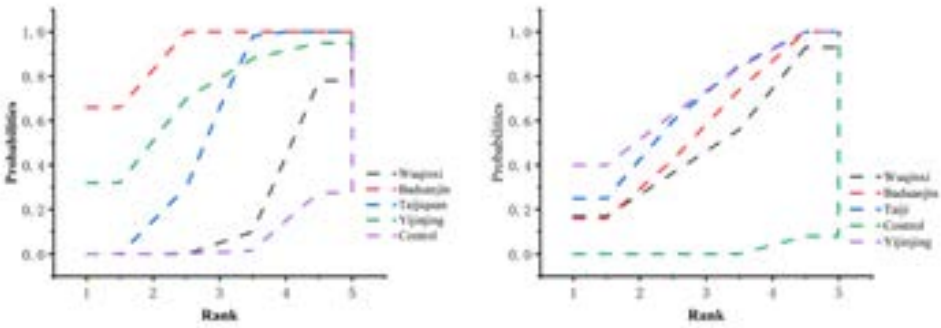
Results: Lumbar Spine BMD: Thirty studies measured lumbar spine BMD. Global inconsistency test (P=0.9873) indicated no significant inconsistency. Compared to control, significant improvements were observed with: Baduanjin (MD=0.10, 95%CI: 0.06–0.14); Taiji (MD=0.07, 95%CI: 0.04–0.09); Yijinjing (MD=0.11, 95%CI: 0.06–0.16); Wuqinxi showed no significant effect. SUCRA ranking: Baduanjin (91.6%) > Yijinjing (71.3%) > Taiji (57.4%) > Wuqinxi (22.4%) > control.

Femoral Neck BMD: Twenty-three studies assessed femoral neck BMD. Global inconsistency (P=0.7361) indicated consistency. Significant improvements vs. control: Baduanjin (MD=0.07, 95%CI: 0.01–0.13); Taiji (MD=0.08, 95%CI: 0.05–0.12); Yijinjing (MD=0.09, 95%CI: 0.01–0.16); Wuqinxi showed no significant effect. SUCRA: Yijinjing (71.6%) > Taiji (67.7%) > Baduanjin (58.0%) > Wuqinxi (50.7%).

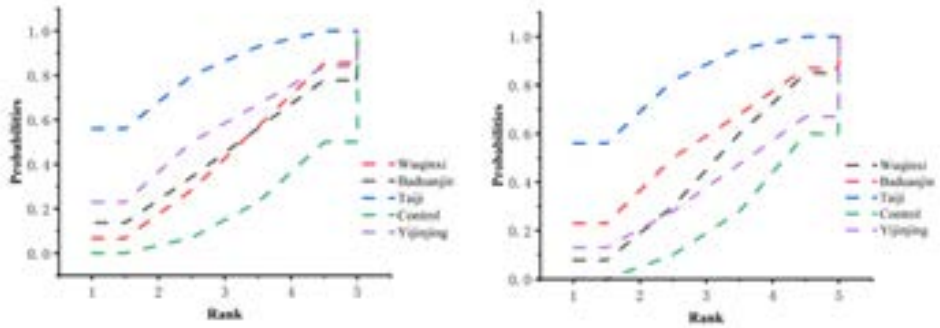
Greater Trochanter BMD: Fifteen studies evaluated greater trochanter BMD. Global inconsistency (P=1.0) showed no inconsistency. Only Taiji demonstrated significant improvement vs. control (MD=0.05, 95%CI: 0.03–0.08). SUCRA: Taiji (83.1%) > Yijinjing (56.2%) > Baduanjin (45.4%) > Wuqinxi (44.7%).

Ward's Triangle BMD: Fifteen studies measured Ward's triangle BMD. Global inconsistency (P=0.5756) indicated consistency. Only Taiji showed significant improvement vs. control (MD=0.06, 95%CI: 0.03-0.08). SUCRA: Taiji (83.5%) > Wuqinxi (45.9%) > Baduanjin (38.4%) > Yijinjing (38.4%).

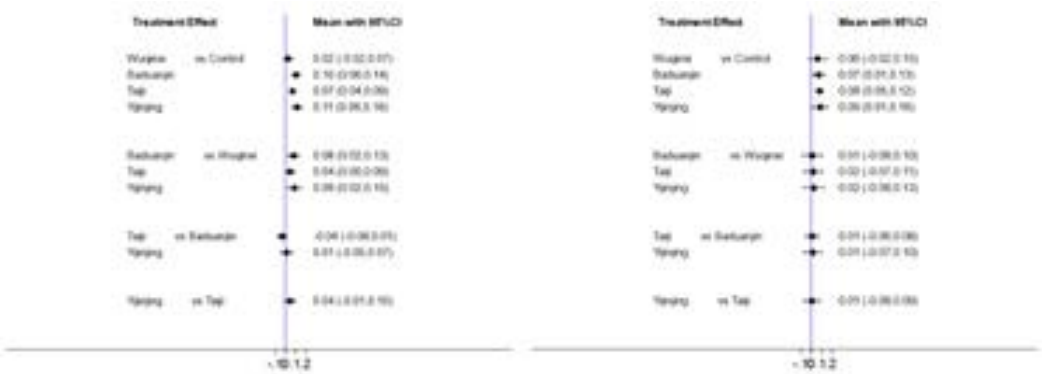
Conclusions: Taiji provides comprehensive BMD improvement, while Baduanjin/Yijinjing offer site-specific benefits. Supports exercise prescription in resource-limited Asia-Pacific communities.



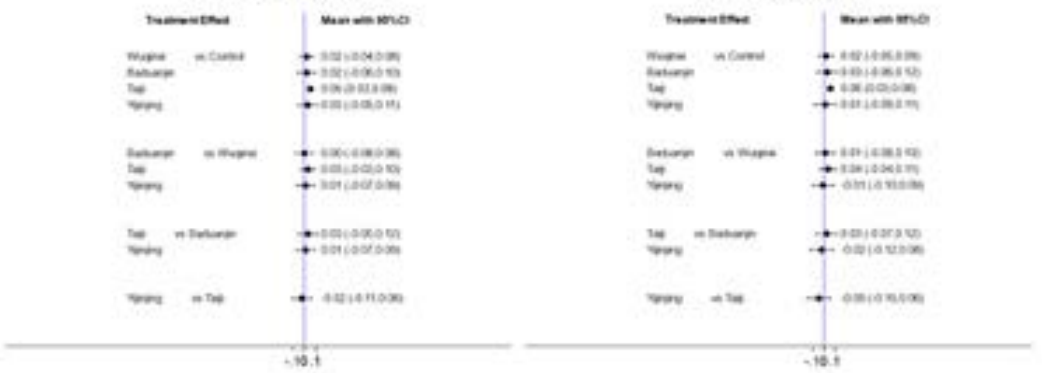
A. lumbar vertebrae B. Femoral neck



C. Greater trochanter D. Ward's triangle



A. lumbar vertebrae B. Femoral neck



C. Greater trochanter D. Ward's triangle

P195

EFFECTS OF A DIGITAL VOICE ASSISTANT-DELIVERED OSTEOPOROSIS SELF-MANAGEMENT PROGRAM ON DIET IN POSTMENOPAUSAL WOMEN WITH OSTEOPOROSIS: A 12-MONTH RANDOMISED CONTROLLED TRIAL

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Objective: To determine the effects of a digital voice assistant (DVA)-delivered self-management program on intakes of nutrients and foods recommended for supporting musculoskeletal health in postmenopausal women with osteoporosis.

Methods and Materials: Fifty postmenopausal women with osteoporosis were randomly assigned to a DVA intervention (N=25) or control group (N=25) for a 6-month intervention and an additional 6-month maintenance period. During the intervention period, the DVA group received three videos per month containing information on nutrition, exercise, and medication for osteoporosis via a provided DVA device located in their home. Dietary videos focused on dairy, dairy alternatives, protein, calcium and vitamin D. The control group received six emails with weblinks to osteoporosis information. Participants completed 24-hour food recalls on two weekdays and one weekend day at baseline, 6 and 12 months.

Results: Participants (mean age 64.3 ± 6.1 years) accessed approximately 80% of prescribed videos during the intervention. At 6 months, mean protein intake increased by 5.2 g/day (95%CI: -7.1, 17.6) for DVA and reduced by -4.4 g/day (95%CI: -16.5, 7.7) for control. Mean calcium intake changes were 88 mg/day (95%CI: -78, 254) and -66 mg/day (95%CI: -229, 97) for the DVA and control group, respectively. 12 months, there were no significant within the group changes in protein or calcium intakes, nor any between-group differences at either time point. However, daily low-fat milk and egg servings increased in the DVA group compared with controls from baseline to 12 months (P=0.02).

Conclusions: A DVA-delivered intervention including osteoporosis-related nutrition information, did not increase habitual protein or calcium intake however there was increased consumption of low-fat milk and eggs in women with osteoporosis. Larger trials are required to determine whether similar interventions are effective for improving osteoporosis-focused diet.

Keywords: digital health, osteoporosis, diet, postmenopausal women

P196

DEADLY PATHWAYS OF RENAL CELL CARCINOMA: ADVANCES IN UNDERSTANDING AND MANAGING BONE METASTASES

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Renal cell carcinoma (RCC) is a type of malignant neoplasm that develops in the kidney and is one of the most common forms of kidney cancer, accounting for approximately one-third of all diagnosed cases. The disease is not homogeneous, but presents itself in a series of histological subtypes, the most common of which is clear cell carcinoma. This is followed in incidence by papillary carcinoma and chromophobe carcinoma, each with different biological and prognostic characteristics.

An important feature of RCC is its increased potential for metastasis. Tumor cells can spread to multiple organs, but bone involvement is notable for its frequency and the severity of its clinical consequences. RCC-associated bone metastases are usually osteolytic, meaning they lead to the destruction of normal bone tissue. This pathological evolution has major consequences: it increases the risk of pathological fractures, promotes the onset of hypercalcemia, and causes a series of other skeletal events that significantly reduce patients' quality of life and increase morbidity.

Therapeutically, nephrectomy is still the standard treatment for localized renal carcinoma. However, with the spread of the disease and the appearance of metastases, therapeutic approaches have diversified. In recent years, targeted therapies, such as tyrosine kinase inhibitors, as well as immunotherapies, including immune checkpoint inhibitors, have significantly changed clinical management and brought real hope for improving the prognosis of patients with advanced or metastatic RCC.

Despite all these advances, bone metastases remain a complex and difficult problem to control. Their negative impact on functional status and survival requires intensified research efforts to identify more effective methods of early diagnosis and specific treatment. Thus, despite notable advances in renal oncology, bone metastases continue to be a major clinical challenge, requiring innovative solutions and multidisciplinary collaboration to optimize long-term therapeutic outcomes

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EFFICACY OF BIODEGRADABLE CALCIUM SULFATE CARRIERS IN TREATING OSTEOARTICULAR INFECTIONS AMONG PATIENTS WITH DIABETES AND OSTEOPOROSIS

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Objectives: Osteoarticular infections in patients with diabetes mellitus and osteoporosis represent a major clinical challenge due to poor vascularization and compromised immune response. The aim of the study was to evaluate the efficacy of using synthetic resorbable calcium sulfate impregnated with antibiotics in controlling osteoarticular infections and promoting bone remodeling.

Materials and Methods: We conducted a retrospective study between 2020 and 2024 on 27 diabetic patients (19 with type II diabetes, 8 with type I diabetes) who underwent surgical debridement and implantation of antibiotic-impregnated calcium sulfate beads, according to the antibiogram. Patients were monitored for between 6 months and 2 years. The parameters analyzed included: infection control, bone remodeling, infectious recurrences, and the influence of glycemic control on progression.

Results: The overall infection eradication rate was 92%. Patients treated with combinations of two antibiotics had no recurrences, unlike those on monotherapy, where the recurrence rate was 25%. Normalization of inflammatory markers (CRP, ESR, WBC) was significantly faster in patients with HbA1c < 7%. Bone remodeling occurred on average at 12 weeks (range 8–16 weeks), with faster recovery in patients with well-controlled diabetes. Complications were minimal, with only one case of soft tissue necrosis, which was treated conservatively.

Conclusions: Local administration of antibiotics via resorbable calcium sulfate is a safe and effective method for treating osteoarticular infections in diabetic patients. Combining local therapy with strict glycemic control and the use of combination antibiotic regimens reduces recurrence, accelerates bone healing, and avoids mutilating procedures. The results support the expansion of this method as an alternative to exclusive systemic administration of antibiotics.

References: Available upon request.

Acknowledgements: Not applicable.

Declarations of interest: The authors declare no conflicts of interest.

P198

THE ECONOMIC BURDEN OF OSTEOPOROSIS IN PATIENTS REFERRED TO SHAHID MOTAHARI BONE TESTING CENTER IN SHIRAZ IN 1400

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Background and purpose: Osteoporosis is defined as a systemic skeletal disease that begins with low bone mass and destruction of fine bone tissues and leads to the possibility of increased bone fragility and susceptibility to fracture. Fracture caused by osteoporosis, which is the main consequence of this disease, imposes a heavy economic and social burden on families and communities. Therefore, this study was conducted with the aim of calculating the economic burden of osteoporosis in patients referred to Shahid Motahari Clinic in Shiraz in 1400.

Methods: This study is a type of partial economic evaluation study which is a sample of cost of disease studies that investigated the economic burden and costs of osteoporosis in a cross-sectional manner in the year 1400 in Shiraz. 252 patients were included in the study. In order to collect data in this study, a researcher-made data collection form was used. A prevalence-based approach was used to prepare cost data, and a bottom-up approach was used to calculate costs. The data related to direct treatment, direct non-treatment and indirect costs were obtained using the data available in the patients' files and also based on the self-declaration of the patients or their companions. The human capital approach was used to calculate indirect costs. To calculate the economic burden of the disease at the country level, the average total cost per patient was estimated and multiplied by the total number of patients

Results: The results of the present study include the sum total of direct and indirect costs for 252 examined samples, which is equal to 70,783,979,868 Rials and the average costs for each person in this section is equal to 280,888,809 Rials. Treatment of patients with osteoporosis, the highest cost related to hospital bed and hotel cost with 53. 9% and the lowest cost related to laboratory cost with 1. 7%. The state of economic sanctions and as a result the lack of medicine and currency fluctuations as well as the lack of insurance coverage of consumed drugs are among the most important reasons for the high cost of consumed drugs in these patients. In the non-medical direct costs section, the highest cost was related to the cost of changes in the place of residence with 58,2% and the lowest cost was related to the cost of parking with 0. 03%. The cost of installing an elevator, bathroom, and repairing the staircase accounted for the most expenses in this sector.

Conclusion: In general, due to the increasing prevalence of osteoporosis and the aging process of the population in Iran and the chronic nature of the disease and the need for long-term treatment, the costs of treating this disease can be a heavy economic burden on society, the health care system, and the insurance system. and impose on the patients themselves. Considering the high share of treatment costs, hoteling and normal beds, it is suggested to reduce the hospitalization of these patients in the hospital by managing treatment solutions along with prevention, and reduce the economic burden of this disease.

Keywords: economic burden, osteoporosis, direct treatment costs, direct non-treatment costs, indirect costs

P199

CAST INDEX – A TOOL TO PROGNOSTICATE THE OUTCOME OF BOTH BONE FRACTURES MANAGED CONSERVATIVELY IN CHILDREN.

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Objectives:

1. To analyse clinico-radiological outcome of paediatric both bone fractures forearm managed conservatively.

2. To analyse incidence of redisplacement of paediatric both bones fractures forearm managed conservatively.

3. To analyse the risk factors associated with re-displacement of these fractures.

Introduction: Paediatric and adolescent forearm fractures continue to present treatment challenges. Despite high-level evidence to the contrary, traditional guidelines for nonsurgical treatment have been challenged in favour of surgical intervention.

Methodology: 196 children presented with closed diaphyseal fractures were managed conservatively from 2013 to 2016. Acceptable reductions (acceptability defined later) maintained in above elbow POP were followed at 01, 3rd, 6th , 10th, 12th weeks and at 06th month. Factors like age, gender, mechanism of injury, laterality, level of fracture, pre and post plaster angulation, quality of reduction, **cast index**, need of re-manipulation, cast related complications, failure of reduction, after plaster removal forearm length, wrist / elbow range of movements, supination pronation arc and duration of clinic-radiological union were noted and analysed.

Results: The overall re-displacement rate was 18% out of which in only 20% of cases fell into unacceptable category. Majority of re-displacement occurred between first to 3rd week. Evaluation of range of motion showed normal elbow and wrist motion. Multivariable analysis showed age, laterality, type of fracture, initial angulation more than 10 degrees, poor reduction, cast index were related with re-displacement. Out of fractures continued with conservative method 94% showed excellent to good results at 6th month follow up. At the latest follow-up, none of children had subjective symptoms, nerve dysfunction and CRPS.

Conclusion: Conservation treatment of paediatric both bone fracture forearm is a viable modality with excellent clinico- radiological outcomes but these results are dependent on factors analysed for re-displacement.

P200

PASSIVE MECHANICAL STIMULATION VIA MASSAGE CHAIR ENHANCES BONE FORMATION IN POSTMENOPAUSAL WOMEN: INSIGHTS FROM A RANDOMISED AND PROSPECTIVE STUDY

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Background: Osteoporosis poses a growing public health concern, especially among the elderly population. As life expectancy increases, so does the prevalence of osteoporosis-related morbidity. While massage chairs are widely used for musculoskeletal pain relief, their potential role in influencing bone metabolism remains underexplored, particularly in relation to bone mineral density (BMD) and biochemical markers of bone turnover.

Objective: To evaluate the impact of automated massage chair therapy on bone formation and resorption markers, as well as BMD status, in post-menopausal women.

Methods: A single-blind, randomized controlled study was conducted involving post-menopausal women attending outpatient follow-up. Participants were randomly assigned to either a control group or an intervention group, which received eight sessions of massage using the **Ogawa** automated massage chair over a one-month period. Serum levels of **P1NP** (bone formation) and **CTX-1** (bone resorption) were measured at baseline and at one month. BMD was assessed at six months using DXA scans.

Results: In the **intervention group**, P1NP increased from **69.65 ng/mL to 75.42 ng/mL**, indicating enhanced bone formation, while CTX-1 decreased slightly from **0.386 ng/mL to 0.380 ng/mL**, suggesting reduced bone resorption. Conversely, the **control group** showed a reduction in P1NP (**76.35 → 71.50 ng/mL**) and an increase in CTX-1 (**0.464 → 0.4735 ng/mL**) after one month. At six months, BMD measurements showed that the intervention group maintained normal values, while the control group demonstrated trends toward osteopenia.

Conclusions: Mechanical stimulation via massage chair therapy may influence bone remodeling processes by promoting bone formation and suppressing resorption, as reflected by favorable shifts in bone turnover markers. This non-pharmacological approach offers a feasible, safe, and potentially effective intervention for maintaining bone health in post-menopausal women who may not tolerate active exercise. Further studies with larger sample sizes and longer follow-up are warranted.

Keywords: Massage Chair, Bone Turnover Markers, P1NP, CTX-1, Bone Mineral Density, Post-menopausal, Osteoporosis, Mechanical Stimulation, Ogawa

P201

SILENT THREATS BEFORE SURGERY: PREVALENCE AND RISK FACTORS OF PREOPERATIVE DEEP VEIN THROMBOSIS IN ELDERLY HIP FRACTURE PATIENTS

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Background: Elderly patients with hip fractures are at high risk of venous thromboembolism, including deep vein thrombosis (DVT), which may result in significant perioperative morbidity and mortality. However, local data on the preoperative prevalence of DVT and associated risk factors are lacking.

Methods: This retrospective cross-sectional study included 150 elderly patients (aged ≥60 years) with hip fractures treated at a tertiary centre and teaching hospital. Patients who underwent preoperative lower limb Doppler ultrasound within 24 hours prior to surgery were included. Demographic and clinical variables were collected from PACS and electronic medical records.

Results: The overall prevalence of preoperative DVT was **5.4%** (5 out of 91 patients). The **mean immobilisation period** in DVT-positive patients was **18.4 days**. Notably, **none** of the DVT-positive patients received prophylactic Enoxaparin, and **two had underlying malignancy**. No patients developed symptomatic pulmonary embolism during the preoperative period.

Conclusion: The observed low prevalence of preoperative DVT (5.4%) may reflect effective early mobilisation and preventive measures. However, **prolonged immobilisation, absence of pharmacologic prophylaxis, and underlying malignancy** were key risk factors. Routine preoperative Doppler screening in high-risk elderly hip fracture patients may aid in timely intervention and reduce thromboembolic complications.

Keywords: Hip fracture, Deep vein thrombosis, Elderly, Immobilisation, Thromboprophylaxis, Doppler ultrasound

P202

CHEST X-RAY AS A SURROGATE SCREENING TOOL FOR OSTEOPOROSIS: A CASE SERIES EVALUATING RADIOGRAPHIC INDICATORS IN ELDERLY PATIENTS

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Background: Osteoporosis remains a silent yet significant health threat globally, particularly in elderly populations. While dual-energy X-ray absorptiometry (DXA) is the gold standard for diagnosis, it is often underutilized due to cost, limited availability, and lack of clinical suspicion. Chest radiographs (CXR), by contrast, are routinely performed and may harbor subtle yet valuable indicators of bone loss. This study explores the feasibility of using routine chest radiographs as an opportunistic screening modality for osteoporosis in high-risk populations.

Methods: We conducted a descriptive case series involving elderly patients (>60 years) who underwent chest radiography for non-skeletal clinical indications. Visual assessments were performed for hallmark osteoporotic features: cortical thinning of ribs and clavicles, increased bone radiolucency, and thoracic vertebral deformities. Where available, radiographic findings were correlated with bone mineral density (BMD) via Dual Energy X-Ray Absorptiometry bone turnover.

Results: Among the series, most of patients with DEXA-confirmed osteoporosis or osteopenia exhibited at least one radiographic indicator on CXR. Thoracic vertebrae (especially T7–T11) were the most prevalent area were analysed, providing a similar finding on T scoring as DEXA scan result. Furthermore, radiographs of patients with normal BMD displayed preserved cortical outlines and vertebral architecture showed a good bone mineral density result as in the DEXA scan result.

Conclusion: Chest radiographs, though historically undervalued for skeletal assessment, may serve as an accessible and cost-effective adjunct for early osteoporosis screening. Given their widespread use in clinical practice, CXRs could be utilized to triage high-risk patients for further BMD assessment, especially in resource-limited settings. This study advocates for the development of structured radiographic assessment protocols and AI-based diagnostic support to enhance osteoporosis detection through routine imaging.

Keywords: Osteoporosis, Chest X-Ray, Opportunistic Screening, Bone Mineral Density, Elderly, Vertebral Fracture, Radiographic Biomarkers

P203

DEOXYCHOLIC ACID (DCA) INHIBITS LPS-INDUCED INFLAMMATORY BONE LOSS

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Aims and Objective: Osteoporosis is an inflammatory bone disease marked by reduced bone mineral density and increased fracture risk. While the gut microbiome's influence on bone health is well recognized, the role of its metabolites—especially secondary bile acids like deoxycholic acid (DCA)—remains unclear. As a ligand for FXR and TGR5 receptors on immune and bone cells, DCA may serve as a novel therapeutic modulator of inflammatory bone loss.

In the present study, we hypothesise to unravel the role of DCA on bone remodeling in both humans and mice.

Materials and Methods: Murine BM cells were cultured with RANKL and M-CSF for 4 days (osteoclastogenesis, TRAP staining) and in osteogenic media for osteoblastogenesis (ALP, Alizarin Red staining). For the in vivo experiment, C57BL/6 male mice (12 weeks) were grouped into Control, LPS, and LPS+DCA. LPS (5 mg/kg, i.p.) was given to LPS and LPS+DCA groups; DCA (1 mg/mouse) was administered orally for 10 days. On day 11, mice were sacrificed, and bone (u-CT, BMD), SI/LI, bone (histology), BM (ex vivo culture for osteoclasts and osteoblasts, qPCR), and serum cytokine were analyzed. Gut microbiome analysis using 16S rRNA seq was done. For human osteoclast culture, PBMCs were isolated from the blood of healthy and osteoporotic patients and cultured in osteoclastogenic media for 14 days and visualized by TRAP staining.

Results: DCA significantly enhanced osteoblastogenesis in a dose-dependent manner while concurrently inhibiting osteoclastogenesis in vitro. *in vivo*, DCA treatment improved bone health in LPS-induced inflammatory bone loss in mice. µCT analysis of the femur and tibia revealed marked loss of bone microarchitecture in LPS-treated mice, which was significantly preserved in the DCA group. DCA supplementation led to increased BMD and improved histomorphometric parameters. *ex vivo* cultures, qPCR, and ELISA from bone marrow showed reduced osteoclastogenesis and downregulation of osteoclastogenic genes and inflammatory cytokines in DCA-treated mice compared to the LPS group. In human PBMCs, DCA reduced osteoclast formation along with promoting osteoblastogenesis in human BM cells.

Conclusion: Our results for the first time establish that DCA directly affects both bone-forming (osteoblasts) and bone-resorbing (osteoclasts) cells and ameliorates bone loss in the LPS-induced inflammatory bone loss model. The findings offer a novel avenue in harnessing the osteoprotective potential of DCA (a secondary bile acid) in improving bone health in various inflammatory bone pathologies, including RA and osteoporosis.

P204

PREOPERATIVE OPTIMIZATION OF BONE METABOLISM IN PATIENTS UNDERGOING HIGH-RISK SPINE SURGERY

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Introduction: The prevalence of osteoporosis in patients undergoing spinal surgery has been estimated at 50% of women over 50 years of age, a higher figure than the general age-adjusted population. During the surgical procedure, there are techniques to minimize the risk of complications caused by poor bone quality, but they increase surgical costs without achieving results comparable to those of surgeries without metabolic alterations.

Decreased bone mineral density (BMD) is the main independent risk factor related to instrumentation failure in lumbar fusion surgeries. Complications resulting from spinal fusion surgery are more frequent in patients over 65 years of age and those with osteoporotic disease.

Consequently, many authors recommend systematic evaluation and timely treatment of osteoporosis in most patients undergoing arthrodesis surgery.

Objective: To evaluate bone metabolism and fracture risk in patients undergoing spinal surgery.

Materials And Methods: This is a prospective, observational, descriptive study involving 24 patients undergoing spinal surgery involving multilevel fixation, assessed in the Rheumatology clinic between November 2024 and June 2025.

The following information was collected: demographic data (sex, date of birth), weight, height, risk factors associated with fragility fracture, laboratory data related to bone metabolism, and previous treatments.

Results: A total of 24 patients were included, with a gender distribution of 13 women (54.2%) and 11 men (45.8%). The mean age was 77.3 years (SD 16.8), and the mean body mass index (BMI) was 29.3 kg/m² (SD 4.16).

Among cardiovascular risk factors, the most common were dyslipidemia in 15 patients (62.5%) and hypertension in 14 (58.3%), followed by diabetes mellitus in 4 (16.7%).

Regarding risk factors associated with fragility fractures, 2 patients (8.3%) had a history of fragility fracture, and another 2 (8.3%) had a family history of hip fracture in parents. Tobacco use was reported by 5 patients (20.8%), with no alcohol consumption reported. Only one patient had a chronic disease (4.2%), specifically rheumatoid arthritis, and only 1 of the patients had previously received long-term treatment with glucocorticoids (4.2%).

In the 13 postmenopausal women, the mean age at menopause was 49.3 years (SD 3.55).

The estimated risk of fracture using the FRAX tool showed a mean of 6.25% (SD 5.2) for major osteoporotic fractures and 2.64% (SD 2.89) for hip fractures. Only 5 patients (20.8%) had bone densitometry prior to their evaluation in the Rheumatology clinic. When analyzing the risk of osteoporotic fracture prior to surgery, 16 patients (66.7%) were classified as low risk, 5 (20.8%) as high risk, and 3 (15.2%) as very high risk.

Regarding treatment for osteoporosis, pharmacological therapy was initiated in 11 patients (45.8%). The most commonly used drug was oral bisphosphonates, prescribed in 7 cases (29.2%). Anabolic treatments such as teriparatide in 2 patients (8.3%), abaloparatide in 1 (4.2%) and romosozumab in 1 (4.2%) were also indicated.

Conclusion: A significant percentage of patients who are candidates for high-risk spinal surgery have risk factors for osteoporosis, although most had not previously been evaluated with densitometry or specifically treated.

This study represents preliminary data from a larger project. Longitudinal follow-up of this cohort is currently underway to calculate the rate of reoperations and the incidence of fragility fractures at 12, 24, and 36 months after the initial surgery. This will allow for the clinical impact of early rheumatologic treatment in these patients to be assessed.

P205

SAFETY EVALUATION OF SEQUENTIAL USE OF ROMOSOZUMAB AFTER DISCONTINUATION OF DENOSUMAB

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Introduction: Denosumab is a monoclonal antibody that blocks bone resorption. Its antiresorptive effect disappears rapidly after discontinuation, causing a transient increase in bone turnover and an increased risk of vertebral fractures. Romosozumab has anabolic and antiresorptive effects that could help prevent this rebound, although the evidence is still limited.

Objective: To evaluate the effectiveness and safety of romosozumab treatment after denosumab withdrawal in real-world clinical practice.

Materials and Methods: This is a prospective, descriptive, observational study focused on four patients with osteoporosis who received treatment with denosumab and subsequently completed treatment with romosozumab.

Demographic variables (sex, age), anthropometric variables (weight, height), risk factors for fragility fractures, laboratory parameters related to bone metabolism, and previous osteoporosis treatments were collected.

Results: The clinical characteristics and comorbidities of the patients, as well as data related to bone metabolism and fracture risk estimated using FRAX, are summarized in Table 1.

Due to the small sample size, a nonparametric statistical test was used to compare bone mineral density before and after treatment with romosozumab. Although a trend toward increased density was observed in the lumbar spine, this change was not statistically significant ($p = 0.125$). Similar results were found at the hip, with no significant differences ($p = 0.250$). No included patients experienced osteoporotic fractures or adverse effects during treatment with romosozumab.

Conclusion: The transition from denosumab to romosozumab was safe in these patients and showed a trend toward improved bone density. Further studies with larger numbers of patients are needed to confirm these results.

Table 1. Baseline and densitometric characteristics of the patients included in the study.

Variable	Patient 1	Patient 2	Patient 3	Patient 4
age	63	75	69	72
Sex	Female	Female	Female	female
High blood pressure	No	No	No	yes
Diabetes mellitus	No	No	No	No
Dyslipidemia	No	No	Yes	yes
Rheumatic disease	No	No	No	No
Tobacco	yes	No	No	yes
Alcohol	No	No	No	No
Premature menopause	No	yes	No	yes
Corticosteroid use	No	No	No	No
Parents' hip fracture	No	No	yes	No
Previous vertebral fracture	Multiple	Single	Single	Multiple
Previous hip fracture	No	No	No	No
Years on denosumab	7	9	5	3
Lumbar spine BMD PRE-Romosuzumab (g/cm2)	0.613	0.776	0.744	0.67
Lumbar spine BMD POST-Romosuzumab (g/cm2)	0.632	0.786	0.789	0.692
Femoral neck BMD PRE-Romosuzumab (g/cm2)	0.512	0.709	0.633	0.445
Femoral neck BMD POST-Romosuzumab (g/cm2)	0.508	0.729	0.675	0.484

P206

OSTEOPROTECTIVE POTENTIAL OF LACTOBACILLUS ACIDOPHILLUS DERIVED EXTRACELLULAR VESICLES IN MODULATING BONE HEALTH

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Objectives: Osteoporosis is an inflammatory bone loss disease characterized by low bone mineral density (BMD) and increased fracture risk. The role of probiotics in modulating bone health has already been established by our group. Probiotics have been shown to mediate their effect, primarily through the release of Extracellular Vesicles (EVs), though the specific role of probiotic-derived EVs in bone remodeling remains underexplored. In this study, we investigated the effects of *Lactobacillus acidophilus*-derived Extracellular vesicles (LA-EVs) on osteoclastogenesis.

Materials & Methods: Probiotic *Lactobacillus acidophillus* was cultured in MRS medium & EVs were isolated by differential ultracentrifugation. EVs were characterized by nanoparticle tracking analysis (NTA) and transmission electron microscopy (TEM). RAW264.7 cell line (ATCC, USA) was used to assess the effect of LA-EVs on cell viability via MTT assay. For Osteoclasts differentiation, primary bone marrow-derived macrophages (BMMs) were cultured in in the presence of RANKL and M-CSF & treated with LA-EVs. TRAP and F-actin staining were performed to confirm osteoclastogenesis. qRT-PCR was further performed to evaluate the effect of LA-EVs on osteoclastogenesis.

Results: Successful isolation of LA-EVs was confirmed by their cup-shaped morphology (TEM) & size ranging from 30-200 nm in diameter (NTA). Interestingly, we observed that treatment of murine BMSCs with LA-EVs significantly reduced osteoclastogenesis, as evidenced by decreased TRAP and F-actin staining. Notably, the expression of osteclastogenic genes: NFATc1, TRAP & Cathepsin K were also reduced after LA-EVs treatment.

Conclusion: Taken together, our results for the first time establish the osteoprotective effects of Lactobacillus acidophilus-derived EVs in modulating osteoclast activity. These findings highlight the potential of probiotic-derived EVs as therapeutic agents for bone health, particularly in conditions such as osteoporosis and inflammatory bone diseases.

P207

BONE HEALTH, PHYSICAL FUNCTION AND MENTAL WELLBEING IN MIDLIFE CHINESE WOMEN WITH SARCOPENIC OBESITY PHENOTYPE

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Background: Singapore has one of the highest global prevalence rates of hip fractures with women of Chinese ethnicity bearing a greater burden. A unique Asian body composition, 'thin-outside-fat-inside" or sarcopenic-obesity (SO) phenotype has been observed in reproductive age Chinese women in Singapore. This study aimed to examine differences in bone health, physical strength and overall wellbeing in midlife Chinese women with SO and those with healthy body composition.

Methods: A total of 272 women from the Growing Up in Singapore Towards healthy Outcomes (GUSTO) longitudinal cohort study underwent dual energy X-ray absorptiometry to measure lean and fat mass (LM and FM) and bone mineral density (BMD) of the femoral neck (FN) and the lumbar spine (LS). Handgrip strength (HGS) was measured. Using international guidelines on optimal cut-offs, LM and FM were dichotomized to derive distinct body composition phenotypes (Fig 1).Women's wellbeing was assessed by Perceived Stress Scales (PSS) and SF-36 health related quality of life (QOL) questionnaires. Multivariable regression analyses adjusting for covariates including age, educational attainment and lifestyle factors were performed to compare BMD, HGS, PSS and QOL between women with healthy body composition and SO.

Results: Only 20.6% of women [mean (SD) age: 44 (4) yrs] had a healthy body composition and 12.1% (N=33) had a sarcopenic-obesity phenotype (SO). They had similar BMI to that of healthy women [21.0(1.3) vs. 21.4(1.5) kg/m^2] but had comparable percent body fat to those at higher metabolic risk [39.2(2.8) vs. 40.9(3.5)%]. Compared to healthy women, those with SO had significantly lower BMD (T-scores) both at FN [ab (95%CI), -0.63(-1.02, -0.23)] and LS [-0.83(-1.28, -0.39)]. They also had lower HGS, higher PSS, and lower physical composite scores in SF-36.

Conclusion: Lower BMD and physical function, and higher perceived stress in midlife women with SO reflect the hidden higher risk of osteoporosis, frailty and adverse cognitive outcomes later in life. Strategies for early screening focusing on healthy body composition, and targeted intervention to preserve bone health, strength and wellbeing are essential for healthy longevity in midlife women.

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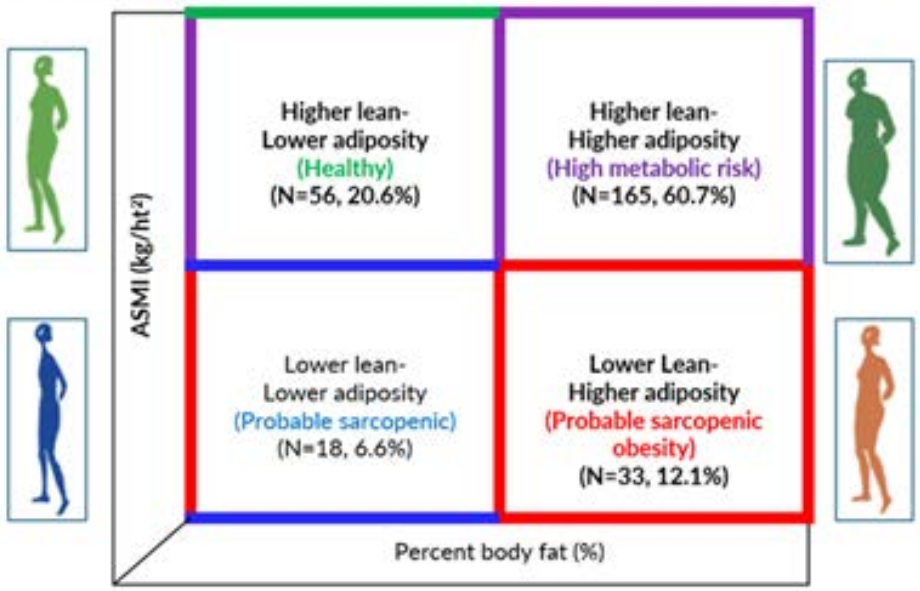
Figure 1. Body composition phenotypes in midlife Chinese women



Appendicular skeletal muscle mass index (ASMI) by Asian Working Group for Sarcopenia (AWGS)

- Sum of the muscle mass of extremities/height^2 with cut-off <5.4kg/m^2 for women

Percent fat: Definition by the American Association of Clinical Endocrinology:

- Optimal: cut-off ≤35% for women

P208

SARCOPENIA AS A NEGATIVE FACTOR AGGRAVATING THE COURSE OF OSTEOPOROSIS

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Background: Osteoporosis (OP) and sarcopenia (SP) are common age-related diseases which have negative consequences, such as an increased risk of falls and fractures, decreased functional capacity, reduced quality of life, and increased mortality risk. However, the impact of their combination on human health has not been sufficiently studied.

Objective: The study aimed to investigate bone mineral density (BMD), fracture risk and quality of life in patients with OP, depending on the presence of SP.

Material and Methods: 265 postmenopausal women were examined (average age - 67.9±8.6 years) and divided into two groups: 115 persons with systemic OP (T-score ≤-2.5 SD, confirmed by dual-energy X-ray absorptiometry, DXA) and 45 females with OP and SP (confirmed by EWGSOP2 criteria). Anthropometric measurements were performed using standard clinical methods. The risk of major osteoporotic and hip fractures was calculated by the Ukrainian version of FRAX®. Quality of life was assessed using the SarQol questionnaire. Muscle strength was determined using hand dynamometry and the "sit-to-stand" test. Bone mineral density (BMD) of the lumbar spine (LS), total hip (TH) and femoral neck (FN), appendicular lean mass and Trabecular bone score (TBS) were evaluated by DXA (Hologic).

Results: Women did not differ in age and menopausal status. However, subjects with OP and SP had significantly lower height, body mass and BMI ($p<0.0001$). Also, their BMDs were lower (LS: 0.71±0.10 vs. 0.76±0.13 g/cm2 ($p<0.05$), TH: 0.67±0.11 vs. 0.73±0.10 g/cm2 ($p<0.001$); FN: 0.54±0.08 vs. 0.59±0.08 g/cm2, $p<0.001$) than in subjects with OP alone. However, the BMD of the distal radius and TBS did not differ significantly between the two groups.

Women with OP and SP had a higher risk of major osteoporotic fractures (FRAX BMI: $Z=2.5$, $p<0.05$; FRAX BMD: $Z=5.8$, $p<0.00001$; and FRAX BMD+TBS: $Z=5.4$, $p<0.00001$), and hip fractures (FRAX BMI: $Z=2.7$, $p<0.05$; FRAX BMD: $Z=7.1$, $p<0.00001$; and FRAX BMD+TBS: $Z=6.0$, $p<0.00001$) compared to females with OP alone. However, there were no significant differences in fracture frequency and SarQol questionnaire indices between the study groups.

Conclusion: Patients with OP and SP had lower BMD and a higher risk of fractures than subjects with OP alone, which requires additional attention regarding SP in such patients.

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SARCOPENIC OBESITY AGGRAVATING COURSE OF KNEE OSTEOARTHRITIS IN POSTMENOPAUSAL WOMEN

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Backgrounds: Knee osteoarthritis (KOA) is a significant cause of pain and disability in postmenopausal women. This population is also characterized by an increased prevalence of obesity and sarcopenic obesity (SPO), further worsening outcomes. This study *aimed* to evaluate the pain intensity, quality of life and risk of falls in postmenopausal overweight (OW) women with KOA depending on the presence of SPO.

Methods: Eighty-three females (mean age 66.0±8.2 years) with KOA (2-3 grade, Kellgren&Lawrence score) were included and divided into two groups. Group I comprised 21 (25%) women with SPO (according to cut-off values established for the Ukrainian female population, 2023), and Group II (control) – 63 (75%) participants with OW (according to WHO criteria in 2000), but without SPO. Anthropometric indices were assessed using routine research methods. Muscle strength was measured using hand dynamometry and the "sit-to-stand" test, and body composition was measured using DXA. The risk of falls was evaluated using the Desmond Fall Risk Questionnaire. Pain severity and quality of life parameters were assessed using the KOOS-12.

Results: Women in groups I and II did not significantly differ in age, height, waist, and hip circumference; however, females with SPO had significantly higher weight (p=0.007) and BMI (p=0.009). A high risk of falls was observed in 100% of patients with SPO compared to 66.7% of patients in the control group (p<0.0001). Pain intensity was significantly higher in women with SPO (50 [33.5–45.5] points) compared to subjects in group II (50 [40.0–60.0] points) (p=0.04). Moreover, the quality-of-life scores were significantly lower in women with SPO (40 [26.0–45.0] points) than in those from the control group (50 [40.0–60.0] points) (p=0.009).

Conclusion: SPO is prevalent in nearly one-fourth of patients with KOA and is strongly associated with a higher risk of falls, pain intensity and lower quality of life. These findings underscore the importance of screening and management strategies in KOA patients to prevent functional decline and adverse outcomes.

P210

SEQUENTIAL THERAPY AFTER DENOSUMAB DISCONTINUATION: EVIDENCE-BASED STRATEGIES FROM A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS

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Objective: To evaluate and compare the effectiveness of different sequential therapies in preventing bone loss and fractures following denosumab discontinuation in individuals with osteoporosis.

Material and Methods: A systematic review and network meta-analysis was conducted according to the PRISMA guidelines and prospectively registered with PROSPERO (CRD420251151695). Databases including Embase, PubMed, and Scopus were systematically searched. Comparative studies in adults previously treated with denosumab for osteoporosis, followed by sequential treatment (oral or intravenous bisphosphonates [BPs], selective estrogen receptor modulators [SERMs], parathyroid hormone analogs, or romosozumab), were included. The outcomes assessed were changes in bone mineral density (BMD) at the lumbar spine, femoral neck, and total hip, and incidence of new vertebral fractures. A random-effects network meta-analysis was performed. Treatments were ranked using p-score heatmaps.

Results: A total of 16 studies (1612 participants) were included. Analysis revealed that romosozumab ranked highest for lumbar spine BMD improvement with a p-score of 0.99, followed by teriparatide (0.65), denosumab continuation (0.60), SERM (0.47), intravenous bisphosphonates (0.39) and oral bisphosphonates (0.37). For vertebral fracture prevention, romosozumab (p-score: 0.87) and denosumab continuation (0.77) were superior, followed by teriparatide (0.66), intravenous BPs (0.61), oral BPs (0.35) and SERMs (0.22). The overall fracture prevention rankings paralleled vertebral fracture results. Observation (no treatment) consistently ranked lowest across all outcomes.**Conclusion:** Sequential therapy after denosumab discontinuation is critical to prevent rapid bone loss and increased fracture risk. Romosozumab and denosumab continuation demonstrated the greatest effectiveness in maintaining BMD and reducing vertebral fractures, while bisphosphonates and SERMs showed moderate benefit. However, the findings should be interpreted with caution due to the limited number of available studies and potential heterogeneity. Overall, these results support the use of active sequential treatments to mitigate rebound bone deterioration and inform clinical decision-making after denosumab discontinuation.

P211

BONE CEMENT IMPLANTATION SYNDROME (BCIS) IN HIP FRACTURE

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A 73-year-old female was admitted following a fall resulting in left neck of femur intracapsular fracture. Her medical history includes advanced COPD (on LTOT), hypertension and diabetes mellitus. She was an ex-smoker. She underwent left hip cemented hemiarthroplasty. Postoperatively, she developed hypoxia, hypotension and tachycardia. Haemoglobin was stable. ECG showed new S1Q3T3 and incomplete RBBB.

Based on the immediate postoperative signs and the ECG findings, BCIS and pulmonary embolism were considered. Chest infection was also considered.

CTPA showed no evidence of central or segmental level pulmonary emboli. There was hyper-expansion of the left hemithorax and paucity of arterial flow suggesting emphysema.

She was treated with Oxygen, IV fluids and IV antibiotics. Vital signs as well as the hydration status were monitored closely and she gradually improved.

Discussion: BCIS is a complication of orthopaedic surgery involving cementation, and prosthesis insertion. It is most seen during cemented hemiarthroplasty or total hip arthroplasty. If severe it could be fatal and It is an important cause of perioperative morbidity and mortality.

The incidence of BCIS ranges from 20% to 30% in patients undergoing cemented hemiarthroplasty, although the frequency of severe events remains low.

Risk factors include old age, male gender, ASA grade 3 -4, cardiovascular disease and chronic lung disease.

There are hypotheses to explain the pathophysiological mechanisms of BCIS including “Embolization” of fat, bone marrow, and cement particles into the venous circulation during cementation leading to right heart strain. Also, it was hypothesized that the bone cement induces the release of “Vasoactive Mediators” leading to systemic vasodilation and bronchoconstriction, or induces an “Anaphylactoid Reaction”.

BCIS presents as hypoxia, hypotension, tachycardia or arrhythmia or unexpected loss of consciousness mostly during the time of cementation or prosthesis insertion, however it can happen within few hours postoperatively. It is frequently under-recognized. The spectrum of BCIS range between transient mild illness to a fatal condition.The diagnosis of CBIS is mainly clinical and is confirmed by CTPA. However, CTPA can be negative in cases of BCIS. Echocardiography can show right ventricular strain and pulmonary hypertension. It may detect hyperechogenic material (the cement) in the heart.

Early recognition and rapid resuscitation are the corner stone of treatment. High flow oxygen and intravenous fluids are essential. Hemodynamic monitoring to guide the subsequent steps including high dependency unit admission, invasive hemodynamic monitoring and inotropes if needed are important steps in the management.

Mild to moderate cases often resolve with prompt intraoperative intervention, severe cases are associated with high mortality rate, ranging from 40% to over 80% in some case series.

P212

THE SIGNIFICANCE OF RANKL, OPG, BONE METABOLISM MARKERS AND THEIR INTERRELATIONS IN THE EARLY DETECTION OF PREGNANCY- AND LACTATION-ASSOCIATED OSTEOPOROSIS

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Objective: To assess the diagnostic significance of RANKL, OPG, their ratio, and biochemical markers of bone turnover (PTH, osteocalcin, Beta-crossLaps, P1CP), as well as to identify their interrelations in pregnancy- and lactation-associated osteoporosis.

Materials and Methods: The study included 40 women during pregnancy or lactation. The main group consisted of 26 patients who presented with compression fractures of vertebrae Th1–Th12 developed during pregnancy and/or lactation.

The control group included 14 women without clinical and instrumental signs of osteoporosis.

In all participants, serum RANKL and OPG levels were measured using ELISA, followed by calculation of the RANKL/OPG ratio. Additionally, PTH, osteocalcin, Beta-crossLaps, and P1CP levels were assessed. The diagnosis of osteoporosis was confirmed by densitometry (DXA).

Results: Women in the main group showed statistically significant increases in RANKL, Beta-crossLaps, and PTH levels, and decreases in OPG, osteocalcin, and P1CP compared with the control group.

The RANKL/OPG ratio demonstrated the highest diagnostic value (AUC 0.870; Se – 90%, Sp – 82%), with a cut-off point >1.5. ROC analysis revealed high informativeness of Beta-crossLaps (AUC 0.830) and P1CP (AUC 0.790). In a regression model, the combination of RANKL/OPG, Beta-crossLaps, and P1CP provided maximum diagnostic accuracy (AUC = 0.920).

Correlation analysis showed a positive association of RANKL with Beta-crossLaps ($r = 0.68$; $p < 0.01$) and PTH ($r = 0.52$; $p < 0.05$), a negative correlation of OPG with PTH ($r = -0.55$; $p < 0.05$), a strong positive correlation of RANKL/OPG with Beta-crossLaps ($r = 0.72$; $p < 0.01$), and a negative correlation with P1CP ($r = -0.60$; $p < 0.05$).

Conclusion: In women with pregnancy- and lactation-associated osteoporosis, an imbalance of the RANKL/OPG system was revealed, indicating activation of bone resorption processes. The RANKL/OPG ratio has high diagnostic value and may be used for early detection of the disease. Beta-crossLaps and P1CP strongly correlate with RANKL/OPG, confirming their pathogenetic role and potential inclusion in the diagnostic algorithm. Comprehensive assessment of RANKL/OPG combined with Beta-crossLaps and P1CP enables the development of personalized fracture prevention strategies in women at risk.

P213

BONE HEALTH AND RECOVERY JOURNEYS IN REHABILITATION EXPERIENCES OF OLDER ADULTS WITH HIP FRACTURES

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Introduction: Hip fractures among older adults are a growing public health concern due to their association with significant physical, emotional and social challenges. Recovery is often complex, requiring not only medical care but also psychological resilience and social support. In Malaysia, limited research explores the lived rehabilitation experiences of older adults post-hip fracture. This study aims to explore the rehabilitation and recovery experiences of older adults with hip fractures in Kuantan.

Methods: This qualitative study was conducted among older adults aged 60 and above who had experienced a hip fracture and were undergoing or had completed rehabilitation at Hospital Tengku Ampuan Afzan (HTAA), Kuantan. Using purposive sampling method, 12 participants were selected based on inclusion and exclusion criteria. Data were collected through semi-structured interviews and analysed using thematic analysis. Verbatim transcripts were generated using the Goodtapes app, and themes were developed iteratively based on recurring patterns.

Results: Four main themes emerged: (1) Lived Experiences During Rehabilitation and Recovery, (2) Barriers to Rehabilitation, (3) Social Support and Cultural Influences on Rehabilitation and Recovery and (4) Long-term Recovery Expectations and Satisfactions. Participants described pain, fear of falling, loss of independence and challenges in accessing care, while also emphasizing the importance of family support, faith and self-motivation.

Conclusion: This study provides in-depth insights into the multifaceted experiences of older adults recovering from hip fractures. Understanding these experiences can guide healthcare professionals in delivering more holistic, culturally sensitive and patient-centred rehabilitation interventions.

P214

BONE HISTOMORPHOMETRIC ASSESSMENTS OF THE EFFECTS OF ROMOSOZUMAB WITH AND WITHOUT PRIOR BISPHOSPHONATE TREATMENT IN ILIAC BONE BIOPSY

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Background: Clinically, it has been reported that the effect of anabolic agents on increasing bone mineral density may be diminished following bisphosphonate therapy. In this study, we conducted histomorphometric observations of iliac bone biopsy specimens from patients treated with romosozumab, comparing those with and without prior bisphosphonate treatment.

Subjects and Methods: Iliac bone biopsies were obtained during spinal surgical treatment, with informed consent, from 4 female patients (mean age: 77 years, mean bisphosphonate duration: 99 months) with a history of bisphosphonate use and 8 female patients (mean age: 73.75 years) without prior treatment, after 3–4 months of romosozumab therapy. Undecalcified bone sections were prepared, and histomorphometric analysis of trabecular bone was performed.

Results: Osteoid volume (OV/BV) was 3.16% in the prior-treatment group and 3.96% in the no-treatment group. Osteoid surface (OS/BS) was 21.21% and 29.85%, respectively. These osteoid-related parameters showed no significant differences between groups. However, mineral apposition rate (MAR) was 0.23 μm/day in the prior-treatment group and 0.47 μm/day in the no-treatment group. Mineralizing surface (MS/BS) was 3.13% and 9.31%, respectively, and bone formation rate (BFR/BV) was 11.8% and 25.71%, respectively. These calcification-related parameters were 2–3 times lower in patients with prior bisphosphonate use.

Discussion: In patients previously treated with bisphosphonates, suppressed bone turnover may inhibit osteoblast function and recruitment, leading to a reduced anabolic response to romosozumab. While osteoid-related parameters did not differ markedly, clear differences were observed in calcification-related parameters. This suggests that long-term bisphosphonate treatment may primarily affect the mineralization aspect of romosozumab's bone-forming action.

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OSTEOPOROSIS SCREENING AND BEHAVIOR: EXERCISE HABITS, REASONS FOR EXAMINATION, AND EXAMINATION CIRCUMSTANCES AMONG WOMEN IN ORTHOPEDIC OUTPATIENT CLINICS

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Objective: This study aimed to examine factors influencing participation in osteoporosis screening using a questionnaire survey.

Material and Methods: The study included 478 women aged ≥40 years who visited our orthopedic clinic and consented to participate in the survey. Individuals with a prior osteoporosis diagnosis and those with incomplete responses were excluded. We collected information on age, height, weight, osteoporosis awareness and diagnosis, history of screening and examinations, and exercise habits. For participants with prior screening or examinations, the reasons for and locations of assessments were also analyzed. Statistical analyses involved chi-square tests and logistic regression adjusted for age and OSTA. The institutional ethics committee approved the study protocol (approval no.: 2225151014003).

Results: In total, 391 participants were analyzed (mean age, 66.4±12.9 years; mean OSTA, -2.32±3.52). Of them, 258 (66.0%) had undergone medical examinations or testing, and 76.0% reported exercising at least once per week. On logistic regression analysis, with history of medical examination as the dependent variable, age (OR 1.05, 95% CI 1.03–1.07) and OSTA (OR 0.86, 95% CI 0.80–0.91) were identified as significant independent predictors but exercise habit was not. Age-stratified analysis of assessment-related factors in the 258 participants with a medical history (40–64 years vs. ≥65 years) showed significant differences between groups in reasons for assessment ($\chi^2(8)=19.92$) and assessment setting ($\chi^2(5)=22.33$). Among participants aged 40–64 years, local government or workplace health checkups were the most common reasons for assessment, whereas physician referrals were most common among those aged ≥65 years.

Conclusions: This study found no direct link between exercise habits and attendance at medical checkups, likely because both exercise frequency and checkup participation increase with age. Medical examinations served primarily as screening opportunities for individuals aged <64 years, whereas physician referrals were vital in identifying high-risk individuals aged ≥65 years. This highlights the importance of implementing age-specific promotional strategies to encourage participation in osteoporosis screening. The authors declare no conflicts of interest.

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ANALYSIS OF RISK FACTORS OF ADJACENT VERTEBRAL FRACTURE AFTER BALLOON KYPHOPLASTY INCLUDING TRUNK MUSCLES

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Introduction: Balloon kyphoplasty (BKP) is a low invasive and effective treatment for osteoporotic vertebral fracture (OVF). However, a major problem in many cases is adjacent vertebral fracture (AVF). The cause of AVF is still unclear. The aim of this study was to analyze the risk factors of AVF after BKP.

Materials and Methods: 119 patients had BKP for OVF in our institution from 2015 May to 2025 May. We retrospectively investigated 91 patients (37 males, 54 females) who had only single-level BKP for levels >L2 and were followed up for >3 months after surgery. The average age at surgery was 77.9 years old, and the average follow-up period was 13.3 months. We divided the patients into two groups: Group A (n=24) had AVF after BKP during follow-up, and Group B (n=67) had no additional AVF after BKP. We compared the risk factors between groups. We investigated duration from onset to BKP, area of intra-vertebral cleft and the intra-vertebral body instability as pre-operative radiographic findings. The area ratio of the major psoas muscle/vertebral body, back muscles (multifidus muscle, longissimus muscle, iliocostal muscle)/vertebral body was investigated. The area ratios were measured at the cranial L4 vertebral body end-plate level in axial CT images and regarded the ratio as the amount of trunk muscle. Data were analyzed using the Mann-Whitney U test.

Results: Significant difference was observed only in the area ratio of the back muscles/vertebral body (average: 1.40 in Group A and 1.95 in Group B; $p < 0.01$). However, other factors, including the area ratio of the major psoas muscle /vertebral body, have no significant difference between groups.

Conclusion: Trunk muscles are reported to be related to vertebral body fractures and spinal deformities. But, no study has investigated the relationship between AVF and trunk muscles. The amount of back muscles was lower in the AVF after BKP group than in the non-AVF group. The pathogenesis of AVF after BKP may be related to trunk muscles before BKP, especially back muscles. Patients with a lesser amount of back muscles tended to suffer from AVF after BKP.

P217

COMMUNITY-BASED MULTICOMPONENT INTEGRATED CARE ENHANCES BONE MINERAL DENSITY OUTCOMES IN OLDER ADULTS WITH OSTEOPOROSIS

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Objective: In Taiwan, the prevalence of osteoporosis among adults aged ≥50 is approximately 25–30% in women and 10–15% in men, contributing substantially to disability, fracture risk, and healthcare burden. Although pharmacological treatment remains essential, effective management requires community-based multicomponent integrated strategies may provide additional benefits for bone health.

Material and Methods: We recruited the adults aged ≥50 years from 30 rural communities and randomly assigned them to multicomponent integrated care (MIC, n=65), osteoporosis care (OC, n=104), or usual care (UC, n=156). The MIC group integrated osteoporosis, sarcopenia, and polypharmacy management with nutritional and exercise support. The OC group focused solely on pharmacological osteoporosis treatment while the UC group received standard care. Bone mineral density (BMD) was measured at baseline, 1 year, and 2 years, and changes over time were analyzed using generalized estimating equation model.

Results: A total of 325 adults with osteoporosis 90.8% female, with a mean age of 75.6 years were included. After two years, MIC achieved the greatest BMD improvements (HIP +3.36%; FN +4.77%; and LS+5.39%), which were significantly higher than UC. OC also showed significant improvements than UC (HIP +3.19%; FN+2.77%; LS+4.10%). GEE analysis indicated that male, younger age, higher BMI, and greater skeletal muscle index were positively associated with BMD. Both MIC and OC groups demonstrated significant improvements compared with UC, with MIC showing the most consistent benefits across three sites in the first and second years (MIC: +3.2%, +2.4%, +2.5%; OC: +2.5%,+1.1%,+1.8% in HIP, FN and LS, respectively, all $p<0.05$ vs. UC).

Conclusions: These findings indicate that while standard osteoporosis care improves bone density, the comprehensive MIC approach yields greater and more sustained improvements, highlighting the superior effect of combining exercise training with pharmacological treatment. Nevertheless, the osteoporosis care can also show meaningful benefits compared with the usual care. The study emphasizes both strategies for osteoporosis management in aging rural populations.

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POTENTIAL PROTECTIVE EFFECTS OF HIBISCUS SABDARIFFA ON ALVEOLAR BONE IN OSTEOPOROTIC PERIODONTITIS MODEL

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As the aging population increases, osteoporosis and periodontitis, two highly prevalent bone-destructive diseases pose a growing threat to oral and systemic health. Periodontal disease and osteoporosis are chronic conditions characterized by inflammatory and metabolic disturbances that lead to progressive bone loss. Osteoporosis may accelerate periodontal breakdown, and although bisphosphonates such as zoledronic acid (ZLD) can reduce alveolar bone resorption, their use is associated with an increased risk of medication-related osteonecrosis of the jaw. This highlights the need for safer therapeutic alternatives. *Hibiscus sabdariffa*, rich in anthocyanins with antioxidant and antimicrobial properties, has been proposed as a potential adjunct for bone health.

Objective: The aim of the present study is to evaluate the effects of *Hibiscus sabdariffa* extract (HSE) on alveolar bone loss in an ovariectomized (OVX) rat model with ligature-induced periodontitis.

Material and Methods: Forty female Sprague-Dawley rats were allocated into four groups: sham control (SHAM), ovariectomized with experimental periodontitis (OVX+EP), OVX+EP treated with HSE (100 mg/kg/day; OVX+EP+HSE), and OVX+EP treated with ZLD (OVX+EP+ZLD). Ovariectomy was performed to induce oestrogen-deficient osteoporosis, and six weeks later, periodontitis was induced by ligature placement around the second maxillary molar. Treatments were initiated post-induction and continued for four weeks, HSE via daily oral gavage and ZLD via weekly intraperitoneal injection. At sacrifice, blood, gingival tissue and the second maxillary molar region were collected for analysis.

Results: HSE significantly reduced serum TNF-α, lowered gingival and femoral MDA levels, and increased serum osteocalcin compared to untreated OVX+EP rats. Micro-CT morphometric analysis showed partial preservation of alveolar bone microarchitecture, with reduced trabecular separation and increased trabecular number. Although ZLD exhibited greater effects on bone volume, both HSE and ZLD reduced alveolar bone loss relative to untreated OVX+EP rats.

Conclusion: HSE demonstrated antioxidant and anti-inflammatory benefits, with potential to mitigate alveolar bone loss in oestrogen-deficient osteoporotic conditions with periodontitis. These findings suggest HSE as a promising adjunctive therapy and an alternative to long-term bisphosphonate use in managing periodontal disease in osteoporotic patients. However, further studies are warranted to confirm its efficacy, clarify mechanisms, and evaluate its translational potential in clinical settings.

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PREDICTIVE SCORING SYSTEM FOR INDEPENDENT WALKING DISABILITY AFTER FRAGILITY HIP FRACTURE SURGERY: A MULTICENTER STUDY

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Objective: This study aimed to develop and internally validate a scoring system to predict independent walking disability three months after surgery for fragility hip fractures in older adults.

Materials and Methods: This multicenter observational cohort study included patients aged ≥60 years who underwent surgical treatment for fragility hip fractures. Twelve candidate predictors were prespecified based on clinical relevance. Multivariable logistic regression with backward elimination identified nine final predictors. A point-based scoring system was developed and internally validated using 500 bootstrap resamples.

Results: Of 740 patients, 113 (15.3%) were unable to walk independently, while 627 (84.7%) regained independent ambulation at three months. The model demonstrated good discrimination (AuROC = 0.81). Patients were stratified into low-, moderate-, and high-risk groups, with positive predictive values for walking disability of 1.8%, 19.1%, and 60.0%, respectively. Mean total scores were significantly higher in the disability group than in the non-disability group (11.7±3.0 vs. 7.2±3.9, p<0.001). To facilitate clinical application, a digital risk calculator derived from the final model was created to provide accessible prognostic information at the point of care.

Conclusions: This scoring system offers a practical tool for early risk stratification and individualized rehabilitation planning, particularly for high-risk patients who may benefit from targeted interventions.

QR code for accessing the scoring system. Scan the QR code to access the scoring tool for stratifying a patient's risk of independent walking disability and to view the corresponding recommended rehabilitation plan.

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A STUDY TO COMPARE ADVERSE CLINICAL OUTCOMES AFTER TOTAL KNEE ARTHROPLASTY BETWEEN DRAINAGE AND WITHOUT DRAINAGE AT RAMATHIBODI CHAKRI NARUEBODINDRA HOSPITAL

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Background: Drainage has been widely used when performing total knee arthroplasty, however, benefits and disadvantages of this procedure remain no consensus in various studies Objective: This study is a retrospective descriptive research project comparing adverse clinical outcomes after total knee arthroplasty between drainage and without drainage. To compare adverse clinical outcomes within two weeks after total knee arthroplasty between drainage and without drainage. To identify factors influencing adverse clinical outcomes within two weeks after total knee arthroplasty between drainage and without drainage

Method: Data were collected from the medical records of patients who underwent elective total knee replacement at Ramathibodi Chakri Naruebodindra Hospital, along with electronic medical records, from January 1, 2021, to December 31, 2023. A total of 262 patients were included. Data were collected by recording forms, including personal data and adverse clinical outcomes. The data were analyzed using descriptive statistics and Chi square test or Fisher's exact test.

Results: Wound complication, superficial wound infection, ecchymosis, swelling and wound discharge were more in to without drainage. In the without drainage group (n=188), 109 experienced ecchymosis, 27 swelling, 11 wound discharge, and 1 wound infection. The risk of wound complications after TKA was 2.85 times greater in patient without drainage than in those with drainage. The drainage were not significantly different compared to without drainage.

Conclusion: No significant different was observed in the two groups with respect to gender, age , body mass index, blood transfusion, Charson Comorbidity Index , blood loss and operation time were not significantly different between drainage and without drainage The findings of this study can guide hospitals in surgical planning and the development of care protocols to reduce adverse clinical outcomes in patients undergoing total knee replacement, ultimately enhancing patient safety.

Keywords: Total Knee Arthroplasty, drainage and without drainage, wound complication, ecchymosis, swelling

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REVIEW OF EFFICACY OF DENUSOMAB FOR TREATMENT OF OSTEOPOROSIS IN HONG KONG

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Introduction: The results of treatment with Denusomab for patients with osteoporosis from 2011 to 2024 were reviewed.

Materials and Methods: A review of 472 females treated with Denusomab from 2011 to 2024 was carried out. The mean age is 72. 49.7% had a history of a previous fragility fracture. This is a heterogeneous group of real-life patients presenting to a single medical clinic. 30% had received treatment for over 5 years. The pre- and post-treatment DXA result was reviewed.

Results: The mean increase of Femoral neck BMD was 12.7% and for the Lumbar spine (total) is 27.4%. A greater increase in BMD is noted for patients with longer-term treatment. Adverse events were similar to previously reported series.

Conclusion: Denosumab showed similar results for a group of heterogeneous females with osteoporosis when compared to other reported control series.

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"TO THE BONES": A META-ETHNOGRAPHY OF THE LIVED EXPERIENCE OF POSTMENOPAUSAL WOMEN WITH OSTEOPOROSIS

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Objective: To synthesize qualitative research on the lived experience of postmenopausal women with osteoporosis, exploring how osteoporosis is understood, felt, and managed in daily life.

Methods: In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and eMERGe reporting guidelines, a qualitative systematic review and meta-ethnographic synthesis was conducted, with four databases (Medline, Embase, CINAHL, and PsycINFO) searched from inception up to June 2025, using terms related to "osteoporosis," "postmenopausal," "qualitative," and "lived experience." Original studies were included if they employed qualitative methods and explored the lived experience of postmenopausal women diagnosed with osteoporosis, with or without fracture. Titles, abstracts, and full texts were screened by two independent reviewers, and data from included studies were charted to capture key study characteristics and second-order constructs (author interpretations). Using constant comparison, second-order constructs were translated across studies to generate third-order constructs, which were then synthesized into overarching lines of argument through an interpretive, embodiment-focused lens and Noblit and Hare's seven-phase approach.

Results: A total of 32 qualitative studies were included, with 22 second-order constructs (author interpretations) identified. These constructs were translated across studies to develop third-order interpretations and two overarching lines of argument grounded in the concept of embodiment. First, embodied disruption highlights how the diagnosis of osteoporosis reconfigures women's bodily awareness: previously automatic movements become infused with caution, and the body is reimagined as fragile, unreliable, and ageing. This shift disrupts identity and erodes confidence. Second, embodied adaptation captures how women navigate fear of fracture and strive to preserve autonomy. They adopt protective routines, renegotiate roles, and seek knowledge to regain bodily agency, yet often remain burdened by uncertainty, invisibility, and unaddressed emotional needs. Fear of falling, fracture, and physical decline remains a pervasive undercurrent among patients.

Conclusions: Osteoporosis affects how postmenopausal women inhabit their bodies, instilling vulnerability, vigilance, and altered self-perception. Women come to feel their bones as brittle and their bodies as newly vulnerable. Recognizing the lived body as central to the osteoporosis experience calls for relational, patient-centered care that affirms bodily knowledge, supports adaptive strategies, and addresses the multifaceted impact of fragility.

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EXPLORATION OF RENIN INHIBITOR TANSHINONE IIA AND ITS PRESERVATION AGAINST DIABETIC SARCOPENIA

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Objective: Diabetic sarcopenia (DS) is a key complication in skeletal muscle associated with hyperglycemia. This study aimed to clarify the role of tissue renin-angiotensin system (RAS) in DS and to explore novel renin inhibitor to preserve muscle associated with diabetes.

Material and Methods: A case-control study was performed to assess angiotensin II (Ang II) level in diabetes participants. The docking analysis with molecular dynamics simulation, the surface plasmon resonance, the human renin-transfected HEK-293 cells, and the mouse myoblasts C2C12 were employed to evaluate the binding of tanshinone IIA (Tan IIA) with renin and the subsequent activity. The db/db mice were orally administered with Tan IIA for 8 weeks and the C2C12 cells culturing with high glucose (HG, 30 mM) were treated with Tan IIA.

Results: The DS participants displayed significant elevation in serum Ang II level. Consistently, high glucose induced up-regulation in protein expression of renin and its downstream peptide Ang II in C2C12 cells. Tan IIA exhibited direct binding affinity with renin protein, showed the comparable IC_{50} value as aliskiren on renin inhibitory activity, and inhibited Ang II content and expression of HEK-293 cells. The treatment of db/db mice with Tan IIA increased muscle strength, cross-sectional area of myofibers, protein expression of MHC, and mRNA expression of MRFs (MEF2C, MyoD, Myf5), and reduced expression and content of Ang II in skeletal muscle. Accordingly, Tan IIA promoted fusion index, wound healing and differentiation of the myoblasts, and enhanced protein expression of MyoD and MyoG of HG-treated C2C12 cells. Furthermore, Tan IIA lowered the levels of fasting blood glucose and glycated serum protein, improved OGTT, and stimulated glycogen accumulation in liver and muscle, followed by increasing glucose uptake *via* 2-NBDG assay, up-regulating GLUT4 expression, and repressing phosphorylation of $IRS1_{Ser307}$ in C2C12 upon to HG. Finally, the type 2 diabetic mice study showed the attenuation of Tan IIA on AGEs accumulation and on protein expression of AGEs and RAGE in muscle, and the *in vitro* study demonstrated the suppression of Tan IIA on RAGE expression and p38 phosphorylation.

Conclusion: The hyperactivity of RAS in skeletal muscle contributed to the development of diabetes sarcopenia. Tanshinone IIA possessed the ability in direct inhibition on renin activity, followed by its beneficial effects on skeletal muscle performance and glucose disposal, and its preservation against insulin resistance and AGEs/RAGE signaling in muscle.

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NONCANONICAL BEHAVIOUR OF THE HUMAN FIBULA IN RESPONSE TO SPORTS TRAINING: EVIDENCE OF PHYLOGENETICALLY ORIENTED ADAPTIVE PATTERNS

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Objectives: To test whether the human fibula displays noncanonical, stimulusspecific adaptations: (1) attenuated mediolateral diameter development and lateralbending inertia with endurance running; and (2) exaggerated cortical growth and tissue redistribution to resist lateral bending with training that solicits foot rotation/eversion.

Material and Methods: Ninetyone healthy young men (18–30 years) were studied: sedentary controls (n=20), longdistance runners (n=20), soccer (n=31) and rugby players (n=20). Peripheral quantitative computed tomography (pQCT) acquired 15 transverse scans per bone from 10–80% of tibial length. Foot rotation/eversion torque and jump force were measured by dynamometry. Structural indices included cortical area and the lateralbending moment of inertia (MIlat). Design–strength and design–mass relations were assessed with ANCOVA.

Results: Compared with controls, proximal fibulae in soccer and rugby players showed larger cortical area (+18.6% and +23.4%; $p<0.01$) and higher MIlat (+32.7% and +41.8%; $p<0.001$). Runners exhibited no significant fibular differences despite tibial improvements (cortical area +12.3%; $p<0.05$). Design–strength relations between proximal fibular MIlat and foot rotation/eversion torque had higher intercepts for soccer and rugby players (ANCOVA, $p<0.01$), whereas runners did not differ from controls. These differential responses were specific to the fibula and were not observed in the tibia. Design–mass relations for MIlat also showed higher intercepts in soccer and rugby players than in controls and runners ($p<0.01$), indicating a more efficient lateral distribution of available tissue.

Conclusion(s): The human fibula exhibits phylogenetically consistent, stimulusspecific adaptations—runnerlike "prey" patterns and football/rugby "predator" patterns—beyond generic bonestrength control. Recognising these noncanonical responses may inform targeted osteogenic interventions and sportspecific injury prevention.

Disclosures: None.

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THE EFFECTS OF A ONE-YEAR CROSS-FIT TRAINING PROTOCOL ON BONE HEALTH PARAMETERS IN A GROUP OF YOUNG INACTIVE MEN

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Objective: The main aim of the current study was to explore the effects of a 1-year Cross-Fit training protocol on bone health parameters such as bone mineral content (BMC), bone mineral density (BMD), femoral neck geometry parameters and composite indices of femoral neck strength in a group of young inactive men.

Material and methods: A total of 40 young inactive men voluntarily participated in the study, with 26 completing it. Bone mineral content (BMC), bone mineral density (BMD) and hip geometry indices were evaluated by DXA. Physical performance parameters were evaluated using valid tests. The participants were assigned to two different groups: a control group (CG; n = 13) and a Cross-Fit group (CFG; n = 13). The CFG performed two sessions of Cross-Fit exercise per week, with each session lasting 60 minutes.

Results: The study demonstrated that whole body (WB) BMC, WB BMD, femoral neck cross-sectional area (CSA), one-repetition maximum (1-RM) bench press, 1-RM shoulder press, 1-RM deadlift, maximum oxygen consumption (VO2 max), vertical jump and lower limb muscular power significantly increased in the CFG but not in the CG.

Conclusion: The current study suggests that 1 year of Cross-Fit training is an effective method to improve WB BMC, WB BMD, CSA and physical performance parameters in young inactive men.

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COMPOSITE INDICES OF FEMORAL NECK STRENGTH IN YOUNG ADULT MALE VOLLEYBALL PLAYERS

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Objective: The aim of the present study was to explore the influence of volleyball practice on composite indices of femoral neck strength (compression strength index (CSI), bending strength index (BSI) and impact strength index (ISI)) in a group of young adult men. To do so, we compared composite indices of femoral neck strength in volleyball players and active men. We hypothesized that volleyball players would have greater indices of femoral neck strength (CSI, BSI and ISI) compared to active men.

Methods: 36 Lebanese young men whose ages range from 18 to 29 years (21.6 ± 3.1 years) participated in our study. The population was divided into 2 groups based on their physical activity status: 18 volleyball players and 18 active men. Total hip and femoral neck bone mineral density was measured by DXA. Composite indices of femoral neck strength were calculated.

Results: In our study, age and weight were not significantly different between the two groups (volleyball players vs active men). Volleyball players had significantly higher CSI, BSI and ISI values compared to active men.

Conclusion: The current study suggests that volleyball practice is associated with greater indices of composite indices of femoral neck strength in young men. Volleyball practice during adolescence and early adulthood seems important to prevent hip osteoporotic fractures later in life. Future longitudinal studies are necessary to confirm our preliminary results.

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INTEGRATIVE RNA-SEQ AND MACHINE LEARNING IDENTIFY BONE–IMMUNE SIGNATURES IN STAT3-LOF HYPER-IGE SYNDROME

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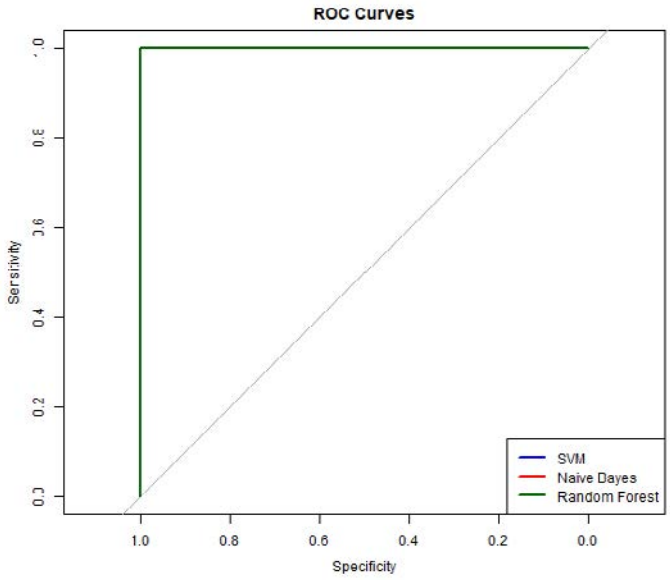
Background: Hyper-IgE syndrome (HIES), most often due to STAT3 mutations, is characterized by recurrent infections, Th17 deficiency, and skeletal abnormalities in ~70% of patients. STAT3 is a key regulator of both immune and bone pathways, but the transcriptional mechanisms linking immune dysregulation to skeletal defects remain incompletely understood.

Aim: To identify molecular mechanisms underlying bone–immune dysregulation in STAT3-LOF HIES using an AI-driven transcriptomic approach.

Methods: Four STAT3-LOF HIES patients (mutations in DNA-binding, coiled-coil, and linker domains; NIH score ≥20, Th17 ≤0.5%, pSTAT3 <30%) and four healthy controls were studied. PBMC-derived MSCs were differentiated into osteoblasts and assessed for ALP activity and mineralization. Bulk RNA-seq was performed, with differentially expressed genes intersected against curated bone-related genes and prioritized using machine learning (ReliefF, ElasticNet, Random Forest). Functional enrichment, WGCNA, ROC analyses, and qRT-PCR validation were performed.

Results: Patient-derived osteoblasts exhibited impaired mineralization and reduced ALP activity compared with controls. RNA-seq identified **529 downregulated and 769 upregulated genes** (≥1.5-fold). AI-guided enrichment analyses highlighted pathways central to **extracellular matrix organization, skeletal system development, osteoblast differentiation, immune cell signaling, and cytokine-mediated regulation of bone remodeling**. WGCNA revealed distinct modules enriched in skeletal and immune programs: the **turquoise module** (836 DEGs) was dominated by skeletal morphogenesis genes (HOX cluster, **TBX15, ALPL, ID4, EFEMP1**); the **yellow module** (197 DEGs) contained immune regulators (**CYBB, ITGAX, TLR4, MMP9, SPP1, SPI1, TREM2**); and the **blue/red modules** were enriched for ECM remodeling and signaling mediators (**POSTN, BMP4, FOS, NFATC2, WNT9A**). Integrated ML feature selection and DEG overlap prioritized a compact **bone–immune signature** consisting of **BGN, EFEMP1, HOXA11, SULF1, IGFBP3, ID4, ADRB2** (skeletal) and **TLR4, MMP9, SPP1, TREM2, SPI1** (immune). ROC analyses confirmed excellent discriminative performance for this signature (Random Forest AUC ≈ 1.0), and qRT-PCR validation confirmed altered expression (**p = 0.0286**). Together, these findings support the potential of these hub genes as **robust biomarkers linking immune dysfunction to skeletal pathology in STAT3-LOF HIES**.

Conclusions: Our integrative AI-guided transcriptomic analysis reveals profound dysregulation of bone–immune regulatory networks, with a particular impact on osteoblast formation in STAT3-LOF HIES. These results provide novel mechanistic insights into the skeletal abnormalities observed in primary immunodeficiency and highlight candidate biomarkers that bridge immune dysfunction with bone pathology.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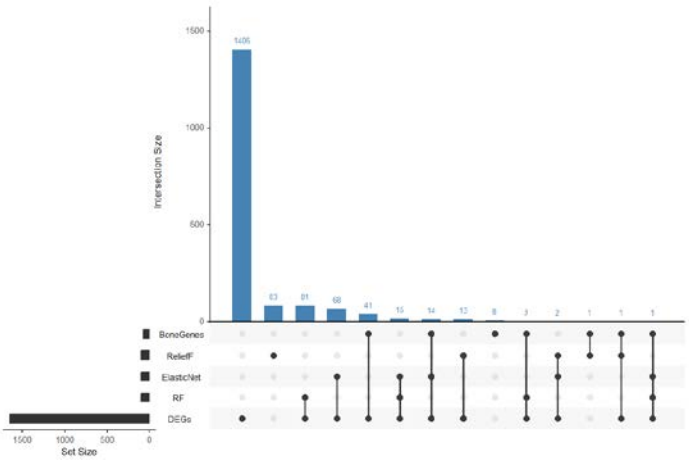
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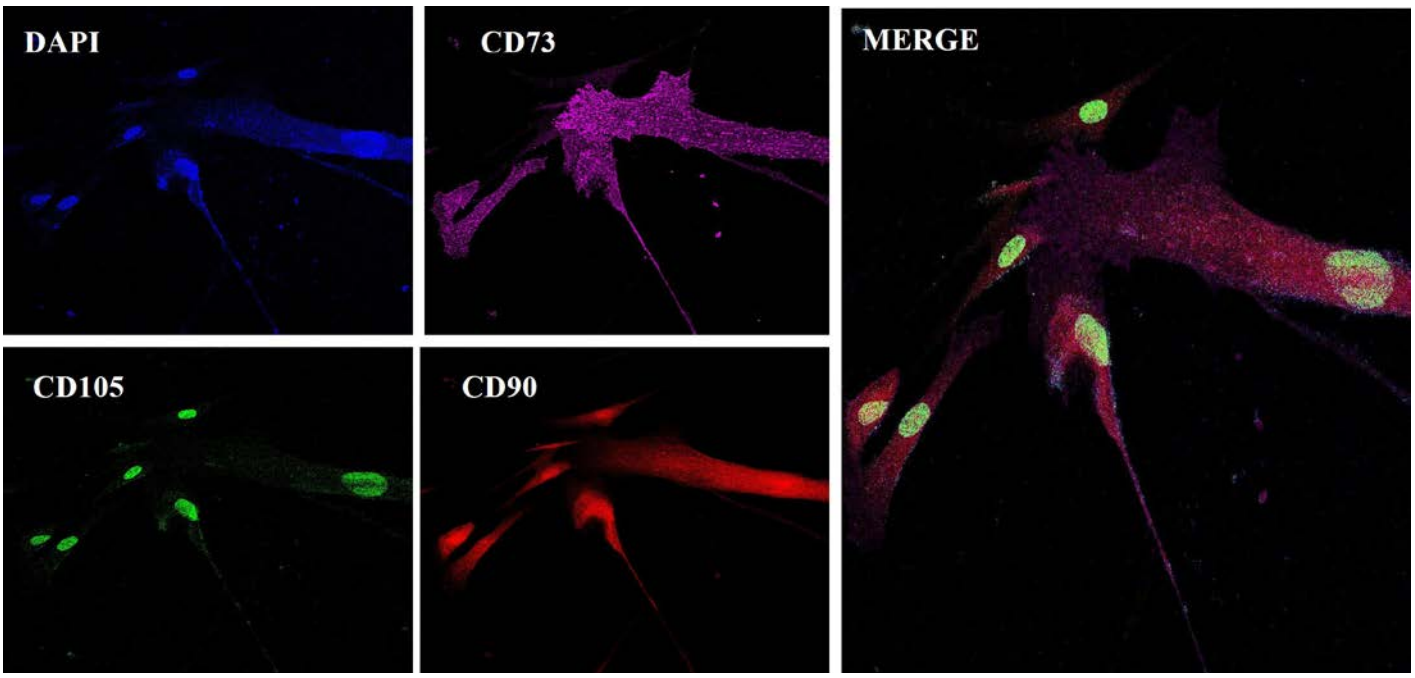
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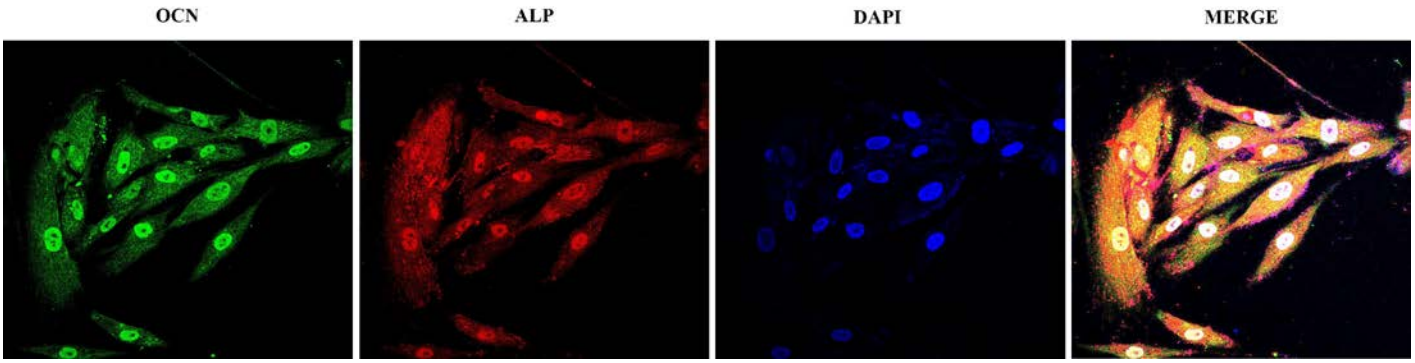
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TARGETING IL-9 AS A NOVEL IMMUNOTHERAPEUTIC STRATEGY IN MITIGATING INFLAMMATORY BONE LOSS IN OSTEOPOROSIS

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Introduction: Recent discoveries have established the pivotal role of IL-9-secreting Th9 helper cells in various inflammatory diseases. However, little is known about how Th9 cells contribute to the etiology of inflammatory bone loss in post-menopausal osteoporosis (PMO). Therefore, in this study, we investigated the role of Th9 cells in the pathogenesis of PMO.

Materials & Methods: *in vitro* assays were conducted to investigate the potential of Th9 cells and IL-9 in influencing osteoclastogenesis. For *in vivo*, female C57BL/6 mice were divided into Sham and ovx groups. The mice were euthanized at different time points (15, 30, and 45 days), and the bone marrow and spleen were harvested for various analyses using SEM, µCT, FACS, and ELISA. To further determine the role of IL-9 in promoting bone loss, mice were injected intraperitoneally (i.p) with 200 µg/mouse anti-IL-9 antibody every other day starting on day -1 of Ovx surgery for 45 days.

Results: We observed that IL-9 has a pathological impact on inflammatory bone loss in ovariectomized (Ovx) mice. Our *in vivo* temporal kinetics analysis revealed that estrogen deprivation enhanced the production of IL-9 from Th cells (majorly Th9 and Th17). Both our *ex vivo* and *in vivo* studies corroborated these findings in Ovx mice, as estrogen diminishes the potential of Th9 cells to produce IL-9. Mechanistically, Th9 cells in an IL-9-dependent manner enhance osteoclastogenesis and thus could establish themselves as a novel osteoclastogenic Th cell subset. Therapeutically neutralizing/blocking IL-9 improves bone health by inhibiting the differentiation and function of osteoclasts, Th9, and Th17 cells, along with maintaining gut integrity in Ovx mice. Post-menopausal osteoporotic patients have increased IL-9-secreting Th9 cells, which may suggest a potential role for IL-9 in the development of osteoporosis.

Conclusion: Collectively, our study establishes IL-9 secreting Th-cells as the critical regulator of bone-loss observed in both preclinical and clinical subjects of post-menopausal osteoporosis and highlights the fundamental implications of IL-9/Th9 targeted immunotherapies as an innovative approach for the management and treatment of inflammatory bone-loss observed in post-menopausal osteoporosis.

P229

FALLS RISK ASSESSMENT IN THE EMERGENCY DEPARTMENT: A MISSED OPPORTUNITY FOR SECONDARY FRACTURE PREVENTION A COLLABORATIVE INITIATIVE BETWEEN EMERGENCY MEDICINE, ORTHOPAEDICS, AND ORTHOGERIATRICS

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Background: Falls and fragility fractures in older adults represent a major healthcare burden, leading to increased morbidity, mortality, and healthcare costs. National guidance, including **NICE CG161** on falls in older people and **NICE QS149** on osteoporosis, recommends systematic falls risk assessment and secondary prevention for patients aged 65 years and above who present with a history of falls or fragility fracture. The new **NHS Long Term Plan (2029–2039)** places fracture and falls prevention at the centre of strategies to reduce avoidable admissions and recurrent fractures. The Emergency Department (ED) is often the first and, in many cases, the only point of contact for older adults presenting after a fall, making it a critical setting to identify patients at risk and initiate preventive measures.

Aim: This project aimed to evaluate current compliance with falls risk assessment in our ED and to explore opportunities for collaboration between ED, Orthopaedics, and Orthogeriatrics in strengthening secondary fracture prevention.

Methods: We conducted a retrospective review of 200 consecutive cases of patients aged 65 years and above who attended our ED with a history of fall. Data were collected regarding the presence of the falls risk assessment form, the rate of completion, and subsequent actions taken. Findings were then discussed jointly by ED, Orthopaedics, and Orthogeriatrics teams to design a collaborative improvement plan.

Results: The audit revealed that the falls risk assessment form was present in 185 of the 200 reviewed cases, representing 92.5% availability. However, the form was completed in only 20 of these 185 cases, giving a completion rate of just 10.8%. The majority of patients were treated for their acute injury and subsequently discharged home without referral for further falls or fracture prevention assessment. This highlights a significant missed opportunity to intervene at the earliest stage and prevent secondary fractures.

Discussion: The findings demonstrate a striking gap between national recommendations and current practice. Low compliance with falls risk screening means that many older adults leave the ED without their risk being addressed. For some, the ED encounter may be the first and last medical contact prior to sustaining a more serious injury, such as a hip fracture. Orthopaedics and Orthogeriatrics traditionally focus on fracture management and secondary prevention once a fracture has already occurred. However, ED clinicians are uniquely positioned at the gateway of care to identify high-risk patients earlier. By working collaboratively, ED, Orthopaedics, and Orthogeriatrics can bridge this gap, aligning with NHS priorities and improving patient safety, outcomes, and resource use.

Proposed Interventions: We propose targeted education and training of ED staff on the importance of falls risk screening and its role in preventing future fractures. Integration of the falls risk assessment form into the ED electronic record, with mandatory completion prompts, would reduce reliance on memory and increase compliance. A clear referral pathway should also be established, ensuring that any positive screen automatically triggers referral to Orthogeriatrics, the Falls Clinic, or the Fracture Liaison Service (FLS). This approach ensures that ED identifies patients at risk, Orthopaedics manages acute fractures, and Orthogeriatrics delivers comprehensive secondary prevention.

Conclusion: Our audit demonstrated that compliance with falls risk assessment in ED is currently very low, at only 10.8%, despite high availability of the form. This represents a major missed opportunity, as the ED is the golden place for initiating secondary prevention. Many patients may never re-engage with healthcare until they sustain a second, more severe fracture, such as a hip fracture. A collaborative pathway involving ED, Orthopaedics, and Orthogeriatrics is essential to address this gap. By improving screening, embedding referrals, and aligning with the NHS Long Term Plan, we can reduce re-fracture rates, lower morbidity and mortality, and deliver safer, more proactive care for older adults.

P230

ASSOCIATION BETWEEN SERUM VITAMIN D LEVELS AND BONE MINERAL DENSITY IN GERIATRIC HIP FRACTURES: IMPLICATIONS FOR SECONDARY FRACTURE PREVENTION

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Introduction: Osteoporosis contributes substantially to fragility fractures in ageing populations, with hip fractures driving morbidity and healthcare burden. Vitamin D deficiency impairs calcium–phosphate balance, reduces bone integrity, and increases fracture risk, while also affecting muscle strength and fall propensity. Bone mineral density (BMD) remains a principal measure of fracture risk. This study examined the correlation between serum vitamin D and BMD T-scores in elderly hip fracture patients, with site-specific DXA analysis as a secondary outcome.

Methods: We retrospectively analysed a prospectively followed cohort of surgically treated hip fracture patients (n=381) between January–December 2024. Demographics, serum 25-hydroxyvitamin D [25(OH)D], and DXA-derived T-scores (femoral neck, total hip, lumbar spine) were obtained. BMD was classified using WHO criteria and stratified per ISCD guidelines; vitamin D status was defined by Holick's classification. Associations were evaluated with Mann–Whitney U, Kruskal–Wallis, Chi-square, logistic regression, and Spearman's correlation (SPSS v30.0.0.0), with significance at $p<0.05$.

Results: Of 381 patients (110 males, 271 females; mean age 79.4 ± 8.2 years), 223 (58.5%) sustained neck of femur and 172 (41.5%) intertrochanteric fractures. Postoperative BMD scans were available in 219 patients; 156 (71.2%) were osteoporotic. Median serum 25(OH)D was 25.9 ng/mL (IQR 12.5). Vitamin D status was normal in 111 (30.1%), insufficient in 147 (39.8%), and deficient in 111 (30.1%). No significant differences were observed in vitamin D by fracture type ($p=0.051$), osteoporosis status ($p=0.498$), or site-specific BMD. Interestingly, patients with normal vitamin D showed lower median femoral neck (−3.05), total hip (−2.95), and lumbar spine (−2.00) T-scores compared to those with insufficiency or deficiency.

Discussion & Conclusion: Serum 25(OH)D did not correlate with BMD in hip fracture patients, consistent with previous studies reporting no direct association. A substantial proportion of non-osteoporotic patients nevertheless exhibited suboptimal vitamin D levels, underscoring its relevance beyond skeletal metrics. Fracture risk is multifactorial, shaped by sarcopenia, BMI, activity, comorbidities, nutrition, and genetics. Routine vitamin D assessment and supplementation, alongside BMD evaluation, should be considered within integrated preventive strategies.

P231

TRADITIONAL METHODS OF SUSTAINING BONE HEALTH, IN PERI AND MENOPAUSAL BONE HEALTH

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Objective: To establish the traditional and cultural practices to upkeep skeletal health of women in peri- and menopausal age group.

Type: Prospective study

Period 11months from August 2024 to June 2025.

Place: Sri. K. Kishan Rao Hospital, Day Care Centre, Hyderabad, India

Methodology: N=56.

Women aged between 45 and 55 were selected who complained of various bone and muscle related complaints, which r then tabulated.

Simple advice regarding lifestyle, dietary choice and placebos were given. Counselling sessions done.

Results: After 11months the following noted: Symptomatic relief, general wellbeing and improved work / return to occupation were noted and tabulated.

Conclusion: In low resource settings, low-cost management of peri and menopausal women for their skeleton muscular complaints consisting of encouraging local traditional practices, diet advice and counseling will improve their QOL and productivity.

P232

A PATIENT-FACING WEB-BASED DECISION AID SIGNIFICANTLY REDUCES ANTICIPATORY DENTAL ANXIETY IN OSTEOPOROTIC PATIENTS: A PRE-POST PILOT STUDY

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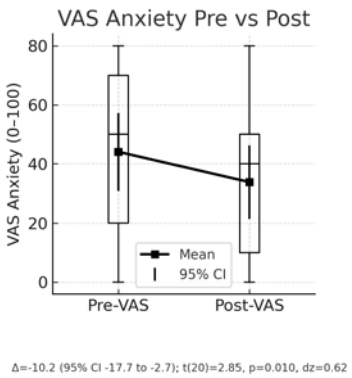
Objective(s): To evaluate a novel web-based decision aid for osteoporotic patients on its effectiveness in reducing anticipatory dental anxiety and improving knowledge/confidence.

Material and Methods: A prospective, single-group, pre-post study was conducted at a tertiary hospital. The decision aid's logic was developed in accordance with the AAOMS 2022 position paper on MRONJ. Fifty adults receiving antiresorptive or anabolic therapy for osteoporosis were enrolled. Before and after using the web app, participants completed the Visual Analog Scale (VAS, 0–100) for anxiety, the Modified Dental Anxiety Scale (MDAS), and a 6-item knowledge/confidence scale. User satisfaction was rated post-intervention. Pre- and post-intervention scores were compared using paired t-tests.

Results: The primary outcome, VAS anxiety score, significantly decreased from a mean of 44.0 (SD 29.1) to 33.8 (SD 27.3), representing a mean reduction of 10.2 points (95% CI -17.7 to -2.7; p=0.010; Cohen's dz=0.62). In contrast, knowledge/confidence scores were high at baseline and remained stable (25.8 vs 25.7; p=0.867), suggesting a ceiling effect. Total MDAS scores also showed no significant change (p=0.635). Overall user satisfaction with the application was high (mean 4.6/5, SD 0.6).



Conclusion(s): This web-based decision aid proved effective in significantly reducing anticipatory dental anxiety among osteoporotic patients. While knowledge scores were already high, the tool was highly rated by users. This digital intervention is a promising tool to support shared decision-making and potentially reduce treatment delays caused by patient anxiety. Further evaluation in a randomized controlled trial is warranted.

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P233

FIBROUS DYSPLASIA OF BONE AND HIP FRACTURE

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A 66-year-old male was admitted with a fall; he was mobilising, felt that his leg 'gave way' and fell onto his left hip, immediately he had left hip pain. His medical history included Fibrous Dysplasia of bone (FD) and sensorineural hearing loss aged 51 years. He was mobile with 2 crutches.

He was haemodynamically stable. Examination was normal. FBC, UEs, LFTs and Ca, PTH and Vit D were normal. XR showed widespread cystic formation in both proximal femurs, with the left being more significantly affected. There was fracture of the left femoral neck and greater trochanter.

it was felt that he fractured then fall and he underwent left hip replacement.

Discussion: Fibrous dysplasia of bone (FD) is a rare genetic bone disease. It is caused by a mutation in the guanine nucleotide-binding protein gene (GNAS). This results in a defect of osteoblast differentiation and an increase in activity of the osteoclasts.

FD can be monostotic (one bone is affected), polyostotic (more than one bone is affected) or a part of the McCune Albright syndrome (with endocrine and skin involvement). The overall incidence of FD is between 1 in 5,000 and 1 in10,000.

Monostotic FD is more prevalent than the polyostotic form, at an approximate ratio of 3:1.

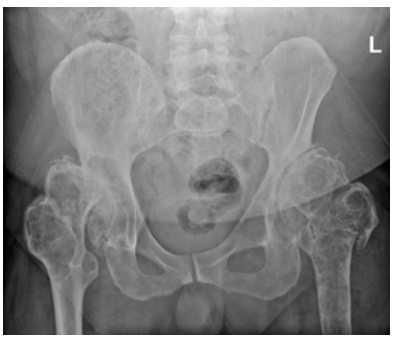
FD has a wide spectrum from slight symptoms to significant bone pains, bone deformity and multiple fractures. Bone pain is present in half of patients.

The incidence of fractures in monostotic FD is approximately 5%, and in polyostotic form it is around 85% with 40% of patients having 3 or more fractures. Around 50% of patients with FD sustained a femoral fracture.

FD is diagnosed by the clinical picture and radiological appearance of well defined “expansile lesions with a ground glass appearance surrounded by a thin cortex”. Histology is not required if the radiological appearance is classical.

Physiotherapy is helpful to increase muscle strength, and surgery to prevent or repair fractures. Observational and un-controlled studies have shown that IV pamidronate and zoledronic acid reduce bone pain and decrease bone turnover markers in most patients and improve the radiological bone lesions in some patients. Also, there is some evidence to support Denosumab use (anti-RANKL antibody). Currently there is no strong evidence to support the use of oral bisphosphonates in the treatment of FD.

The prognosis depends on the number of bones affected and the extent of disease.



P234

MAGNETIC RESONANCE IMAGING PHANTOM-BASED S1 VERTEBRAL SCORES INDICATE OSTEOPOROTIC CHANGES IN POSTMENOPAUSAL WOMEN

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Background: Using advanced MRI technique, previous studies have found that fat–water changes were consistent with osteoporosis. The role of routine MRI sequences have not been investigated yet. The S1 vertebra is considered a crucial anatomical site in spine surgeries because it seldom suffers from fractures. Thus, S1 could indicate osteoporotic fat–water changes.

Purpose: To assess fat–water-like tissue changes on the 1st sacral vertebra using novel magnetic resonance imaging (MRI) phantom-based F- and W-scores and evaluate their diagnostic performances in osteoporosis detection.

Materials and Methods: Forty-two female volunteers (aged 62.3±6.3 years) underwent spine examination with both MRI (including a phantom) and dual-energy X-ray absorptiometry (DXA) following ethical approval. MRI phantom-based F- and W-scoreS1 were defined by normalizing S1 vertebral signal intensities (SIs) by coconut oil and water SIs of the phantom on T1- and T2-weighted imaging, respectively. Using receiver operating characteristic analysis, the diagnostic performances of the new scores for evaluating osteoporosis and vertebral fractures were investigated against standard areal bone mineral density measured with DXA (DXA-aBMD).

Results: The F-scores1 and W-scores1 were greater (4.11 and 2.43, respectively) in patients with osteoporosis than those without osteoporosis (3.25 and 1.92, respectively) and achieved areas under the curve (AUCs) of 0.82 and 0.76 ($p<0.05$), respectively, for osteoporosis detection. Similarly, the mean F-scores1 and W-scores1 were higher (4.11 and 2.63, respectively) in patients with vertebral fractures than in those without fractures (3.30 and 1.82, respectively) and had greater AUCs (0.90 for W-scoreS1 and 0.74 for F-scores1) than DXA-aBMD (AUC, 0.26; $p<0.03$). In addition, the F- and W-scores1 demonstrated a strong correlation ($r=0.65$, $p<0.001$).

Conclusion: The new S1 vertebral-based MRI scores were developed to detect osteoporotic changes and demonstrated improvements over DXA-aBMD in differentiating patients with vertebral fractures.

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TRIPLE BURDEN OF AUTOIMMUNITY AND OSTEOPOROSIS: RHEUMATOID ARTHRITIS AND PRIMARY BILIARY CIRRHOSIS

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Objective: To highlight the risk of secondary osteoporosis in patients with rheumatoid arthritis and primary biliary cirrhosis, illustrating how autoimmune overlap and longterm corticosteroid use accelerate skeletal fragility.

Methods: A clinical case of a 60-year-old woman with diagnosed rheumatoid arthritis placed on methotrexate which was later discontinued due to high transaminases and switched to corticosteroids and antimalarials. Suspicion from persistent high transaminases lead to a referral to gastroenterohepatology where she was diagnosed with primary biliary cirrhosis with positive Anti-mitochondrial antibodies and given Ursodeoxycholic acid. The condition worsened due to multiple vertebral compression fractures, and loss of bone density confirmed with DXA scan. Secondary osteoporosis was diagnosed, and she continues taking vitamin d and calcium supplements.

Results: The patient showed osteoporosis with T-score results of -3.4, along with multiple vertebral fractures on x-ray, despite continuing treatment with vitamin D and calcium, as bone fragility progressed with corticosteroid use. Transition to Rituximab showed significant improvement to her autoimmune diseases, which led to reduction in corticosteroids and little improvement of her bone density.

Conclusion: This case highlights the importance of early recognition and management of secondary osteoporosis in patients with overlapping autoimmune diseases, where cumulative risk factors converge to accelerate skeletal fragility. Postmenopausal patients with rheumatoid arthritis have higher prevalence of osteoporosis and vertebral fractures. Treatment of osteoporosis with vitamin D and calcium is a must even before the definite diagnosis, as bone fragility is expected with so many factors coupled together.

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ASSOCIATION OF PARATHYROID HORMONE AND HYPERPARATHYROIDISM ON THROMBOEMBOLIC EVENTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Primary hyperparathyroidism (PHPT) and secondary hyperparathyroidism (SHPT) in chronic kidney disease–mineral bone disorder (CKD-MBD) are associated with excess cardiovascular morbidity and mortality. Accumulating evidence implicates parathyroid hormone (PTH), a key regulator of calcium homeostasis, in major adverse cardiovascular events (MACE) via vascular, metabolic, and prothrombotic pathways. However, the strength and consistency of these associations remain uncertain.

Objectives: To systematically evaluate whether (1) hyperparathyroidism (HPT) increases the risk of thromboembolic cardiovascular events, (2) elevated PTH levels confer risk even without overt HPT, and (3) PTH correlates with haemostatic and coagulation biomarkers.

Methods: We conducted a systematic review and meta-analysis in accordance with PRISMA 2020 guidelines. EMBASE, MEDLINE, and ClinicalTrials.gov were searched to March 2025 for studies reporting acute myocardial infarction (aMI), stroke and coagulation markers in relation to HPT or PTH levels. Random-effects meta-analyses were performed and heterogeneity was assessed using I^2 and τ^2.

Results: 72 studies (n = 32 meta-analysed; 40 narratively synthesised) involving >150,000 participants were included. Diagnosed HPT was associated with a non-significant increased risk of MI and stroke, with heterogeneity driven by a small number of large cohorts. In contrast, threshold-based and dose–response analyses consistently demonstrated that each unit rise in PTH increased MACE risk (HR 1.08, 95% CI 1.05–1.11; random-effects HR 1.23, 95% CI 1.03–1.45). Patients with stroke or ACS had significantly higher mean PTH than controls (SMD 0.39–0.44, $p < 0.001$). HPT was further linked to elevated fibrinogen, suggesting a prothrombotic influence, though D-dimer findings were inconsistent. Heterogeneity was generally low to moderate.

Conclusions: Elevated PTH is robustly associated with higher risk of ACS and MACE, and with prothrombotic biomarker profiles, whereas associations with stroke are less consistent. These findings support PTH as an under-recognized cardiovascular risk marker. Prospective studies and interventional trials are needed to determine whether reducing PTH can lower cardiovascular event rates.

P237

ESTABLISHING VITAMIN D REFERENCE INTERVALS FOR THE PAKISTANI POPULATION: A BIG DATA APPROACH USING REFINER ALGORITHM

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Objectives: To establish population-specific reference intervals (RIs) for serum 25-hydroxyvitamin D [25(OH)D] in the Pakistani population using an indirect big data approach, and to evaluate the prevalence of vitamin D deficiency across age and sex strata.

Methods: This retrospective study analyzed serum 25(OH)D levels from 201,625 individuals aged ≥18 years who underwent testing at a tertiary care center over five years. Data were extracted from electronic medical records. Serum 25(OH)D was measured via chemiluminescent immunoassay (DiaSorin Liaison), with internal and external quality controls. The refineR algorithm with modBoxCox transformation was used to derive RIs. Statistical analysis was conducted using R software.

Results: The median serum 25(OH)D level was 17.2 ng/mL, with 25.7% of individuals classified as deficient (≤20 ng/mL), and 33% severely deficient (≤12 ng/mL). Vitamin D deficiency was more pronounced in men and younger adults. Reference intervals derived using modBoxCox transformation were 10.3–51.5 ng/mL for females and 6.1–50.6 ng/mL for males. Notably, females demonstrated higher vitamin D levels across all age groups compared to males.

Conclusion: This study presents the first large-scale, data-driven vitamin D reference intervals for Pakistan. The findings highlight a high burden of vitamin D deficiency, particularly among men and younger adults, and reinforce the need for localized reference values to improve diagnostic accuracy. These insights support the development of targeted screening and supplementation strategies, and the reevaluation of clinical thresholds based on population-specific data.

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ANALYTICAL VALIDATION AND CLINICAL ASSESSMENT OF BONE STATUS INDICES IN CHRONIC KIDNEY DISEASE: A RETROSPECTIVE CASE–CONTROL STUDY

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Objectives: This study aimed to perform analytical validation of osteocalcin, procollagen type 1 N-terminal propeptide (P1NP), and C-terminal telopeptide of type I collagen (CTx) assays and compare bone status indices (BSIs) between chronic kidney disease (CKD) patients and healthy controls (HC) in the local population.

Material and Methods: This retrospective case–control study was conducted at the Section of Chemical Pathology, Aga Khan University Hospital, Karachi, Pakistan. De-identified residual serum samples from patients with CKD and HC stored in the laboratory biorepository were retrieved for analysis between August and October 2024. Clinical data, including serum creatinine and demographic variables, were extracted from the integrated laboratory information management system. CKD was classified using the locally validated eGFR equation. Before sample analysis, osteocalcin, P1NP, and CTx assays underwent analytical validation: precision was assessed using two-level quality controls (L1, L2) and expressed as coefficient of variation (CV%); accuracy, reportable range, and linearity were evaluated across the measured ranges for each analyte. After validation, BSIs were measured in case and control samples. Statistical analyses were performed in SPSS v.23

Results: Eighty-five patients with CKD (46 females, 54.1%; 39 males, 45.9%) and 45 HC were evaluated. The median (IQR) age of CKD patients was 59 (54–64) years. Analytical validation demonstrated acceptable precision: CTx CV% 5.2 (L1) and 5.1 (L2), osteocalcin 4.3 (L1) and 10.5 (L2), and P1NP 4.9 (L1) and 7.3 (L2). Accuracy and linearity testing confirmed reliable performance across clinically relevant ranges. Clinically, BSIs were significantly elevated in CKD patients compared to controls, with median (IQR) levels of osteocalcin 62.5 (28.4–133.0) ng/mL, P1NP 83.2 (61.2–153.0) ng/mL, and CTx 1.00 (0.67–1.71) ng/mL, all higher than controls—osteocalcin 24.1 (19.3–30.9) ng/mL, P1NP 62.8 (52.7–72.9) ng/mL, and CTx 0.28 (0.18–0.37) ng/mL ($p<0.001$ for all). Additionally, serum creatinine showed significant positive correlations with osteocalcin ($r=0.37$, $p<0.001$), P1NP ($r=0.39$, $p<0.001$), and CTx ($r=0.45$, $p<0.001$).

Conclusion: Validated BSI assays revealed significantly elevated indices in CKD patients, which correlated with renal dysfunction, highlighting their reliability and potential utility for early skeletal risk assessment in this population.

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CONSENSUS OF 350 EXPERTS ON STRATEGIES TO DELAY OSTEOPOROSIS IN INDIA: A MULTIDIMENSIONAL APPROACH

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Objective: Osteoporosis is a growing public health challenge in India, where reliance on T-score thresholds often overlooks broader determinants of bone fragility. This study aimed to capture expert consensus on redefining management strategies with emphasis on delaying osteoporosis in young and older individuals, focusing on nutrition and risk stratification.

Methods: The Back to the Future consensus drew upon approximately 7000 man-hours of clinical experience. A structured exercise using 11 evidence-informed statements was conducted. Experts rated each statement on a five-point Likert scale. Weighted scores were calculated, with >100 indicating consensus.

Results: Strong consensus emerged for broader diagnostic and preventive approaches. Highest agreement was for incorporating reproductive history, hormonal assessment, and biomarkers to optimize care in at-risk women (122.6). AI-assisted diagnostics using lumbar and femoral X-rays for early detection received high support (120.9). Routine calcium and vitamin D supplementation in women over 50 (119.8) and promoting adolescent calcium intake with physical activity to delay osteoporosis in youth (112.9) were strongly endorsed. Redefining osteoporosis beyond T-scores (103.3) and addressing bone health in obesity and type 2 diabetes (100.1) also achieved consensus. Weaker agreement was seen for routine lab investigations (43.5) and fracture risk tools (66.9), highlighting practice gaps. The overall mean response scores were: agree: 50±14 (95% CI 40 to 60), strongly agree: 50±20 (95% CI 36 to 63), $p<0.0001$

Conclusion: Findings reflect a paradigm shift from narrow T-score diagnosis toward holistic, preventive, and personalized care. Consensus supports delaying osteoporosis through adolescent nutrition and physical activity in the young and supplementation with proactive screening in older adults. AI-based diagnostics and biomarkers strengthen prevention, while gaps in lab testing and fracture risk assessment call for system-level alignment.

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COMPARATIVE EFFICACY AND SAFETY OF DIFFERENT OSTEOPOROTIC MEDICATION REGIMENS IN POSTMENOPAUSAL OSTEOPOROSIS: A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS OF RCT

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Objectives: To compare the efficacy and safety of all available osteoporosis treatment regimens in postmenopausal women through a systematic review and network meta-analysis.

Methods: We searched PubMed, Embase, and the Cochrane Library up to 9 May 2026 for randomized controlled trials comparing two or more pharmacologic regimens in postmenopausal women with osteoporosis based on the world health organization (WHO) definition. A network meta-analysis was conducted to compare the percentage change in lumbar spine bone mineral density (BMD) and assess safety outcomes, including adverse events and serious adverse events. Mean difference and 95% confidence intervals (CIs) were estimated from both direct and indirect evidence. Treatments were ranked according to surface under the cumulative ranking curve (SUCRA) values.

Results: A total of 13,758 records were screened, and 55 randomized controlled trials (n = 38,204 participants) were included. Combination therapy with an anabolic agent (teriparatide or romosozumab) and denosumab showed the greatest improvement in lumbar spine BMD (MD 20.2 g/cm³, 95% CI 8.4 to 32.0 g/cm3, SUCRA = 0.97). For total hip BMD, denosumab monotherapy ranked highest (MD 6.0 g/cm³, 95% CI −1.6 to g/cm3, SUCRA = 0.94). Denosumab, zoledronate, neridronate, teriparatide, and alendronate plus raloxifene achieved statistically significant improvements in lumbar spine BMD compared with control, whereas no regimen achieved a statistically significant increase in total hip BMD. No intervention was associated with a statistically significant difference in adverse event rates versus control.

Conclusion: Current evidence shows that combining an anabolic agent with denosumab yields the greatest improvement in lumbar spine BMD, while denosumab monotherapy ranks highest for total hip BMD, without increasing adverse events. This efficacy–safety profile supports their use as therapeutic options for postmenopausal osteoporosis.

P241

THE EFFECTIVENESS OF VITAMIN D3 SUPPLEMENTATION IN IMPROVING FUNCTIONAL OUTCOME OF NON-SURGICALLY TREATED SYMPTOMATIC LUMBAR SPINAL STENOSIS. - RANDOMIZED CONTROLLED CLINICAL TRIAL - PILOT STUDY

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Background: Although vitamin D is one of the essential nutrients associated with musculoskeletal system function, there is no standard treatment method for vitamin D deficiency. This study aimed to investigate the effects of vitamin D supplementation on the improvement in symptoms, functional recovery of the spine, and changes in the quality of life in patients with spinal stenosis.

Methods: In this prospective study, patients with spinal stenosis and serum 25-hydroxy vitamin D (25OH-Vit D) levels less than 10 ng/mL were randomly assigned to a supplementation group (Group S) and a non-supplementation group (Group NS): 26 participants in Group S (16 females and 10 males) and 25 in Group NS (15 females and 10 males). The degree of lower back pain in both groups was assessed using the visual analog scale; spine function was assessed using the Oswestry Disability Index (ODI) and Roland–Morris Disability Questionnaire (RMDQ); and patient quality of life was assessed using the 36-item Short Form Health Survey (SF-36). We compared and analyzed the values that were measured at baseline, between 4 and 6 weeks (V1), 10 and 12 weeks (V2), and 22 and 26 weeks (V3).

Results: No statistically significant difference was observed in lower back pain, spine function, or quality of life between both groups at baseline. In terms of lower back pain in V1, Group S scored 4.15 ± 3.12, while Group NS scored 5.64 ± 1.85 ($p = 0.045$). In V2, Group S scored 3.15 ± 2.38, while Group NS scored 4.52 ± 1.87 ($p = 0.027$). Moreover, in V3, Group S scored 3.58 ± 1.65, while Group NS scored 4.60 ± 1.68 ($p = 0.033$), indicating a statistically significant improvement in each period.

Conclusion: If a vitamin D deficiency that does not require surgical treatment exists in patients with lumbar spinal stenosis, high-dose vitamin D injections can improve lower back pain, which is the main symptom of LSS, as well as the functional outcomes of the spine and quality of life.

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EFFECTS OF VITAMIN D SUPPLEMENTATION ON THE FUNCTIONAL OUTCOME IN PATIENTS WITH OSTEOPOROTIC VERTEBRAL COMPRESSION FRACTURE AND VITAMIN D DEFICIENCY

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Background: In osteoporotic vertebral compression fractures, supplementation using vitamin D preparations and maintenance of blood vitamin D level within the normal range are necessary for proper fracture union, enhancement of muscle strength, and maintenance of body balance. The purpose of this study is to investigate the effects of vitamin D supplementation on blood vitamin D level, pain relief, union time, and functional outcome in patients with osteoporotic vertebral compression fracture and vitamin D deficiency.

Methods: 130 patients who deficient blood vitamin D level and had osteoporotic vertebral compression fracture were divided into a supplementation group and non-supplementation group. At initial, 3 months, 6 months and 12 months after the injury, radiographs were taken to assess fracture union, and questionnaire were evaluated to evaluate the functional outcome and quality of life.

Results: The mean age of the 130 patients (36 males and 94 females) was 74.75 ± 7.25 years. There were no statistically significant differences in initial severity of low back pain, functional outcome, and quality of life between the insufficient group and deficient group (all p values were >0.05). There was no significant time-by-group interaction between the supplementation group and non-supplementation group ($p = 0.194$). In terms of SF-36 physical component score, there was no significant time-by-group interaction between the supplementation group and non-supplementation group ($p = 0.934$).

Conclusions: Fracture union was achieved in all patients regardless of serum vitamin D level, and there were significant improvements in severity of low back pain, functional outcome, and quality of life over 12 months in patients with osteoporotic vertebral compression fracture. Short-term vitamin D supplementation of patients with osteoporotic vertebral compression fracture and deficiency of vitamin D did not result in significant differences in fracture union status, functional outcome, and quality of life between the supplementation groups and non-supplementation groups of patients.

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THE EFFECTIVENESS OF VITAMIN D SUPPLEMENTATION IN FUNCTIONAL OUTCOME AND QUALITY OF LIFE(QOL) OF LUMBAR SPINAL STENOSIS(LSS) REQUIRING SURGERY

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Study design: This is a retrospective cohort comparative study.

Background: Vitamin D supplementation is considered to be associated with good functional outcomes. Thus, a few studies have proposed that vitamin D supplementation is benefit to the functional outcome in LSS requiring surgery. The purpose of this study is to identify the prevalence of vitamin D deficiency in patients with LSS requiring surgery, and to compare the differences between the cases whether vitamin D is supplemented and vitamin D is not supplemented in terms of a QoL during postoperative 2 year.

Methods: All patients with LSS who underwent surgery from March 1, 2015, to August 31, 2016 were enrolled. Among them, 61 patients with vitamin D deficiency were divided into two groups (supplemented group (A) and non-supplemented group (B)). Functional outcomes using Oswestry Disability Index (ODI) and Rolland Morris Disability Index (RMDQ) and QoL using SF-36 were evaluated at 12-month and 24-month follow-up periods. Differences in functional score and SF-36 between the vitamin D supplemented and non-supplemented group were compared.

Results: Among the total 102 patients, 78 patients (76.5%) had vitamin D deficiency. Of the 78 patients, 61 patients were included, 27 patients were group A and 27 patients were group B. There was no difference in age and 25-OHD level between the two groups (all 0 > 0.05). Group A were better functional outcomes at 2 years after surgery ($p < 0.05$). On the QoL, group A were higher score than group B from 12 month later after surgery ($p < 0.05$).

Conclusions: Vitamin D deficiency was highly prevalent in LSS patients (76.5%). Assessment of serum 25-hydroxyvitamin D (25(OH)D) is recommended in LSS needing surgical intervention and active treatment vitamin D supplementation and maintenance of normal range should be considered for better postoperative functional outcome and QoL.

P244

IMPLEMENTING THE OSTEOPOROSIS RE-FRACTURE PREVENTION MODEL OF CARE: A HYBRID TYPE 3 EFFECTIVENESS-IMPLEMENTATION TRIAL (IORP TRIAL)

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Objectives: To assess the effectiveness of the implementation of a best practice fracture liaison service to reduce the risk of subsequent fracture and mortality following an initial minimal-trauma fracture (MTF).

Materials and Methods: A stepped-wedge-cluster trial, three intervention sites and one control site. The study population consisted of ~ 35,000 women and men from the inception cohort of MTF presenting to four large teaching hospitals between 2015 and 2023. The primary outcomes of interest were subsequent fracture and mortality following an initial MTF. The analysis was undertaken using Cox's proportional hazards regression, with a random effect for site.

Results: Among the 36,657 women and men with MTF, there were a total of 5,467 subsequent fractures; the adjusted HR for refracture post implementation, compared to pre-implementation, was 0.81 (95% CI 0.71 to 0.93, p = 0.001), and mortality, the HR was 0.84 (95% CI 0.76 to 0.92, p < 0.001). The two-year absolute risk of re-fracture (for all and those with the initial fracture type) and mortality are presented in the **Table** below.

Conclusion: The intervention reduced the relative risk of refracture by 19%. The relative risk of death following a fracture was reduced by 16%.

	Two-year absolute risk per 1000 (95% CI) of refracture type		
Group	Control	Intervention	Absolute difference per 1000 (95% CI)
All refractures	111 (102-109)	101 (82-112)	-10 (-5 to -19)
Death	206 (201-2011)	177 (156-198)	-29 (-20 to -41)
Distal	76 (69-77)	70 (55-80)	-6 (-1 to -12)
Hip	21 (19-22)	19 (12-25)	-2 (-0.2 to -7)
Proximal	7 (6-8)	7 (4-12)	0
Vertebral	7 (6-8)	5 (3-7)	-2 (-0.2 to -7)

P245

ESTABLISHING A NURSE-LED OSTEOPOROSIS SCREENING PROGRAMME FOR PATIENTS WITH DISTAL RADIUS FRACTURES

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Objective: To increase the osteoporosis screening rate for patients with distal radius fractures aged 50 years and above.

Material and Methods: Prior to implementation of our programme, the screening rate for osteoporosis in patients with distal radius fractures aged 50 years old and above was low. National and international guidelines state that all patients with fragility fractures should have screening for osteoporosis. We established a protocol involving nurse-led screening for patients aged 50 years old and above with distal radius fractures in our hand surgery specialist clinic. The pilot project was run over 2 years.

Results: The initial rate of osteoporosis screening in the hand surgery specialist clinic was 10 %. The nurse-led screening protocol was implemented in stages. Doctors in the department were educated on osteoporosis, screening guidelines and management. Next presentations were made to familiarize the department on the nurse-led screening protocols. Finally, an osteoporosis education booklet was introduced, to help doctors and nurses counsel patients.

The protocol consisted of ensuring a Bone Mineral Density scan was ordered for all patients with distal radius fractures, within the first month of presentation to our clinic. Thereafter, the Bone Mineral Density scan results were used to analyse risk of future fracture. Patients with high risks for subsequent fracture were counselled on the risks of osteoporosis and the role of lifestyle changes and medication.

The programme was successful in raising the number of patients screened from a baseline of 10% to a median of 63% maintained 2 years.

Conclusions: The nurse-led programme was successful in increasing the number of patients screened. This programme also served as an opportunity to increase the awareness among health-care professionals and patients alike, about fragility fractures and their prevention.

P246

LOCOMOTIVE SYNDROME RISK IN COMMUNITY-DWELLING ELDERLY INDIVIDUALS WITH MUSCULOSKELETAL DISORDERS

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Background: The Locomotive Syndrome Risk Test (LSRT) is a screening tool to quantify motor function decline in adults. In 2018, our institution established a "Locomotive Syndrome Outpatient Clinic" to mitigate motor function deterioration in community-dwelling elderly individuals with musculoskeletal disorders. This clinic conducts annual or biannual motor function assessments for voluntary participants.

Objective: The purpose of this study was to evaluate trends in locomotor function during hospital visits in outpatients with locomotive syndrome using the LSRT score.

Methods: The study included 32 patients aged ≥65 years who attended our Locomotive Syndrome Outpatient Clinic between 2018 and 2024 (10 males, 22 females; mean age at initial visit: 76.3±5.5 years; mean attendance duration: 31.5±21.3 months). We initially compared participants' first LSRT scores (Two-Step Test, Stand-Up Test, and 25-question Geriatric Locomotive Function Scale [GLFS-25]) with normative values. Subsequently, participants were stratified into a long-term attendance group (attendance duration >2 years, s, mean age at initial visit: 74.3±5.3 years, n=17) and a short-term attendance group (attendance duration ≤2 years, mean age at initial visit: 78.5±4.8 years, n=15) for intra- and inter-group analyses.

Results: At baseline, over 60% of participants scored below normative values on each LSRT component (Two-Step Test: 71.9%, Stand-Up Test: 62.5%, GLFS-25: 68.8%). Intra-group comparisons revealed a significant decrease in Two-Step Test scores in the long-term attendance group (p=0.03), while the short-term attendance group demonstrated significant improvement in GLFS-25 scores (p=0.01). Inter-group analyses showed significantly higher initial Two-Step Test scores in long-term attendance group (p=0.01). However, at the final assessment, no significant differences were observed between the two groups in any LSRT component scores.

Conclusion: There have been few previous studies on the change over time in LSRT scores in elderly people with musculoskeletal diseases. We believe that the results of this study may be helpful in prescribing exercise for elderly people with musculoskeletal diseases.

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HIP FRACTURE PATIENTS ADMITTED TO NATIONAL HOSPITAL, GALLE, SRI LANKA; REASONS FOR PRE-HOSPITAL DELAYS

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Objectives: Hip fractures (HF) require early hospital admission and timely surgical interventions to minimize morbidity, mortality and long-term functional decline. Delays in admission to hospital, however, remain a major issue in low- and middle-income countries like Sri Lanka. This study assessed the reasons for delay in admitting patients with incident HF to National Hospital, Galle, Sri Lanka.

Material and methods: Total of 210 patients with incident HF were admitted between May 2023 and May 2024 and they were interviewed within 48 hours of admission, provided they were medically stable and free of pain.

Results: Mean (SD) age of 210 HF patients was 73.7(11.3) years and the majority were female (152 patients, 72%). Pre-hospital delay (>24 hours after HF) was a significant issue, affecting 161 patients (76.6%). Only 23.4% of patients were admitted within 24 hours after HF to the National Hospital, Galle. The reasons for delay in admission included the following: 40.5% initially sought conservative management at private hospitals, 11.4% were unaware of the severity of the injury, 10% reported lack of transport facilities, 7.6% were admitted to regional hospitals without orthopedic services and transferred and 7.1% sought Ayurveda treatment at the initial stage.

Conclusion: Most of the reasons for delay in hospital admission are preventable if appropriate measures are taken. This, however, will require educating public as well as health care professionals at different levels.

Key words: Admission, Hip fracture, Pre-Hospital Delay

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EVALUATING THE PERFORMANCE OF A NEWLY ESTABLISHED FRACTURE LIAISON SERVICE IN A TERTIARY HOSPITAL IN EAST COAST PENINSULAR MALAYSIA

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Objective: Fracture liaison service (FLS) aims to improve identification, investigations and close treatment gaps of fragility fractures. Prior to the commencement of the service, the rate of detection and management of osteoporotic fracture were very low. This study aimed to evaluate the performance of the newly formed FLS with regard to identification and management of fragility fractures in a tertiary hospital in the East Coast of Peninsular Malaysia.

Material and Methods: A retrospective observational study involving fragility fracture patients who are 50 years old or older, who were identified and enrolled into FLS from June 2022 until December 2024. Demographic data such as age, sex and ethnicity were collected. The types of fractures, rate of bone density assessment, BMD results and the rate of treatment commencement were recorded. Key performance index was used to measure performance.

Results: A total of 128 patients were identified and included. Majority of patients with fragility fractures were females, N=106 (82.8%). Mean age of the patients were 72.6 years for females and 79.4 years for males. Majority of the patients belong to the Malay ethnicity (91%) followed by Chinese (7.8%). The types of fractures recorded were mostly hip fractures (72.6%), followed by vertebral fractures (14%), wrist fractures (3.9%), humeral fractures (2.3%) and other types of fractures (6.3%). Only 51 patients (40%) underwent DEXA scan and it showed 51% had osteopenia, 7.8% T-score between -2.5 and -3.0, 41% T-score between -3.1 and -4.0 and 23.5% had severely low T-score of less than -4.0. Seventy-one out of 128 patients commenced on calcium, Vitamin D and osteoporosis treatment (55.4%). Upon follow-up, 2% had recurrence of falls, and no hospital admission for any patient with new fractures.

Conclusion: The FLS has managed to achieve the minimal key performance index for the commencement of osteoporosis treatment. However, detection rate of other types of fragility fractures and the rate of bone density assessment need improvement given that many patients had severe osteoporosis and are at high risk for future fractures and should receive osteoporosis treatment.

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LACTOBACILLUS ACIDOPHILUS (LA) SUPPLEMENTATION MITIGATES INFLAMMATORY BONE LOSS BY MODULATING THE ILC3-ILCREG CELL AXIS

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Introduction: Immunoporotic potential of the "Treg-Th17" cell-axis has been extensively studied in post-menopausal osteoporosis (PMO). However, the role of Innate Lymphoid Cells (ILCs), which represent the innate counterpart of helper-T cell subsets, is yet to be explored in PMO. Additionally, while our laboratory has demonstrated immunomodulatory potential of probiotics in regulating the "Treg-Th17" cell axis, their effects on the ILCs remain unexplored. Therefore, this study aims to examine the potential of a probiotic, *Lactobacillus acidophilus* (LA), in modulating the "ILC3-ILCreg" cell axis in the murine model of Osteoporosis.

Materials & Methods: Building on the novel concept of "Immunoporosis", we investigated the role of the "ILC3-ILCreg" cell axis in PMO and evaluated the Immunoporotic potential of LA supplementation in restoring the same. Female (C57BL/6J) mice were ovariectomized (OVX) and divided into Sham, OVX and OVX+LA groups (n=6/group). 45 days post-surgery, mice were sacrificed, allowing us to evaluate a range of osteoimmune parameters (ILC3-ILCreg, Treg-Th17) in the bone-marrow and mucosal tissues, along with serum cytokines (IL-17, IL-10, IL-22, etc.), and micro-CT analysis.

Results: Interestingly, our findings reveal that PMO conditions significantly disrupted gut integrity and enhanced $ROR\gamma t^{+}CCR6^{+}$ ILC3s, which was accompanied by a concomitant reduction in the anti-inflammatory ILC populations, i.e. $ROR\gamma t^{+}CCR6^{-}$ ILC3s and $GATA3^{+}IL10^{+}$ ILCregs. Concomitantly, serum cytokine balance was tipped towards the inflammatory phenotype. Altogether, our data suggested a crucial role of the "ILC3-ILCreg" cell axis in inflammatory bone loss in OVX mice. Notably, the administration of LA ameliorates these effects by restoring the osteoimmune profiles (*in vivo* and *in vitro),*

Conclusions: Our findings for the first time provide compelling evidence for the osteoprotective potential of LA by modulating the ILC3-ILCreg cell-axis in the murine model of PMO, thus paving the way for clinical applications.

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CLINICAL AND GENETIC ANALYSIS OF OSTEOGENESIS IMPERFECTA (OI) AND ITS TREATMENT RESPONSE TO ZOLEDRONIC ACID: A TERTIARY CARE CENTER EXPERIENCE FROM EASTERN INDIA

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Objectives: Osteogenesis imperfecta (OI) and its variants are typically characterized by childhood onset recurrent pathological fractures and bony deformities. Associated extra-cellular manifestations include blue sclera, dentinogenesis imperfecta, hearing defects, bone pain, and impaired quality of life. The study aimed to investigate the various clinical characteristics and genetic mutations of OI, as well as the safety and efficacy of zoledronic acid (ZA) infusion in preventing fragility fractures and bony pain.

Material and Methods: Clinical histories of age of onset of first fractures, the number of fractures and precipitating events were enquired in this retrospective cohort study (data collected between 2022 and 2025). Genetically confirmed cases of OI underwent lumbar spine (LS) and total body less head (TBLH) bone mineral density (BMD) before and after 2 years of ZA infusions (0.05 mg/kg every six months). Subjects were closely monitored for clinical adverse events and newonset fractures.

Results: The study included 18 patients with OI and its variants. The mean age of the first fracture was 14.74±8.74 months, and the mean number of fractures before presentation was 6.57±2.81. Type I OI (50%, n=9) was the most common, followed by type IV (27.7%, n=5). The commonest mutation found was c.3470G>A in exon 47 of the COL1A1 gene. One case of Bruck syndrome (type 2) (c.1886C>T genetic mutation in exon 18 of PLOD2 gene) was also diagnosed. With at least four doses of biannual zoledronic acid (ZA) infusions, the gain in LS spine and TBLH BMD was significant ($p < 0.001$). After two years of treatment, OI patients exhibited a significant decline in fracture rates ($p < 0.001$) and pain ($p < 0.001$). Apart from non-specific polyarthralgia, no adverse events were noted in zoledronate infusion.

Conclusion: This study is one of the largest reported from India on OI. Type I OI was the most common, and our study established ZA to be a safe and efficacious treatment option.

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PREDICTION OF MAJOR OSTEOPOROTIC FRACTURES USING TRANSFER LEARNING ON PLAIN X-RAY IMAGES AMONG POSTMENOPAUSAL WOMEN THROUGH AGENTIC ARTIFICIAL INTELLIGENCE: AN INTERIM ANALYSIS

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Objectives: Osteoporosis is a significant disease of post-menopausal women associated with fragility fractures. Non-traumatic vertebral fractures are the commonest ones, followed by hip fractures. Dual Xray Energy Absorptiometry (DXA) is the gold standard investigation to measure bone mineral density. However, its discrimination ability between fractured and control cases is limited. Trabecular bone score (TBS) and high-resolution peripheral quantitative tomography are additional costly tools for understanding the bony microarchitecture. The need for an accurate, country-specific, real-world-based fracture prediction model cannot be underscored.

Materials and Methods: We proposed a hybrid system that combines transfer learning with an Agentic Retrieval-Augmented Generation (RAG) framework to predict fracture risk from radiographs alone. Our longitudinal cohort study included a total of 300 postmenopausal women as the derivation cohort, comprising 100 patients in each group (normal bone mass, osteoporosis, and osteopenia). They underwent DXA, and lumbar spine and total hip bone mineral densities were calculated. Additionally, a plain X-ray image of the dorsolumbar spine and femoral neck was performed.

Results: DXA and X-ray images were standardized in terms of resolution, normalization, and orientation. We utilized a Vision Transformer (ViT) and a convolutional neural network (DenseNet-121) as the base architecture. This model was pre-trained with the large dataset of paired DXA and X-ray images. The pre-trained model was fine-tuned on X-ray images using diagnostic labels (e.g., Osteoporosis) extracted from DXA reports. The Agentic RAG Framework invoked the trained transfer learning model to get a raw prediction of the fracture risk category and a confidence score.

Conclusion: This model aims to validate fracture risks among 140 postmenopausal patients using their vertebral and hip joint X-rays over a 2-year clinical follow-up. Additionally, we plan to compare the fracture risks with the DXA data. The proposed Agentic RAG and Transfer Learning framework represents a paradigm shift in osteoporosis screening. Unlocking the diagnostic potential of ubiquitous X-ray imaging offers a scalable, cost-effective, and accurate solution to a pressing public health challenge in India.

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SHORT-CHAIN FATTY ACIDS AS DUAL MODULATORS OF HUMAN BONE REMODELING: ANABOLIC AND ANTIRESORPTIVE PROPERTIES

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Aim & Objective: This study was designed to explore the dual role of short-chain fatty acids (SCFAs) in maintaining bone health under postmenopausal osteoporosis conditions. While SCFAs such as butyrate and propionate are known to suppress osteoclastogenesis and modulate immune responses, their effects on osteoblast differentiation and function remain less understood. We hypothesized that SCFAs exert both anabolic effects, by enhancing osteoblast activity and mineralization, and antiresorptive effects, by inhibiting osteoclast formation via modulating immune cell functions. The objectives were to assess their effects on PBMC-derived osteoclasts, MSC-derived osteoblasts, and immune cell functions regulating bone homeostasis.

Material & Methods: Human peripheral blood mononuclear cells (PBMCs) were isolated by density gradient centrifugation and differentiated into osteoclasts using M-CSF (30 ng/ml) and RANKL (100 ng/ml) for 12–14 days, followed by TRAP staining. Human bone marrow–derived mesenchymal stem cells (MSCs) were obtained through density gradient separation or plastic adherence and passages 4–10 were used for osteoblastogenesis. Osteoblast differentiation was evaluated by alkaline phosphatase activity (p-nitrophenol phosphate assay, 405 nm) and mineralization by Alizarin Red (40 mM) staining.

Results: Short-chain fatty acids (acetate, propionate, butyrate, and valerate) markedly promoted early osteoblast differentiation, reflected by elevated alkaline phosphatase activity, and enhanced mineralized nodule formation in human MSCs, confirming their osteoanabolic effects. Concurrently, SCFAs inhibited osteoclast generation from human PBMCs, indicating antiresorptive activity, and also altered inflammatory and anti-inflammatory T- and B-cell responses. Together, these findings demonstrate that SCFAs could support bone health through dual actions on bone cells and immune modulation, highlighting their therapeutic potential in postmenopausal osteoporosis.

Conclusion: SCFAs exhibit dual anabolic and antiresorptive effects by enhancing osteoblast function, suppressing osteoclastogenesis, and modulating immune responses. These findings suggest that SCFAs may serve as promising therapeutic agents for the prevention and management of inflammatory bone loss under postmenopausal osteoporotic conditions.

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ROMOSOZUMAB INCREASED VERTEBRAL AND PROXIMAL FEMORAL STRENGTH IN POSTMENOPAUSAL WOMEN WITH OSTEOPOROSIS IN REAL-WORLD CLINICAL PRACTICE

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Objectives: Bone strength reflects the ability of bone to resist fracture. Limited data is available on the effect of romosozumab or other osteoporosis therapies on bone strength in real-world clinical practice. This study evaluated the real-world effectiveness of romosozumab (Romo) or teriparatide (TPTD) on vertebral and proximal femoral strength in Japanese postmenopausal women with osteoporosis using biomechanical computed tomography (BCT; VirtuOst®), an FDA-cleared diagnostic test.

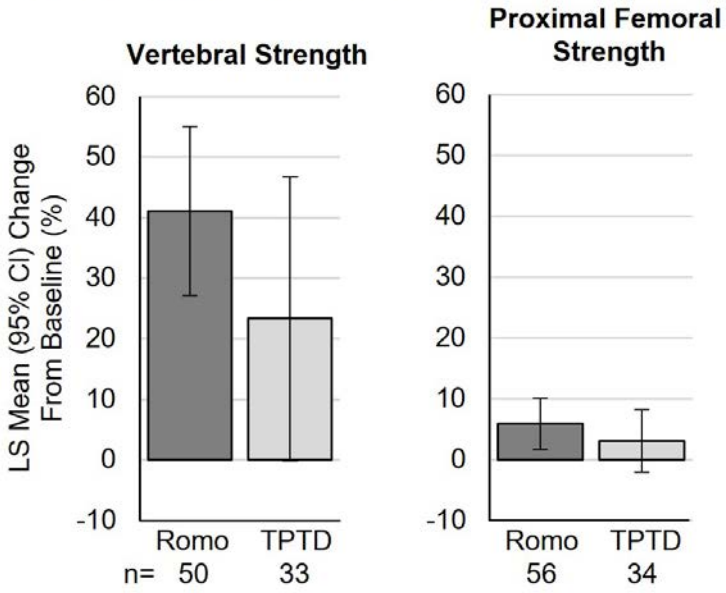
Materials and Methods: In this retrospective observational study, 91 Japanese postmenopausal women with osteoporosis received Romo (n=57) or TPTD (n=34) for 12 months. None of them received osteoporosis treatment within 3 years of the index date. Vertebral strength, vertebral cortical and trabecular compartment strength, and proximal femoral strength were assessed before and after treatment, using BCT on a patient's routine clinical CT scan. BCT analyses were performed blinded to treatment status. The primary endpoint was percent change from baseline in vertebral strength at 12 months. Secondary endpoints included change in vertebral compartment and proximal femoral strength.

Results: At baseline, vertebral (including cortical and trabecular compartment strength) and proximal femoral strength were similar between Romo and TPTD groups. After 12 months of treatment, percent change in vertebral strength was 39.5% for Romo and 24.4% for TPTD (Figure). Percent change in vertebral cortical compartment (outer 2mm of bone) strength was 41.0% for Romo and 22.0% for TPTD. Percent change in vertebral trabecular compartment strength was 39.8% for Romo and 27.2% for TPTD. These trends suggest that the treatment difference in overall vertebral strength was largely derived from the cortical compartment. Percent change in proximal femoral strength was 7.4% for Romo and 4.4% for TPTD (Figure).

Conclusion: Romo and TPTD increased vertebral and proximal femoral strength in postmenopausal women with osteoporosis in real-world clinical practice, and the increases trended larger with Romo.

Funding: Amgen Inc., UCB

Figure: Percent Change from Baseline in Vertebral and Proximal Femoral Strength at Month 12



LS mean percent change was determined using generalized linear models adjusted for the patient's age at the index date, baseline value of the parameter, and fracture history. *CI, confidence interval; LS, least squares; Romo, romosozumab; TPTD, teriparatide.*

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GLOBAL AND REGIONAL ESTIMATES OF HIP FRACTURE BURDEN ASSOCIATED WITH TYPE 1 DIABETES FROM 1990 TO 2021

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Aim: To assess the global and regional burden of hip fractures associated with type 1 diabetes (T1D) from 1990 to 2021.

Materials and Methods: The population attributable fraction was calculated by combining the published risk ratio with T1D prevalence (age ≥ 20 years) from the Global Burden of Disease study to estimate the T1D-associated hip-fracture burden. Trends were assessed using the age-standardized incidence rate (ASIR) and estimated annual percentage change (EAPC).

Results: The global incidence of T1D-related hip fractures was 290,180 in 2021 with an ASIR of 3.96 (95% confidence interval: 1.92-5.87) per 100,000 population and a male-to-female ratio of 0.54. At the super-regional level, the highest incidence(204,610) and ASIR (13.09 per 100,000 population; 6.40-25.53) were observed in high-income regions, in particular in Australasia and Western Europe. Notably, Australasia exhibited the highest EAPC, 2.90% in T1D-associated ASIR, followed by East Asia (2.73%). The incidence among those aged 45-64 years grew significantly in 14 regions over the past decade. Nationally, the ASIR increased in 166 countries from1990 to 2021.

Conclusions: High-income regions experienced the greatest burden of T1D-associated hip fracture, while Australasia and East Asia witnessed the largest increase over the last 32 years. Prioritizing the promotion of T1D treatment and hip-fracture screening for middle-aged females living with T1D is crucial in these regions.

P255

RECURRENT FRAGILITY FRACTURES IN A 57-YEAR-OLD WOMAN WITH SEVERE OBESITY: RETHINKING THE RELIANCE ON BMD IN OSTEOPOROSIS MANAGEMENT

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Background: Fragility fractures, defined as fractures sustained from a fall from standing height or less, are an important clinical marker of osteoporosis and future fracture risk. They are associated with substantial morbidity, loss of independence, and increased mortality. Despite clear evidence supporting early secondary prevention, the treatment gap remains considerable, with up to 70–80% of patients never receiving osteoporosis therapy after their first fragility fracture. Bone mineral density (BMD) assessed by DXA and fracture risk assessment tools such as FRAX are widely used to guide treatment decisions, but they may underestimate fracture risk in individuals with severe obesity, multiple comorbidities, or a history of recurrent fractures.

Case Presentation: We present the case of a 57-year-old woman with a body mass index of approximately 45 and multiple comorbidities (ASA IV) who sustained a supracondylar extra-articular femoral fracture following a simple fall at home. She had a background diagnosis of osteoporosis made several years earlier but had never commenced on anti-osteoporosis therapy. Importantly, this was her second fragility fracture, having previously sustained a distal radius fracture under similar low-energy circumstances. The current fracture was managed operatively with closed reduction and fixation using a retrograde femoral nail, supported by perioperative orthogeriatric optimisation given her high anaesthetic risk and complex medical background.

Risk Assessment and Challenges: Her fracture risk was reassessed following this event using FRAX. The calculated score suggested the need for further evaluation with BMD. However, the very high BMI substantially influenced the score, giving an artificially lower estimate of risk that did not reflect the clinical reality. Despite having already sustained two major fragility fractures, her earlier management pathway had been directed towards awaiting BMD rather than initiating treatment. This case underlines the limitations of fracture risk algorithms and the potential consequences of delaying therapy in patients whose risk is already evident from clinical events.

Discussion: This case raises several important considerations. Firstly, a fragility fracture is in itself diagnostic of osteoporosis, and recurrent fractures should be treated as an urgent indication for secondary prevention, irrespective of BMD values. Secondly, while FRAX and DXA remain valuable tools, they should not override clinical judgment, particularly in patient groups where accuracy is compromised. In individuals with extreme BMI, near-normal BMD values can be misleading and contribute to therapeutic inertia. Thirdly, the treatment gap in this patient highlights a wider systemic issue: failure to initiate therapy after the first fracture, despite a confirmed diagnosis of osteoporosis, allowed progression to a more disabling second fracture. Finally, the case reinforces the need for multidisciplinary management. Patients with obesity, frailty, and multimorbidity require coordinated orthopaedic and orthogeriatric care to optimise both surgical outcomes and long-term bone health.

Conclusion: This case demonstrates the importance of recognising fragility fractures as sufficient grounds for initiating anti-osteoporosis therapy, regardless of BMD results. Reliance solely on DXA or fracture risk tools in patients with severe obesity may contribute to under-treatment and recurrent fractures. Clinical context and fracture history must take precedence in decision-making. Closing the treatment gap through early initiation of secondary prevention strategies remains essential to reduce the personal and healthcare burden of fragility fractures.

P256

FEASIBILITY OF AN AI-BASED ALGORITHM USING SPINAL RADIOGRAPHS TO PREDICT LONGITUDINAL CHANGES IN BONE MINERAL DENSITY: A MULTICENTER STUDY IN HOSPITAL AND COMMUNITY SETTINGS

S.-H. Fu[1], J.-Y. Hsu[2], Q. Tseng[3], Y.-C. Wang[4], C.-Y. Li[5], C.-Y. Wang[6]

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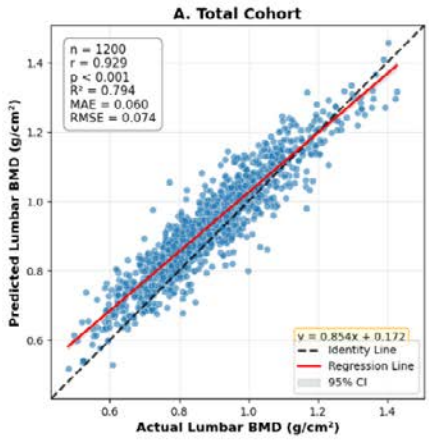
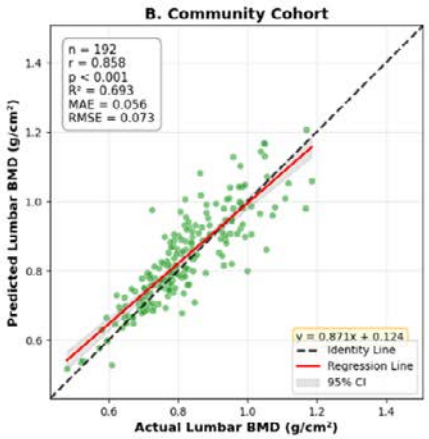
Objectives: While artificial intelligence (AI) algorithms demonstrate strong cross-sectional performance for opportunistic osteoporosis screening from radiographs, their ability to track longitudinal bone mineral density (BMD) changes remains unvalidated. To evaluate an AI algorithm's performance in predicting lumbar spine BMD from routine radiographs, assessing both cross-sectional accuracy and longitudinal tracking capability.

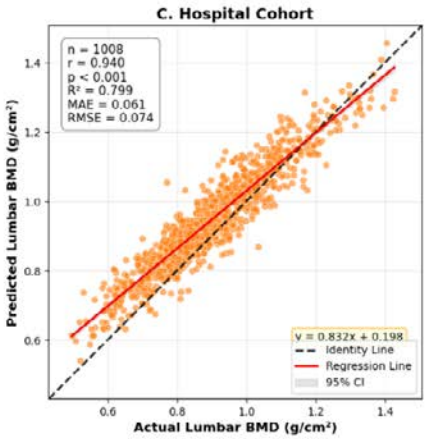
Materials and Methods: This retrospective multicenter study included 600 patients (mean age 59.4±13.6 years; 451 women) from hospital and community settings in Taiwan (March 2014-December 2024) with paired lumbar spine DXA and radiographs at baseline and follow-up (median interval: 897 days). The commercial AI software (DeepXray Spina) analyzed kidney-ureter-bladder (KUB), thoracolumbar, or lumbosacral radiographs. Cross-sectional agreement was assessed using Pearson correlation, intraclass correlation coefficient (ICC), and Bland-Altman analysis. Longitudinal performance was evaluated using three-class categorization (±5% least significant change threshold) with confusion matrices and Cohen's κ.

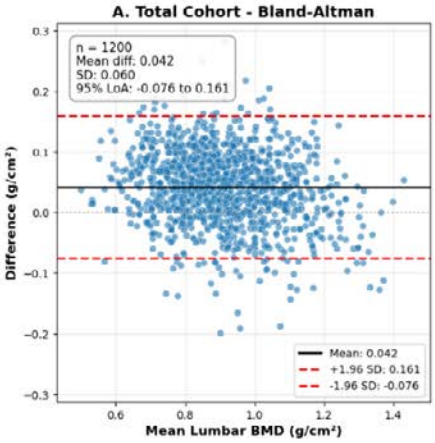
Results: Cross sectional agreement between AI-predicted and DXA measured BMD was high across time points (correlation 0.93; ICC 0.90; root mean square error 0.07 g/cm²) with small bias (mean difference, 0.04 g/cm²; limits of agreement, −0.08 to 0.16 g/cm²). Performance was higher in hospital cohort than in community one. Longitudinally, ΔBMD agreement was moderate overall (ICC 0.52). Three class classification achieved 61.5% overall agreement with fair kappa (0.31); sensitivity for significant decrease was 56.5% and specificity for no significant change was 68.4%, with better performance in the hospital cohort.

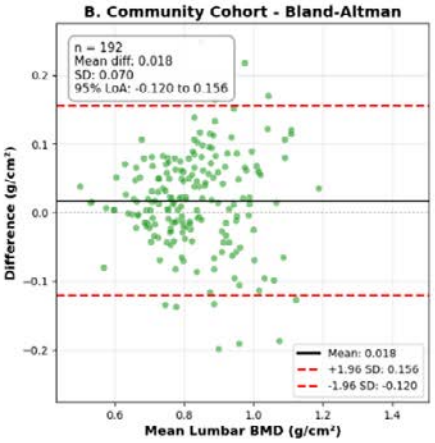
Conclusion: The AI algorithm accurately predicted lumbar spine BMD cross-sectionally, supporting its utility for opportunistic screening. Moderate longitudinal tracking capability, which may be constrained by DXA's precision ceiling and small biological changes, suggests potential for monitoring but requires further refinement before replacing serial DXA.

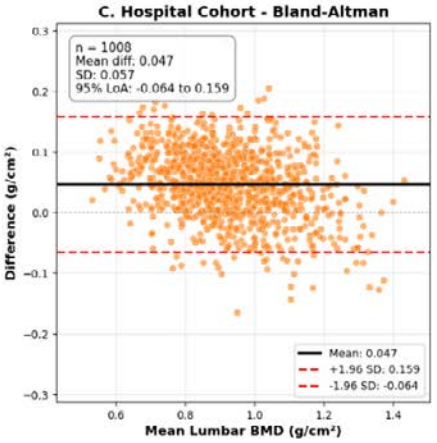

A. Total Cohort
n = 1200
r = 0.929
p < 0.001
R² = 0.794
MAE = 0.060
RMSE = 0.074
y = 0.854x + 0.172
Identity Line
Regression Line
95% CI
Predicted Lumbar BMD (g/cm²)
Actual Lumbar BMD (g/cm²)


B. Community Cohort
n = 192
r = 0.858
p < 0.001
R² = 0.693
MAE = 0.056
RMSE = 0.073
y = 0.871x + 0.124
Identity Line
Regression Line
95% CI
Predicted Lumbar BMD (g/cm²)
Actual Lumbar BMD (g/cm²)


C. Hospital Cohort
n = 1008
r = 0.940
p < 0.001
R² = 0.799
MAE = 0.061
RMSE = 0.074
y = 0.832x + 0.198
Identity Line
Regression Line
95% CI
Predicted Lumbar BMD (g/cm²)
Actual Lumbar BMD (g/cm²)


A. Total Cohort - Bland-Altman
n = 1200
Mean diff: 0.042
SD: 0.060
95% LoA: -0.076 to 0.161
Mean: 0.042
+1.96 SD: 0.161
-1.96 SD: -0.076
Difference (g/cm²)
Mean Lumbar BMD (g/cm²)


B. Community Cohort - Bland-Altman
n = 192
Mean diff: 0.018
SD: 0.070
95% LoA: -0.120 to 0.156
Mean: 0.018
+1.96 SD: 0.156
-1.96 SD: -0.120
Difference (g/cm²)
Mean Lumbar BMD (g/cm²)


C. Hospital Cohort - Bland-Altman
n = 1008
Mean diff: 0.047
SD: 0.057
95% LoA: -0.064 to 0.159
Mean: 0.047
+1.96 SD: 0.159
-1.96 SD: -0.064
Difference (g/cm²)
Mean Lumbar BMD (g/cm²)

P257

SEQUENTIAL STRATEGIES AFTER LONG-TERM DENOSUMAB: A RANDOMIZED TRIAL COMPARING ZOLEDRONATE ALONE VERSUS ALENDRONATE–ZOLEDRONATE SEQUENCE

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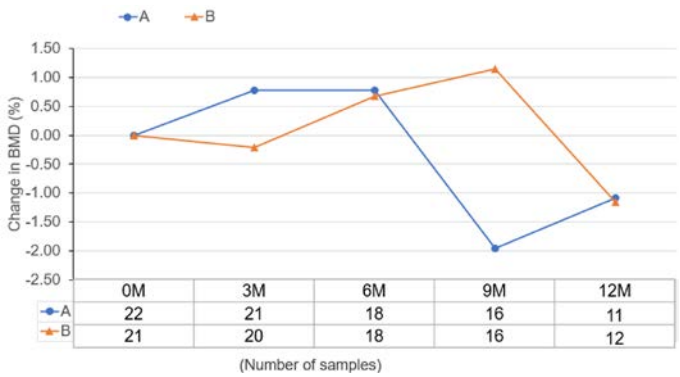
Background: Long-term treatment with denosumab effectively suppresses bone resorption but abrupt discontinuation can lead to rebound bone loss and increased fracture risk. Optimal sequential strategies remain unclear, particularly after more than three years of continuous therapy.

Methods: We conducted a randomized, stratified clinical trial in postmenopausal women and men over 50 years old who had received uninterrupted denosumab for at least three years. A total of 44 participants were enrolled and allocated 1:1 into two groups. Group A (control) received zoledronate six months after the last denosumab injection, while Group B (experimental) received alendronate for four months starting at month five, followed by zoledronate at month nine. Participants underwent serial measurements of bone turnover markers (CTX, P1NP) at baseline and 1, 2, 4, 5, 7, 10, and 13 months, and bone mineral density (BMD) of the lumbar spine, total hip, and femoral neck at 1, 4, 10, and 13 months. Safety was closely monitored, with predefined criteria for rescue zoledronate.

Results: Baseline characteristics were balanced between groups except for slightly lower femoral neck BMD and T-scores in Group B. At 12 months, both groups demonstrated BMD decline at the lumbar spine, total hip, and femoral neck, with no statistically significant between-group differences. Notably, the total hip BMD at 12 months showed a trend favoring Group A ($p = 0.093$). Bone turnover markers indicated transiently higher resorption activity in Group A at 6 months. Adverse events and incident fractures were rare and comparable across groups.

Conclusion: Preliminary results suggest that both sequential strategies maintained BMD to a similar extent within one year after denosumab discontinuation, though a possible advantage in hip preservation was observed in the conventional zoledronate-first approach. Continued follow-up is needed to clarify long-term efficacy and refine sequential treatment protocols for safe denosumab discontinuation.



P258

EFFECTIVENESS OF CONTINUOUS DENOSUMAB VERSUS DENOSUMAB–ZOLEDRONATE–DENOSUMAB SEQUENCE ON BONE MINERAL DENSITY: A RANDOMIZED CONTROLLED TRIAL

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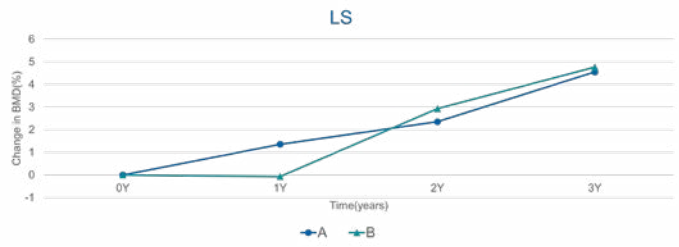
[1]Department of Orthopedics, National Taiwan University Hospital Yun-Lin Branch, Douliu, Taiwan, [2]Department of Orthopedic Surgery, National Taiwan University Hospital, Taipei, Taiwan, [3]Department of Public Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan, [4]National Center for Geriatrics and Welfare Research, National Health Research Institutes, Huwei, Taiwan

Introduction: Osteoporosis requires lifelong management, typically involving anabolic and anti-resorptive agents. Anabolic therapies are limited to short-term use, necessitating sequential strategies. Among anti-resorptives, denosumab discontinuation may lead to rapid bone loss, while bisphosphonate-associated BMD gains plateau after 3–5 years. Previous studies indicate that denosumab following bisphosphonates can still enhance BMD. This study aimed to evaluate whether a sequential denosumab–zoledronate–denosumab strategy yields BMD gains comparable to continuous denosumab therapy.

Materials and Methods: This randomized controlled trial enrolled patients who had received 4–5 doses of denosumab (2–2.5 years). Participants were randomized to either an intervention group (zoledronate at six months after the last denosumab injection, followed by resumption of denosumab in years 2–3) or a control group (continuous denosumab for three years). Lumbar spine, femoral neck, and total hip BMD were measured annually; bone turnover markers (CTX, P1NP) every six months; and spinal radiographs yearly. The primary endpoint was lumbar spine BMD change at three years, with secondary endpoints including hip/femoral neck BMD, BTMs, and fracture incidence.

Results: Fifty-nine patients were recruited (91.5% female, mean age 71.2 years). After three years, lumbar spine BMD increased by 4.8% in the intervention group versus 4.6% in the control group; femoral neck BMD increased by 3.2% versus 2.9%, and total hip BMD by 2.0% versus 2.3%, respectively. Between-group differences were not statistically significant. In the intervention group, P1NP rose after zoledronate but decreased significantly upon reintroduction of denosumab. Few osteoporotic fractures occurred.

Discussion & Conclusions: The sequential denosumab–zoledronate–denosumab strategy achieved BMD gains non-inferior to continuous denosumab, while offering additional flexibility and potentially mitigating concerns about rebound bone loss. The transient rise in P1NP during zoledronate therapy may also facilitate microdamage repair. This approach appears promising for long-term osteoporosis management, though further validation of its efficacy and safety is warranted.



P259

FRACTURE RISK PREDICTION USING DXA-MEASURED BMD VERSUS AI-PREDICTED BMD FROM SPINAL RADIOGRAPHS: A MULTICENTER RETROSPECTIVE STUDY IN HOSPITAL AND COMMUNITY SETTINGS

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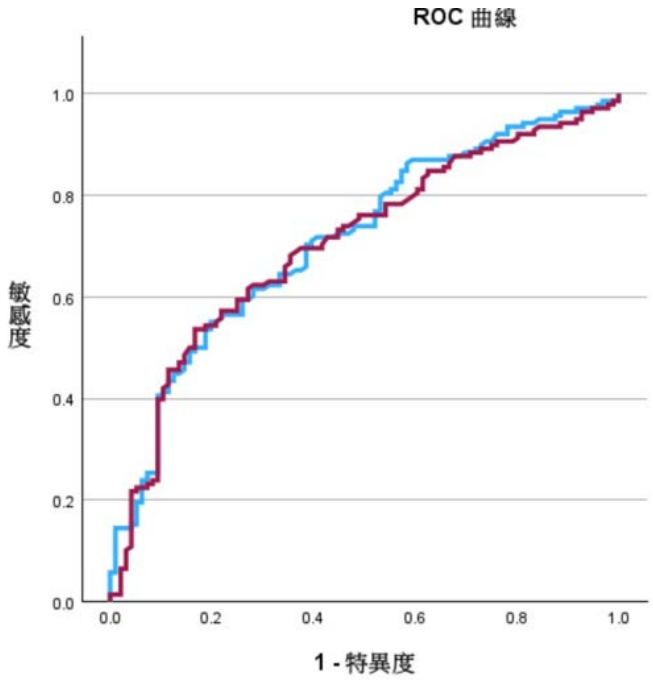
[1]Department of Orthopedic Surgery, National Taiwan University Hospital, Taipei, Taiwan, [2]Department of Orthopedics, National Taiwan University Hospital Yun-Lin Branch, Douliu, Taiwan, [3]Institute of Allied Health Sciences, College of Medicine, National Cheng Kung University, Tainan, Taiwan, [4]Department of Family Medicine, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan, [5]Department of Public Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan, [6]Alpha Intelligence Manifolds, Inc., New Taipei City, Taiwan, [7]National Center for Geriatrics and Welfare Research, National Health Research Institutes, Huwei, Taiwan

Objectives: Osteoporosis is a major global health issue, associated with high morbidity, mortality, and healthcare costs. Dual-energy X-ray absorptiometry (DXA) remains the gold standard for bone mineral density (BMD) measurement and fracture risk estimation. However, DXA access is limited by cost, portability, and reimbursement restrictions, particularly in community and rural settings. Artificial intelligence (AI)-based algorithms applied to routine spinal radiographs may provide a feasible alternative. This study compared fracture risk prediction using DXA-measured BMD with AI-predicted BMD derived from spinal radiographs.

Methods: We retrospectively analyzed adults who underwent DXA at National Taiwan University Hospital Yunlin Branch and community between 2014 and 2025 and had corresponding lumbar radiographs within six months. Patients with major bone metabolic disorders, bone metastases, implants, severe scoliosis, or poor image quality were excluded. Radiographs were analyzed using AI software (DeepXray Spina) to predict BMD. Osteoporosis was defined as T-value ≤ −2.5 by either DXA or AI. Predictive performance for incident vertebral fractures was evaluated using sensitivity, specificity, predictive values, and area under the ROC curve (AUC).

Results: A total of 234 patients (mean age 59.9±10.9 years, 81% male) were included. The intraclass correlation coefficient between AI-predicted and DXA-measured lumbar BMD was 0.934 (95% CI 0.916–0.949). During follow-up, 52.6% sustained fractures, including 41.0% vertebral and 7.7% hip fractures. For vertebral fracture prediction, the AUC was 0.705 for DXA-measured BMD and 0.712 for AI-predicted BMD, indicating comparable performance.

Conclusion: AI-predicted BMD from spinal radiographs demonstrates excellent agreement with DXA and comparable ability in predicting fractures. This approach may provide a practical alternative for osteoporosis screening and fracture risk assessment in regions where DXA is unavailable, and could potentially be integrated into established risk models such as FRAX.


ROC 曲線
敏感度
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
1 - 特異度

P260

MODIFYING EFFECTS OF REHABILITATION METHOD ON THE ASSOCIATION BETWEEN NUTRITIONAL STATUS AND FUNCTIONAL RECOVERY IN OLDER ADULTS WITH HIP FRACTURE

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[1]Department of Rehabilitation Medicine, Soonchunhyang University Cheonan Hospital, Soonchunhyang University College of Medicine, Cheonan, Republic of Korea, Cheonan, South Korea, [2]Department of Rehabilitation Medicine, Seoul National University Bundang Hospital, Seoul National University College of Medicine, Seongnam, Republic of Korea, Seongnam, South Korea

Objectives: To compare the effectiveness of Fragility Fracture Integrated Rehabilitation Management (FIRM) versus conventional rehabilitation in malnourished older adults with hip fracture, and to evaluate whether nutritional status modifies the effect of rehabilitation method on functional recovery.

Material and methods: This prospective observational study included 107 patients aged ≥65 years (73 men, 34 women; mean age 81.8 ± 6.2 years) who underwent surgery for hip fracture and received either FIRM or conventional rehabilitation. Malnutrition was assessed using both the global leadership initiative on malnutrition (GLIM) criteria and the geriatric nutritional risk index (GNRI). Functional recovery was measured by the modified Barthel index (MBI) at admission, discharge, and 3 and 6 months postoperatively. Linear mixed-effects models with time as a repeated measure examined the associations of nutritional status, rehabilitation type, and their interactions with longitudinal MBI scores, with separate analyses for MBI change scores (ΔMBI). Missing data were handled with multiple imputation and complete-case analyses were performed as sensitivity checks.

Results: MBI and ΔMBI improved significantly over time at discharge, 3 months, and 6 months. Baseline functional status, pre-fracture walking ability, and cognitive function were the strongest predictors. Nutritional status defined by GNRI and GLIM was linked to lower baseline function but did not consistently alter recovery magnitude. At 6 months, FIRM showed a marginal benefit in the high-risk GNRI group (estimate 17.4, $p=0.060$) and a significant benefit among GLIM-defined malnourished patients (estimate 13.5, $p=0.030$) (Figure 1). Based on ΔMBI, FIRM yielded markedly greater 6-month improvements in high-risk GNRI (estimate 20.0, $p<0.001$) and malnourished GLIM patients (estimate 14.2, $p=0.004$) (Figure 2).

Conclusions: FIRM yielded superior functional outcomes in malnourished patients compared with conventional rehabilitation, indicating that rehabilitation strategy can substantially influence recovery in this high-risk population. Early nutritional assessment combined with structured, high-intensity, multidisciplinary rehabilitation such as FIRM may optimize postoperative functional recovery after hip fracture.

Figure 1

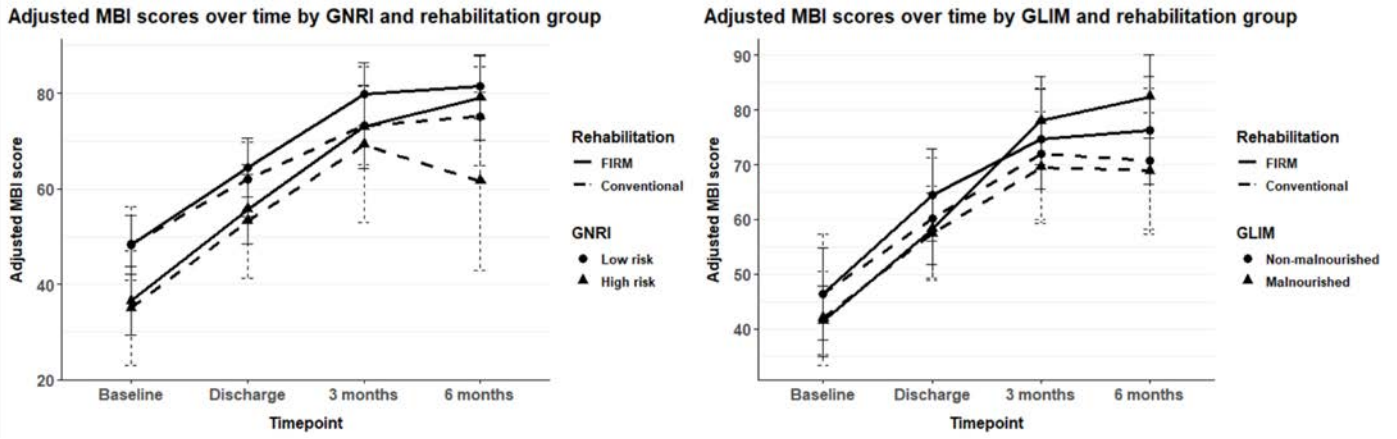
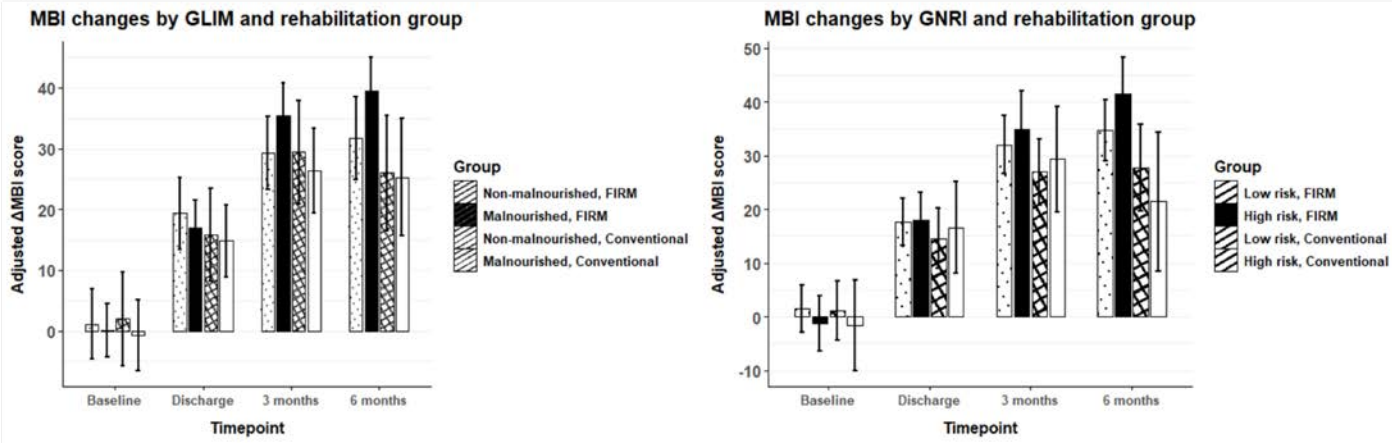


Figure 2



P261

BIOMECHANICAL EVALUATION OF A NOVEL WINGED SUTURE ANCHOR FOR ROTATOR CUFF REPAIR

T. Chia-Chi[1], H. Shao-Fu[1], L. Chun-Li[1], H. Pin-Tsang[1]
[1]National Yang Ming Chiao Tung University, Taipei, Taiwan

Background: Suture anchors are widely used in the surgical treatment of rotator cuff tears. However, clinical limitations persist, notably early anchor loosening, which is a significant concern in patients with osteoporosis. To address this, we developed a novel "EPAC-PTB Wing Anchor" designed to enhance fixation stability, especially in osteoporotic bone, and to simplify the surgical technique, thereby reducing the risk of intraoperative complications.

Methods: This study evaluated the biomechanical performance of the EPAC-PTB Wing Anchor. Static pullout tests were performed to determine its maximum failure load. The anchor was inserted into 20 PCF (pounds per cubic foot) density polyurethane foam blocks (sawbones) through a 4.5 mm pilot hole drilled to a depth of 20 mm. After deploying the anchor's wings, pullout strength was tested at both 0-degree (in-line) and 90-degree (perpendicular) angles to the insertion axis, at a constant displacement rate of 12.5 mm/s.

Results: At the 0-degree pullout angle, the anchor demonstrated an average maximum failure load of 374.25 ± 8.1 N. At the 90-degree angle, the average maximum failure load was 385.92 ± 42.08 N. In all trials, the mode of failure was anchor pullout from the test block, with no structural damage to the anchor body or the attached suture.

Conclusion: When compared to the commercially available CorkScrew FTII anchor, the novel EPAC-PTB Wing Anchor exhibited superior pullout strength in both 0-degree and 90-degree test configurations. This suggests its potential for providing more robust fixation in rotator cuff repair.

P262

PREFER STUDY: PATIENT PREFERENCES INFORMING AN AI DECISION-SUPPORT TOOL TO IMPROVE ADHERENCE IN OSTEOPOROSIS TREATMENT

T. Forfa[1]

[1]Independent Researcher, Brisbane, Australia., Kings Beach, Australia

Objectives: To capture real-world patient experiences and treatment preferences in order to generate AI-trainable datasets for a decision-support tool designed to improve satisfaction and persistence with therapy.

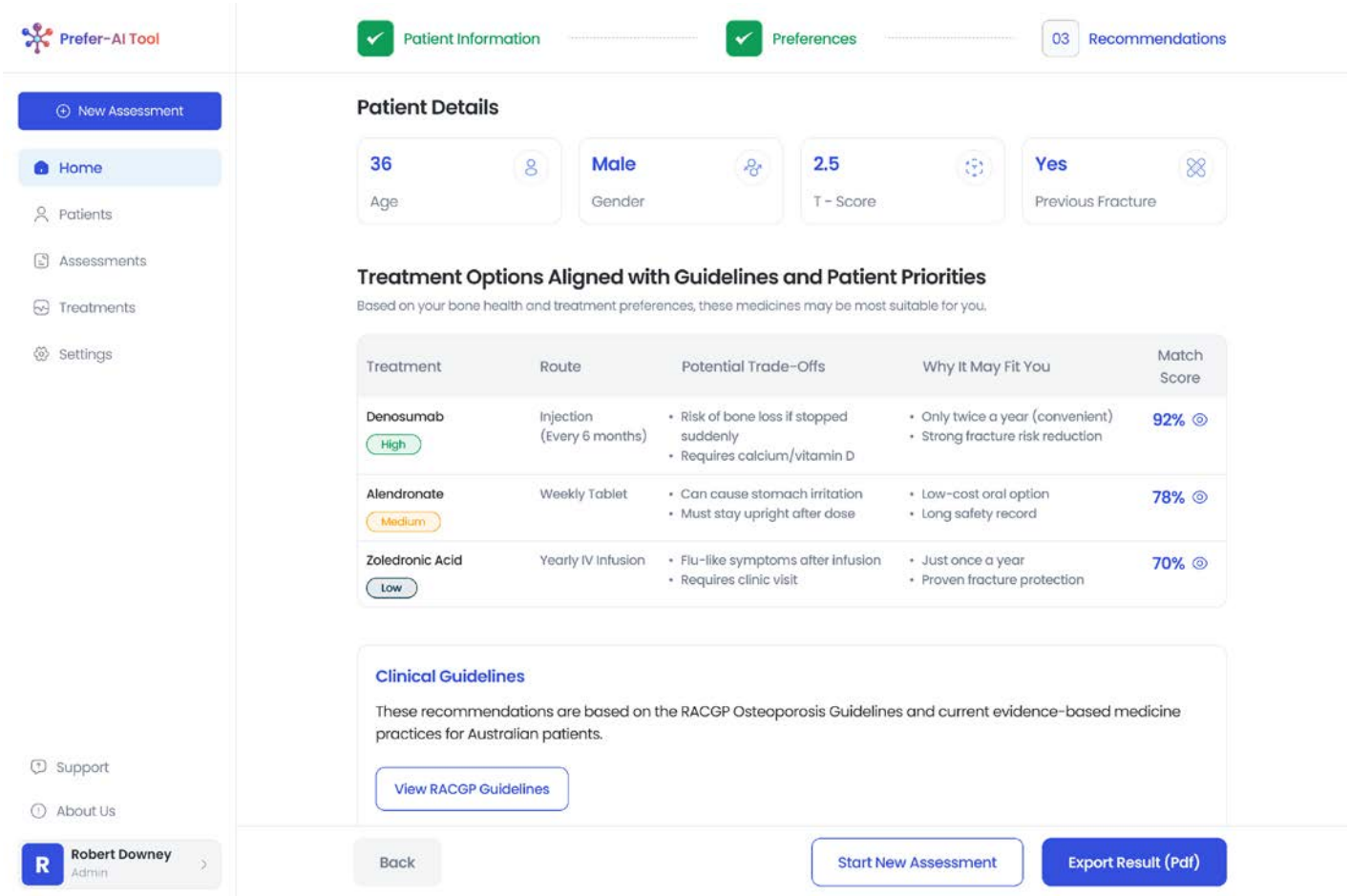
Material and Methods: An anonymous online survey recruited adults with osteoporosis. Questions covered treatment history, satisfaction, side-effects, and beliefs. Preferences were quantified with MaxDiff scaling. Analyses used regression and structural equation modelling. With 403 respondents, this is among the largest real-world patient preference surveys in osteoporosis.

Results: Of 403 respondents (90% women, 43% aged 65–74), 191 (47%) were currently on medication. Mean satisfaction was 5.0/10; side-effect burden 3.3/10. Intention to continue was high (2.55/3). Side-effects were the leading reason for stopping (31%).MaxDiff showed the most valued attributes were: fracture risk reduction, few common side-effects, rare serious risks unlikely, low cost, yearly dosing, and fixed-term treatment.

SEM confirmed satisfaction significantly mediated continuation: perceived benefit increased satisfaction ($p<0.01$), while side-effects reduced it ($p<0.001$). Satisfaction strongly predicted continuation ($B=0.11$, $p<0.001$). Exploratory analyses suggested higher satisfaction with anabolic agents and romosozumab, though only romosozumab reached significance. Route of administration showed no significant effect. Among non-users ($n=212$), 52% cited side-effect concerns and 18% preferred non-drug management.

Conclusions: The PREFER study highlights that patient satisfaction - driven by perceived benefit, tolerability, and convenience - emerged as central to treatment persistence. These structured preference data provide a novel foundation for AI tools that integrate patient values with guideline-based recommendations to support shared decision-making and improve adherence in osteoporosis care.

Prototype of the PREFER AI tool showing ranked treatment options matched to patient preferences and guideline criteria:


Prefer-AI Tool
Patient Information
Preferences
03 Recommendations
New Assessment
Home
Patients
Assessments
Treatments
Settings
Support
About Us
Robert Downey
Admin
Patient Details
36
Age
Male
Gender
2.5
T - Score
Yes
Previous Fracture
Treatment Options Aligned with Guidelines and Patient Priorities
Based on your bone health and treatment preferences, these medicines may be most suitable for you.
Treatment
Route
Potential Trade-Offs
Why It May Fit You
Match Score
Denosumab
High
Injection (Every 6 months)
Risk of bone loss if stopped suddenly
Requires calcium/vitamin D
Only twice a year (convenient)
Strong fracture risk reduction
92%
Alendronate
Medium
Weekly Tablet
Can cause stomach irritation
Must stay upright after dose
Low-cost oral option
Long safety record
78%
Zoledronic Acid
Low
Yearly IV Infusion
Flu-like symptoms after infusion
Requires clinic visit
Just once a year
Proven fracture protection
70%
Clinical Guidelines
These recommendations are based on the RACGP Osteoporosis Guidelines and current evidence-based medicine practices for Australian patients.
View RACGP Guidelines
Back
Start New Assessment
Export Result (Pdf)

P263

COST-EFFECTIVENESS OF OPPORTUNISTIC OSTEOPOROSIS SCREENING USING ARTIFICIAL-INTELLIGENCE ENHANCED CHEST RADIOGRAPHS IN JAPAN

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Objective: Japan, one of the world's most rapidly aging societies, faces a growing burden of osteoporosis and fractures. Yet, osteoporosis often goes undiagnosed due to limitations of conventional screening, leading to missed opportunities for early treatment. Advances in artificial intelligence (AI), particularly deep learning applied to chest X-rays, offer a new avenue for opportunistic screening. This study evaluates the cost-effectiveness of this approach in Japanese women aged 50 years and older.

Methods: A decision tree combined with a Markov microsimulation model was used to estimate the cost per quality-adjusted life year (QALY) gained (in 2024 yen) for AI-assisted chest X-ray screening followed by treatment versus no screening. Patient trajectories were modeled using the AI system's diagnostic performance and aligned with Japanese osteoporosis guidelines. Analyses were conducted nationwide, in Kure City (as the high-fracture-incidence area in Japan), and in a lower-incidence setting assumed to be 25% below the national average, to test robustness across fracture-risk profiles. Real-world medication persistence, DXA uptake after screening detection, and treatment initiation rates were incorporated.

Results: Nationwide, opportunistic osteoporosis screening yielded a cost per QALY of ¥189,713 for women aged 50+, well below the accepted cost-effectiveness threshold of ¥5 million. In Kure City, screening was dominant (lower costs, more QALYs). In the lower-incidence scenario, the cost per QALY was ¥1,055,095, also below the threshold. Findings were consistent across age groups and sensitivity analyses.

Conclusion: Leveraging AI-assisted chest X-rays for incidental osteoporosis detection is economically viable for Japanese women aged 50+ nationwide and a dominant strategy in high-risk regions, highlighting its potential to reduce the national fracture burden in an aging society.

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KURE-DREAMS-3: CITY'S BOLD MOVE CUT VERTEBRAL AND HIP FRACTURES IN AN AGING SOCIETY

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Background: This study represents the third phase of the Kure Data-based Results and Evidence Assisted by a Multi-profession Study (Kure-DREAMS) project, a large-scale municipal cohort for skeletal health improvement. The first phase reported the regional incidence of clinical vertebral and hip fractures, and the second investigated regional and dose-dependent incidence and trend of antiresorptive agent-related osteonecrosis of the jaw.

Objectives: In 2017, Kure City designated osteoporosis and fracture prevention as key administrative policies and launched a comprehensive initiative called the "Kure Project." The purpose of this study was to evaluate the impact of a government-supported, multidisciplinary fracture liaison service (FLS) and public awareness activities on the incidence of clinical vertebral fractures (CVF) and hip fractures (HF) in Kure City, which is experiencing rapid population aging.

Material and Methods: A population-based study targeting individuals aged 65 years and older was conducted in Kure using National Health Insurance and Late-Stage Elderly Medical Care System claims data from 2015 to 2021. Fracture events were identified using diagnosis and procedure codes, and annual trends in CVF and HF incidence rates were analyzed by age and sex. Poisson regression analysis was used, with 2017 (pre-project) as the baseline year.

Results: The incidence rates of CVF and HF showed an increasing trend until 2017 but subsequently shifted to a decreasing trend in both sexes, particularly pronounced in women. Compared to 2017, the age- and sex-adjusted incidence rate ratios in 2015 were 0.76 (95% CI, 0.70–0.83) for CVF and 0.87 (0.78–0.96) for HF. By 2021, the rates were 0.89 (0.82–0.96) for CVF and 0.85 (0.76–0.94) for HF, indicating a significant post-intervention decrease. This effect was more pronounced in women than in men. Increased use of osteoporosis medications and the establishment of the FLS system are considered contributing factors to the decrease.

Conclusions: The government-led multidisciplinary FLS and public awareness campaigns on osteoporosis were associated with a sustained and significant reduction in clinical vertebral fractures and proximal femoral fractures in Kure City since 2017. These findings highlight the importance of fracture prevention strategies tailored to regional characteristics in a super-aged society.

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RESULT OF 8 YEAR TREAMENT OF OSTEOPOROSIS BY A REHABILITATION DOCTOR AT A REGIONAL CORE HOSPITAL: COLLABORATION WITH EACH DEPARTMENT HAS JUST BEGUN!

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Objective: I am a rehabilitation doctor covering all wards of a regional core hospital. Four rehabilitation doctors handle about 4,500 inpatients per year. In recent years, I leave the initial response to new patients to the other 3 doctors, and I lead the rehabilitation conference once a week in each ward and spend more than half of my working hours on all weekdays on osteoporosis. I would like to share my experience in this rare situation.

Material and Methods: Since September 2017, I have been checking sagittal images of chest/abdominal CT of patients referred to our department. If a vertebral fracture was found, the attending doctor was notified and the patient was recommended exam for osteoporosis, advised exercise, nutrition and medication. Treatment initiation and following up were adjusted to the post-discharge schedule of each attending doctor.

Results: In 1346 patients observed for more than 2 years, number of patients who initially received the drug was 806, but after two years it was 507. The incidence of fractures was 3%. High-risk patients with low BMD were treated with romosozumab or denosumab, resulting in BMD improvement. Patients with normal BMD received vitamin D supplementation, and if BMD decreased, antiresorptive agents were added to stabilize or increase it. When I asked the home doctors to take over the medication, it went mostly smoothly. However, scheduling errors occurred in about 10% of cases. Interdepartmental collaboration has grown little by little. I work closely with gastrointestinal surgeons about post-gastrectomy osteoporosis, hematologists during weekly conferences, and respiratory surgeons during preoperative rehabilitation. Cardiovascular specialists have also welcomed osteoporosis interventions. Recently, hepatology, neurology, and endocrinology doctors have sought consultation, and younger physicians in pulmonology and nephrology have shown increased awareness of osteoporosis.

Conclusions: Standard osteoporosis treatment was effective in patients with comorbidities in addition to fragility vertebral fractures. If the osteoporosis specialists collaborating with the osteoporosis liaison service work in the wards of each department and outpatient clinics any day of the weekday, we could treat a dramatically large number of high-risk osteoporosis patients.

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QUADRICEPS MUSCLE STRENGTH IS ASSOCIATED WITH BONE, JOINT, AND MUSCLE DISORDERS OF THE LOCOMOTOR SYSTEM REGARDLESS OF LOCATION - THE ROAD STUDY-

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Objective: To investigate to comprehensively investigate the associations between quadriceps strength and various disorders of the locomotor system, including knee osteoarthritis (OA), hip OA, lumbar spondylosis (LS), osteoporosis (OP), sarcopenia, frailty, and locomotive syndrome in Japanese men and women using a large-scale population-based cohort study, Research on Osteoarthritis/osteoporosis Against Disability (ROAD).

Methods: We analyzed 1,561 community-dwelling adults (511 men, 1,050 women; mean age 65.5 years) from the 3rd ROAD study (2012–2013) who underwent quadriceps strength testing. Radiographs were scored using the Kellgren/Lawrence grading system. OP was defined based on the World Health Organization criteria. Sarcopenia, frailty, and locomotive syndrome were defined using three tests proposed by Japanese Orthopaedic Association, Asian Working Group for Sarcopenia criteria, and Fried's definition, respectively.

Results: A significant association was observed between quadriceps strength and several locomotor system conditions: knee OA (odds ratio [OR] 0.98; 95% confidence interval [CI], 0.96–0.99), OP (lumbar spine L2–4: OR 0.95; 95% CI, 0.93–0.98; femoral neck: OR 0.96; 95% CI, 0.94–0.98), sarcopenia (OR 0.94; 95% CI, 0.92–0.97), frailty (OR 0.90; 95% CI, 0.87–0.93), and locomotive syndrome (stage 0 vs. stage 3: relative risk ratio 0.88; 95% CI, 0.85–0.90).

Conclusion: Quadriceps strength is broadly associated with disorders of the locomotor system affecting bones, joints, and muscles, highlighting its potential as a key indicator of the health of the locomotor system.

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HYPOPHOSPHATEMIC OSTEOMALACIA IN A PATIENT WITH PHOSPHATURIC MESENCHYMAL TUMOR MIMICKING NORMOCALCEMIC PRIMARY HYPERPARATHYROIDISM: A CASE REPORT

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Background: Tumor-induced osteomalacia (TIO) is an extremely rare condition caused by phosphaturic mesenchymal tumors most often producing FGF23, leading to hyperphosphaturia, hypophosphatemia, and osteomalacia. Despite established clinical and biochemical profiles, TIO is often misdiagnosed, resulting in diagnosis delay.

Case Presentation: A 29-year-old Caucasian woman with severe bone and muscular pain, gait disturbance, cramps, height loss, multiple pathological fractures (pelvis, metatarsals, L3-L4 compression), and bilateral femoral head osteonecrosis. Post-third delivery, a pelvic CT performed for bone pain showed consolidated pelvic fractures, initially treated symptomatically without improvement. Foot pain and deformation led to a right foot CT, revealing a II metatarsal fracture. Pathological fractures raised suspicion of primary hyperparathyroidism (PHPT). Labs showed elevated iPTH (96.9 pg/mL) with normocalcemia and hypophosphatemia (0.43 mmol/L), interpreted as normocalcemic PHPT. 99mTc-MIBI scintigraphy and ultrasound suggested a parathyroid adenoma, prompting parathyroidectomy. However, clinical symptom severity and hypophosphatemia degree were disproportionate to iPTH and calcium levels, due to it phosphaturic mesenchymal tumor was suspected. Reduced tubular reabsorption of phosphate supported this – 58.12% (<85). 68Ga-DOTA-TATE PET/CT identified a 1.4x1.9x1.7 cm subcutaneous lesion in the right forefoot (SUVlbm max=14.83), alongside multiple non-consolidated fractures (pelvis, ribs, scapulae, vertebral processes). Hypophosphatemia was managed with oral phosphate and alfacalcidol. Lesion resection in June 2025 normalized serum phosphorus and improved clinical signs.

Conclusion: Long-term hypophosphatemia and delayed diagnosis caused severe osteomalacia and multiple pathological fractures in a young woman. To prevent such a disease progression, a phosphaturic mesenchymal tumor should be suspected in patients with hypophosphatemia and osteomalacia.

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A GAME-CHANGER IN EXERCISE ONCOLOGY: THE PURPLE EDGE PROGRAM'S IMPACT ON MUSCULOSKELETAL HEALTH IN BREAST CANCER SURVIVORS

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Background: Breast cancer survivors frequently experience significant declines in muscle strength and bone mineral density (BMD), leading to a reduced quality of life (QOL) and a shortened healthspan. Despite the widespread recommendation of a daily walking regimen of 10,000 steps, it is often challenging for older adults and patients to achieve, especially while undergoing or recovering from cancer treatment. Consequently, there is an urgent need for interventions that are highly accessible and feasible.

Methods: This prospective, single-arm observational study aims to evaluate the safety and feasibility of the Purple Edge Program (PEP) in breast cancer patients. Fifty women will be enrolled in the study, which will be conducted from October 1, 2025, to September 30, 2027. PEP sessions are 20 minutes long and delivered weekly for 48 weeks via a mobile unit to enhance accessibility. Eligible participants are women aged 20 years or older who have either completed or are currently undergoing breast cancer treatment and have obtained approval from their physician. The PEP integrates three distinct modalities: a) bioDensity for low-impact, high-intensity, self-applied osteogenic loading; b) Power Plate for whole-body vibration training; and c) Neuradiant 1070 for transcranial near-infrared photobiomodulation to support fatigue recovery and cognition. Primary outcomes include maximal isometric force production via bioDensity®, BMD (measured by Radiofrequency Echographic Multispectrometry, REMS), grip strength, and psychological status (Profile of Mood States 2, POMS2). Secondary outcomes include breast cancer-specific QOL (EORTC QLQ-BR23), sleep quality (Athens Insomnia Scale, AIS), pain levels (Visual Analog Scale, VAS), shoulder mobility, and lymphedema severity (Upper Limb Lymphedema-27, ULL-27). Safety will be monitored through adverse events, dropout rates, and program adherence.

Conclusion: This study represents the first prospective investigation in Japan to evaluate a short-duration, low-frequency exercise program designed specifically for breast cancer patients. The PEP could be a practical, safe, and sustainable alternative to conventional exercise recommendations, with the potential to significantly improve musculoskeletal health, fatigue, and overall QOL. Future analyses will explore its impact on cancer recurrence and survival rate, providing new, evidence-based insights for comprehensive cancer survivorship care.

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ARTIFICIAL INTELLIGENCE–BASED REMOTE SCREENING REVEALS RISK FACTORS FOR OSTEOPOROSIS AND HIP FRACTURES IN VIETNAM

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Objectives: To investigate risk factors associated with osteoporosis and hip fractures in Vietnamese adults using an artificial intelligence (AI)–based analysis of pelvic radiographs, and to evaluate the feasibility of a remote screening model with cross-border data processing.

Materials and Methods: We conducted a cross-sectional study of 1,987 pelvic and hip radiographs from patients aged ≥40 years at Hue Central Hospital, Vietnam (January–December 2023). Radiographs were de-identified and transferred to Taiwan for analysis using *DeepXray Coxa* (Alpha Intelligence Manifolds, Taiwan), an AI software cleared by the Taiwan FDA to estimate bone mineral density (BMD) and T-scores from plain radiographs. Osteoporosis was defined as T-score ≤ −2.5. Logistic regression was applied to determine independent risk factors for osteoporosis and hip fractures.

Results: Osteoporosis prevalence was 43.9%. Multivariate analysis showed strong associations with age and sex: compared with participants <50 years, the odds ratios (ORs) for osteoporosis increased to 3.2 (95% CI: 1.7–6.1) at 50–59 years, 10.8 (5.8–19.9) at 60–69 years, 23.1 (12.3–43.1) at 70–79 years, and 71.6 (37.8–136.0) at ≥80 years. Female sex conferred a nearly six-fold higher risk (OR: 5.9, 95% CI: 4.5–7.8). Hip fractures were closely linked to osteoporosis, with elevated risks for femoral neck (OR: 3.8, 95% CI: 2.7–5.2) and intertrochanteric fractures (OR: 7.0, 95% CI: 4.5–11.0). Lower T-scores predicted greater fracture risk; patients with T-scores ≤ −3.0 had an eleven-fold higher risk of hip fracture (OR: 11.5, 95% CI: 5.5–24.5).

Conclusions: This study demonstrated that older age, female sex, and hip fractures are independent risk factors for osteoporosis in Vietnamese adults, while progressively lower T-scores were strongly associated with hip fracture risk. Importantly, radiographs collected in Vietnam and analyzed remotely in Taiwan confirmed the feasibility of a cross-border AI-assisted screening model. Such an approach may provide a scalable and accessible strategy for early osteoporosis detection and risk stratification in resource-limited settings.

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CENTRAL OBESITY AND LOW HDL AS KEY DRIVERS OF SEVERITY IN KNEE OSTEOARTHRITIS: A COMPONENT-SPECIFIC ANALYSIS

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Objective: Metabolic syndrome (MetS) is increasingly recognized as a risk factor for osteoarthritis (OA). While previous work has shown that MetS is associated with OA severity, the relative impact of individual metabolic components is less clear. This study specifically examined whether central obesity and lipid profile abnormalities contribute disproportionately to radiographic severity of knee OA.

Material and Methods: A case-control analysis was conducted at a tertiary care hospital among 216 adults aged ≥50 years with primary knee OA. Cases (n=108) were scheduled for total knee replacement, while controls (n=108) had OA not requiring surgery. Anthropometry, blood pressure, fasting glucose, triglycerides, and HDL cholesterol were recorded. Radiographic severity was graded using the Kellgren-Lawrence (KL) system. Statistical comparisons were performed between advanced and non-advanced OA groups.

Results: Patients with advanced OA had greater waist circumference (92.1 ± 13.5 cm vs 83.7 ± 12.8 cm, $p<0.01$) and lower HDL cholesterol (48.2 ± 13.8 mg/dL vs 55.6 ± 15.0 mg/dL, $p<0.01$) compared with controls. In contrast, blood pressure, fasting glucose, and triglycerides were similar across groups. MetS-positive patients demonstrated higher radiographic severity, with 56.1% reaching KL grade 4 versus 35.3% of MetS-negative patients ($p=0.026$).

Conclusion: Among MetS components, central obesity and low HDL cholesterol emerged as the most consistent predictors of severe knee OA. These findings suggest that focusing on targeted metabolic risk reduction may help delay disease progression and reduce the need for surgical intervention.

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EFFECT OF CHOLECALCIFEROL SUPPLEMENTATION ON BONE TURNOVER MARKERS IN ADOLESCENTS WITH TYPE 1 DIABETES MELLITUS

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Objectives: Cholecalciferol is known to play an important role in bone mineral metabolism. Its deficiency may affect growth and status of bone markers. Aim of the study was to evaluate the correlation between serum 25(OH)D and bone markers and impact of vitamin D supplementation on serum bone formation [procollagen type 1 amino-terminal propeptide (P1NP)] and bone resorption [β-cross laps (CTx)] markers among adolescents with type 1 diabetes mellitus (DM).

Materials and Methods: Total 58 adolescents with type 1 DM, who were given 2000 UI of cholecalciferol supplementation, were included in the study. These 58 persons with pre- and postsupplementation preserved samples with available anthropometry, serum biochemistry, 25-hydroxyvitamin D ([25(OH)D]), and parathormone (PTH) were evaluated for bone formation (procollagen type 1 amino-terminal propeptide [P1NP]) and resorption (β-cross laps [CTx]) markers.

Results: The mean age and body mass index of these children were 16.4 ± 2.3 years (boys: 15.9 ± 2.4; girls: 16.8 ± 1.4 years; $p = 0.04$) and 18.2 ± 3.9 kg/m^2 (boys: 18.1 ± 3.8; girls: 17.8 ± 3.4 kg/m^2; $p = 0.206$), respectively. Baseline serum P1NP levels were positively correlated with serum phosphates ($r = 0.281$, $p < 0.001$), PTH ($r = 0.291$, $p < 0.001$), and CTx ($r = 0.425$, $p < 0.001$) but not with age ($r = -0.016$, $p = 0.404$), BMI ($r = -0.080$, $p = 0.032$), serum calcium ($r = -0.038$, $p = 0.107$), and baseline 25(OH)D ($r = -0.069$, $p = 0.035$). Postsupplementation serum P1NP and CTx levels maintained similar correlations. There was a significant decline in serum P1NP (from 681 ± 223 ng/ml to 630 ± 279 ng/ml, $p < 0.01$) and CTx (from 1.63 ± 0.51 ng/ml to 1.37 ± 0.53 ng/ml, $p < 0.01$) following supplementation. Though decline in serum P1NP and CTx levels was observed in both boys and girls, among all supplementation patients, the effect was more marked in serum CTx than P1NP levels.

Conclusions: Vitamin D supplementation in type 1 DM persons resulted in decrease in both bone formation (P1NP) and resorption (CTx). The impact, however, was more marked on bone resorption than bone formation.

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WHAT IS THE ASSOCIATION BETWEEN UROLITHIASIS AND OSTEOPOROSIS? A SYSTEMATIC REVIEW AND META-ANALYSIS OF EPIDEMIOLOGIC AND GENETIC EVIDENCE

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Objective: Emerging evidence suggests a bidirectional association between urolithiasis and osteoporosis, potentially mediated through shared metabolic and hormonal mechanisms. This study aimed to systematically evaluate the association between these two conditions.

Methods: A systematic review and meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and registered on PROSPERO. Three databases (Medline, EMBASE and Cochrane Library) were searched up to May 2025 using comprehensive terms for “osteoporosis” and “urolithiasis”, “nephrolithiasis” or “kidney stone”. Eligible studies included observational studies in adults that reported likelihood ratios or raw data for prevalence of urolithiasis and osteoporosis. Two independent reviewers conducted study screening, data extraction, and quality assessment using the Newcastle-Ottawa Scale (NOS). Between-study heterogeneity was assessed using the I^2 statistic, and publication bias was evaluated via funnel plots and Egger’s test. Random-effects models were used to compute pooled odds ratio (OR).

Results: A total of 11 studies were included. Nine observational studies (case control and cohort) indicated a higher likelihood of osteoporosis in patients with nephrolithiasis (OR = 1.20, 95% CI: 1.13–1.28), and vice versa (OR = 1.51, 95% CI: 1.31–1.73). Complementing the observational evidence, two large mendelian randomization (MR) studies supported a unidirectional causal effect of urolithiasis on osteoporosis. One MR study based on the Japan Biobank (n > 400,000) identified a significant direct causal effect, robust to multiple sensitivity analyses and multivariable adjustments. A second MR study using FinnGen and UK Biobank data (n > 800,000) found a similar causal association (OR ~1.14–1.15), with mediation analysis revealing that total body bone mineral density accounted for ~50% of the effect, and SHBG for ~2–3%. No mediating role was observed for serum 25(OH)D or calcium supplementation, and no reverse causality was observed in the MR studies.

Conclusion: This review of epidemiologic and genetic evidence establishes a robust and likely unidirectional causal relationship between urolithiasis and osteoporosis. Clinicians should consider proactive osteoporosis screening in patients with urolithiasis, irrespective of traditional lifestyle risk factors. Future work should further study exploring genetic causality and mediation mechanisms, and explore targeted interventions along shared biological pathways to mitigate dual disease risk.

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INCEDENCE OF HYPERCALCEMIA WITH AND WITHOUT CALCIUM SUPPLEMENTATION IN CHINESE POSTMENOPAUSAL OSTEOPOROSIS PATIENTS TREATED WITH ELDECALCITOL: RESULTS FROM THE DRUG INTENSIVE MONITORING

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Objective: To investigate clinical factors involved in hypercalcemia associated with Eldecalcitol treatment among postmenopausal osteoporosis patients with and without calcium supplementation in a real-world setting.

Materials and Methods: This prospective, observational study was conducted at 29 clinical sites across China as a post-marketing drug intensive monitoring program. Patients were included if they provided informed consent, initiated Eldecalcitol and were expected to use it for one year. The primary outcome was to compare the incidence of hypercalcemia in patients with and without calcium supplementation at baseline. Secondary outcomes contained monitoring the type, incidence, severity, and relevance of other adverse drug reactions (ADRs), including urolithiasis. Safety data were collected using an electronic case report form and analyzed using descriptive statistics and logistic regression adjusted for baseline characteristics. Logistic regression was applied to assess associations, adjusting for calcium use, renal function, parathyroid status, and other covariates.

Results: Between January to September 2023, a total of 1000 patients were screened, and 958 patients were enrolled. Of the 958 patients in the Safety Analysis Set (SAS), 853 (89.0%) did not receive Ca supplements (non-Ca group) and 105 (11.0%) did (Ca group) at baseline. Hypercalcemia occurred in 5/105 (4.8%) of the Ca group and 17/853 (2.0%) of the non-Ca group. In multivariate logistic regression, Ca supplementation was significantly associated with hypercalcemia (adjusted OR=3.07; 95% CI: 1.16–8.10; p = 0.024). No cases of urolithiasis were reported. Overall, ADRs occurred in 379 (39.6%) patients, which is comparable to incidences reported in the known safety profile, with lower rates in non-Ca (39.2%) vs. Ca (42.9%) groups.

Conclusion: In this study, multivariate logistic regression analyses indicated a higher risk of the incidence of hypercalcemia in the Ca group than in non-Ca group. The results shown here support the caution that patients should be carefully monitored due to a higher risk of hypercalcemia when they are treated with Eldecalcitol along with Ca supplements. No urolithiasis was reported, and the overall ADRs incidence remained consistent with the known safety profile, with no new safety concerns identified.

Disclosures: The study was sponsored by Chugai Pharmaceutical Co., Ltd.

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ASSOCIATION BETWEEN USE OF RENIN-ANGIOTENSIN SYSTEM INHIBITORS AND RISK OF MAJOR OSTEOPOROTIC FRACTURES IN 0.26 MILLION PEOPLE WITH TYPE 2 DIABETES: A TERRITORY-WIDE COHORT STUDY OF HONG KONG

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Objective: We evaluated the associations between use of renin-angiotensin system (RAS) inhibitors (angiotensin-converting enzyme inhibitors [ACEi] and angiotensin-receptor blockers [ARB]) and the major osteoporotic fracture risk in type 2 diabetes(T2D).

Methods: People with T2D aged ≥40 years who underwent a comprehensive diabetes complication evaluation were identified from the territory-wide electronic health records of Hong Kong (2008–2012). Based on prescriptions at index date (date of diabetes complication evaluation), patients were classified as ACEi/ARB users and non-users. They were followed fracture outcomes (hip, clinical vertebral, upper limb), death or end of 2023, whichever was earlier. Propensity-score (PS) weighting with inverse probability of treatment weighting (IPTW) was used to balance baseline characteristics. Hazard ratios (HR) were computed using Cox proportional hazards models.

Results: 259648 people were included (122404 ACEi/ARB users and 137244 non-users): mean age 63.8 years; 51.1% female. Upon median follow-up of 12.8 years, there were 11155 hip, 2415 vertebral and 9758 upper limb fractures. ACEi/ARB use was associated with an increased risk of hip fracture (HR 1.11, 95%CI 1.06–1.15, p<0.001), but not vertebral or upper limb fractures. Subgroup analyses showed no interaction by age, sex or kidney function, but more significant risks in those with less comorbidities, diabetes duration<10 years, non-obese and HbA1c<8.0%(p-for-interaction<0.05). Sensitivity analyses (1:1 PS matching, new-user design, time-dependent model) were consistent. There was no association with gastrointestinal bleeding (a falsification end-point) (p=0.54). The increased hip fracture risk was driven by ACEi but not ARB. ACEi/ARB use posed a lower hip fracture risk than calcium-channel blockers.

Conclusions: Initiation of RAS inhibitors, especially ACEi, was associated with increased hip fracture risk in people with T2D, especially those with lower baseline fracture risk.

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EIGHTEEN-MONTH NUTRITION AND EXERCISE INTERVENTION IN ELDERLY TYPE 2 DIABETES: MUSCLE IMPROVEMENTS AND BONE MASS EVALUATION

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Objective: Sarcopenia and osteoporosis are major causes of in elderly patients with type 2 diabetes mellitus (T2DM). This study evaluated whether long-term dietary intervention improves muscle and bone mass without deterioration of renal or hepatic function in very elderly patients with T2DM.

Material and Methods: This Single-arm, prospective, non-blinded study enrolled 44 subjects aged ≥75 years with T2DM. Nutritional counseling and exercise guidance were provided at baseline, 6, 12, and 18 months, along with dietary assessment using a Food Frequency Questionnaire (FFQ) and clinical evaluations. Primary endpoints were skeletal muscle index (SMI), grip strength, gait speed, and bone mass. Bone mineral density (BMD) was assessed by dual-energy X-ray absorptiometry (DXA) at the lumbar spine (LS), femoral neck (FN), and total hip (TH), and further analyzed using the 3D-Shaper software at the total hip. Renal and hepatic functions were evaluated throughout the study by routine tests.

Results: At baseline, mean age was 80.2 years (19 men, 25 women), mean BMI was 22.1 kg/m², and mean HbA1c was 8.0%. Twenty-one participants met criteria for sarcopenia, and 18 were diagnosed with osteoporosis. The stages of diabetic nephropathy were: stage 1 in 30 patients, stage 2 in 12, and stage 3 in 2. Protein intake was maintained above baseline throughout 18 months. During the intervention, SMI improved at 6 and 12 months, gait speed improved at 6 months, and grip strength showed a significant gain at 12 months. Renal and hepatic functions remained stable. DXA-based areal BMD (aBMD) at the LS significantly increased at 18 months (+1.96%, p=0.016), whereas FN aBMD showed a transient decrease at 12 months (−1.8%, p=0.004) but no significant change at 6 or 18 months. TH aBMD remained stable without significant changes. 3D-Shaper analysis of the TH revealed a significant increase in cortical thickness at 18 months, while cortical sBMD, cortical vBMD, and trabecular vBMD showed no significant changes.

Conclusion: Long-term nutrition and exercise intervention was safe and suggested to improve muscle outcomes and bone parameters in older adults with T2DM.

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THE PREVELANCE AND ASSOCIATED FACTORS OF SARCOPENIA AMONG RESIDENTS OF A NURSING HOME IN SOUTHERN TAIWAN

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Objective: Sarcopenia was one of the common musculoskeletal diseases in older people. In recent years, rapidly aging cause sarcopenia emerging and becoming an important public health issue. The associated risk factors of sarcopenia, including aging, inactivity, malnutrition, and endocrine disorder, were explored in general and community-dwelling population. Studies have found that the prevalence of sarcopenia among nursing home residents were higher than community population, which may expose to a higher risk of death. However, the data of nursing home residents was limited. This study aims to explore the prevalence and associated risk factors of sarcopenia among nursing home residents.

Material and Methods: The study was conducted at a nursing home in southern Taiwan from February 2021 to July 2021. The residents of the nursing home were enrolled and interviewed with questionnaires, including socioeconomic status, smoking, drinking, betel nuts chewing, exercise, medical history, and the scales of disability, comorbidities, frailty, activities of daily living, instrumental activities of daily living, and nutritional assessment. We also obtained their muscle strengthen and physical performance by hand grip and 6-meter gait speed test. Sarcopenia is defined by Asian working group for sarcopenia (AWGS 2019) consensus.

Results: Of total 74 residents of the nursing home were enrolled in the study. The subjects were mostly women (62.2%), with a mean age of 79.5±13.3 years and a mean body mass index (BMI) of 23.3±3.9 kg/m^2. The prevalence of probable, established, and severe sarcopenia was 81.6%, 8.2%, 10.2% respectively. The multivariate linear regression analysis showed that body mass index and frailty scale were most crucial associated factors of sarcopenia. The lower BMI and higher frailty scales were more likely to develop sarcopenia.

Conclusions: Our study results revealed that body mass index and frailty scale were most crucial associated factors of sarcopenia. It implies that keeping normal weight and an early frailty prevention program could be beneficial among residents nursing home.

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CLINICAL IMPACT OF IONIZED CALCIUM AND HIDDEN HYPOCALCEMIA ON CARDIOVASCULAR OUTCOMES IN DIALYSIS PATIENTS

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Background: Calcium homeostasis is critical for cardiovascular health in patients with chronic kidney disease (CKD). Although ionized calcium is biologically active, clinical monitoring typically relies on total or albumin-corrected calcium, which may misclassify calcium status and mask abnormalities such as hidden hypocalcemia

Methods: We analyzed data from 662 maintenance dialysis patients in the prospective, multicenter ORCHESTRA cohort with baseline ionized calcium measurements. Total, corrected, and ionized calcium were categorized as low, normal, or high, and patients were further classified into concordant or discordant groups (both normal, hidden hypocalcemia, true hypocalcemia, hidden hypercalcemia, true hypercalcemia). Repeated measurements at baseline, 6, and 12 months were evaluated. Primary outcomes were major adverse cardiovascular events (MACE) and all-cause mortality.

Results: During a median follow-up of 2.1 years, 82 MACE and 62 deaths occurred. Neither total nor corrected calcium, whether averaged over 12 months or defined by abnormal-value frequency, was associated with MACE or mortality. In contrast, low ionized calcium was linked to higher MACE risk (hazard ratio [HR], 2.53; 95% CI, 1.25–5.13). Patients with ≥2 ionized-hypocalcemic measurements had markedly elevated risk (HR, 3.94; 95% CI, 1.66–9.35). Hidden hypocalcemia (normal total or corrected but low ionized calcium) independently predicted MACE at baseline (total×ionized HR, 2.33; corrected×ionized HR, 2.18) and in longitudinal analyses (corrected×ionized ≥2 episodes HR, 4.42). No calcium category predicted mortality

Conclusion: Total and corrected calcium did not discriminate cardiovascular or mortality risk, whereas low ionized calcium—particularly hidden hypocalcemia—was consistently associated with excess MACE. Identifying discordant calcium status may improve cardiovascular risk stratification in dialysis care.

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ASSOCIATION BETWEEN BISPHOSPHONATE USE AND COLON CANCER; ANALYSIS OF NATIONWIDE SAMPLE COHORT

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Background: Epidemiologic studies have reported inconsistent findings regarding the association between oral bisphosphonate use and colorectal cancer risk. The objective of this study was to evaluate the risk of colorectal cancer among bisphosphonate users using a nationwide database.

Methods: We conducted a retrospective cohort study using the Korean National Health Insurance Service sample cohort (2002–2011). Among 1,107,015 individuals, 41,553 new bisphosphonate users aged ≥50 years without prior cancer history were compared to an age- and gender-matched control group (n=41,553) without bisphosphonate or SERM prescriptions. Incidence rates and hazard ratios for colorectal cancer were calculated using Cox proportional hazards modeling adjusted for age and Charlson Comorbidity Index (CCI).

Results: Colorectal cancer occurred in 215 bisphosphonate users (0.00517; 517/100,000) and in 219 controls (0.00527; 527/100,000). The adjusted hazard ratio (HR) for colorectal cancer in the bisphosphonate group was 0.6826 (95% CI: 0.4031–1.156), not statistically significant. Age was a significant predictor of colorectal cancer risk, particularly in those aged 60–84 years.

Conclusion: Our study suggested that Long-term bisphosphonate use was not significantly associated with a reduced or increased risk of colorectal cancer.

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VENDOR-SPECIFIC DXA AI COMBINED WITH FRAX IMPROVES FRACTURE RISK PREDICTION AND CLINICAL RECLASSIFICATION

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FRAX is widely used for fracture risk prediction, but many patients lie near clinical thresholds, where small improvements may alter stratification and care. While FRAX incorporates BMD to refine prediction, concurrently acquired DXA report images remain underutilized. This study examined whether deep learning (DL) of these images could augment FRAX and improve risk prediction.

This retrospective multicenter study used vendor-specific datasets for development and validation. For GE, 41,334 patients (mean age 59.2 years; 80.1% women) from Hospital A (2008–2019) formed the training set, and 16,374 patients (mean age 64.0 years; 73.3% women) from Hospital B (2003–2022) were used for external validation. For Hologic, 17,644 patients (mean age 62.2 years; 81.4% women) from Hospital C (2010–2020) were used for training, and 14,966 (mean age 65.0 years; 63.8% women) from Hospital B (2003–2022) for validation.

GE-DL models achieved a concordance index (C-index) of 0.878 (spine) and 0.853 (femur) for internal validation, and 0.763 (spine) and 0.745 (femur) for external validation, significantly outperforming FRAX with BMD (0.816 and 0.738; all P<.001). Hologic-DL models yielded C-indices of 0.807 (spine) and 0.826 (femur) for internal validation, and 0.733 (spine) and 0.730 (femur) for external validation, also surpassing FRAX with BMD (0.793 and 0.706; all P<.001). In the external validation sets, 5-year area under the receiver operating characteristic curves (AUROCs) were 0.793 (spine, GE), 0.775 (femur, GE), 0.742 (spine, Hologic), and 0.757 (femur, Hologic), all higher than those of FRAX with BMD (0.758 for GE and 0.719 for Hologic; all P<.001).

In conclusion, vendor-specific DL models using DXA report images improved fracture risk prediction over FRAX with BMD across cohorts. These results support integrating image-based DL into osteoporosis workflows for more accurate and individualized risk assessment.

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MAPPING THE EVIDENCE ON PATIENT ACTIVATION AND OSTEOPOROSIS IN OLDER ADULTS: A SCOPING REVIEW

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Objective: Patient activation, broadly defined as knowledge, skills, and confidence to manage one's health, has been proposed as a modifiable factor influencing preventive behaviours and health outcomes. This scoping review aimed to map the extent and nature of research on health activation measures and their relationship to osteoporosis-related outcomes in adults aged 65 and older.

Methods: Following the PRISMA-ScR and Joanna Briggs Institute (JBI) guidelines for scoping reviews, we devised a study protocol and searched Medline, Embase, Scopus, and PsycINFO for studies published in English without date restrictions, using combinations of keywords including "patient activation," "PAM," "osteoporosis," "osteopenia," "older adults," and "fracture." Eligible studies included those that used any validated patient activation instruments (e.g., the patient activation measure (PAM), the consumer health activation index) in populations aged ≥60 years, and examined associations with osteoporosis-related outcomes. Two reviewers independently screened titles, abstracts, and full texts; data were extracted on study design, population, setting, activation measure, and outcomes. Discrepancies were resolved by consensus.

Results: Five studies met inclusion criteria, all conducted in the United States and employing the PAM. Most were interventional studies assessing activation-enhancing strategies such as tailored motivational strategies, nurse consultations, or personalized video education. These studies consistently reported post-intervention improvements in PAM scores and selected intermediate outcomes (e.g., calcium intake, exercise, osteoporosis knowledge), but no significant increases in treatment initiation or fracture prevention were observed. One large study found that providing dual-energy X-ray absorptiometry (DXA) testing and results alone improved activation levels, yet elevated activation did not correlate with higher medication uptake or adherence. No studies examined long-term outcomes or tracked activation levels over time.

Conclusion: Despite a growing emphasis on population health, few studies have explored the role of patient activation in osteoporosis care among older adults, and findings remain inconclusive. While some evidence suggests potential benefits for intermediate outcomes, further research is needed to assess long-term impact and to evaluate activation within broader, multi-component care strategies. Research gaps include the lack of longitudinal data linking activation to fracture risk and limited focus on early-stage bone loss to optimize osteoporosis care in older adults.

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AI-ASSISTED HIP BONE MINERAL DENSITY SCREENING IN TAIWANESE COMMUNITIES

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Objective: This study aimed to assess the prevalence of normal bone density, low bone mass, and osteoporosis in community residents of Taoyuan, Nantou, and Hualien, Taiwan, using artificial intelligence (AI)–assisted hip bone mineral density (BMD) analysis.

Material and Methods: A cross-sectional study was conducted in Taoyuan, Nantou, and Hualien. A total of 3,515 participants (mean age 61.4 years) underwent AI-assisted pelvic radiograph analysis. Outcomes were classified as normal, low bone mass, or osteoporosis. Subgroup analyses were performed by sex and age groups (<50, 50–70, >70 years). Chi-square tests assessed differences between groups. Multinomial logistic regression was used to examine the independent effects of sex and age on bone status.

Results: Among all participants, 97 (2.8%) were normal, 2,352 (66.9%) had low bone mass, and 1,066 (30.3%) had osteoporosis. Women (n=1,449) exhibited higher osteoporosis prevalence (43.2%) than men (15.3%), X^2 $p<0.001$. Osteoporosis prevalence rose with age: <50 years (male 6.6%, female 3.0%), 50–70 years (male 13.5%, female 30.9%), and >70 years (male 22.6%, female 66.9%). Multinomial logistic regression confirmed female sex as an independent predictor of osteoporosis (adjusted OR ≈3.0, 95% CI 2.3–3.9, $p<0.001$). Age showed a strong dose-response relationship: individuals aged 50–70 had OR ≈2.6 (95% CI 1.9–3.5, $p<0.001$), and >70 had OR ≈5.7 (95% CI 4.2–7.6, $p<0.001$) for osteoporosis compared with <50 years. Similar trends were observed for low bone mass versus normal.

Conclusion: AI-based pelvic radiograph screening effectively identified high prevalence of osteoporosis in Taiwanese communities. Both female sex and older age were strong independent predictors of bone deterioration. These findings highlight the utility of AI tools in large-scale community osteoporosis screening and early risk stratification.

References: Nguyen, H.G., Nguyen, DT., Tran, T.S. *et al.* Artificial intelligence system for predicting areal bone mineral density from plain X-rays. *Osteoporos Int* (2025).

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MECHANISM STUDY OF LIGUSTROFLAVONE PROMOTING OSTEOGENIC DIFFERENTIATION AND IMPROVING GLUCOCORTICOID INDUCED OSTEONECROSIS BY INHIBITING CASR AND PLC Γ/PKC PATHWAYS

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Objective: To investigate the effects of Ligustroflavone (Lig) on osteoblast differentiation in vitro and bone repair in a glucocorticoid induced osteonecrosis of the femoral head (GIONFH) model in vivo, and to explore its regulatory mechanism involving the Calcium-Sensing Receptor (CaSR) and downstream Phospholipase Cγ/Protein Kinase C (PLCγ/PKC) signaling pathway.

Material and Methods: MC3T3-E1 osteoblasts were divided into four groups: Osteogenic Medium group, Dexamethasone group, low-dose Lig group, and high-dose Lig group. Detection methods included: ALP staining and activity assay; ARS staining for mineralization; qRT-PCR to detect the expression of osteogenic markers (Runt-Related Transcription Factor 2 [RUNX2], Osteocalcin [OCN], Type I Collagen [COL-1]); Western Blotting (WB) to analyze protein levels of CaSR, PLCγ, phosphorylated PLCγ (p-PLCγ), PKC, and osteogenic markers; Ca^{2+} imaging to assess calcium signaling; Surface Plasmon Resonance (SPR) and molecular dynamics simulation to verify the binding between Lig and CaSR.

A GIONFH mouse model was established and grouped into: Sham-operated group, model group, Lig-low group, Lig-high group, and Lig-high-SR group. Bone structure and pathology were evaluated by micro-CT, Hematoxylin-Eosin (HE) staining (tissue damage), and Masson staining. Immunofluorescence (IF) was used to detect the co-localization of CaSR with RUNX2, OCN, or p-PLCγ.

Results: In vitro osteogenic promotion: Compared with the DEX group, the Lig groups showed enhanced ALP staining/activity and ARS-positive mineralization; qRT-PCR and WB confirmed upregulated expression of RUNX2, OCN, and COL-1.In vivo bone repair: The Lig groups exhibited improved bone density and trabecular structure, reduced femoral head tissue, and increased collagen deposition compared with the model group; IF showed increased CaSR/RUNX2 and CaSR/OCN co-localization. CaSR pathway regulation: Molecular dynamics simulation and SPR verified direct binding between Lig and CaSR; Lig downregulated CaSR expression and inhibited Ca^{2+} signaling activation. Downstream PLCγ/PKC inhibition: The Lig groups had decreased p-PLCγ and PKC protein levels and reduced CaSR/p-PLCγ co-localization in vitro and in vivo. The CaSR agonist reversed Lig-induced effects.

Conclusion: Ligustroflavone promotes MC3T3-E1 osteoblast differentiation and alleviates GIONFH in mice by directly binding to CaSR, inhibiting CaSR expression, and suppressing the downstream PLCγ/PKC signaling pathway. This study identifies Lig as a potential therapeutic agent for GIONFH, with CaSR as a key regulatory target.

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ASSOCIATION BETWEEN BONE MINERAL DENSITY BY REMS AT THE LUMBAR SPINE AND FEMORAL NECK AND MULTI-SITE MUSCLE STRENGTH IN COMMUNITY-DWELLING ADULTS

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Background: Osteoporosis and sarcopenia frequently co-exist in older adults, culminating in the high-risk phenotype of osteosarcopenia. While DXA is the reference for bone mineral density (BMD), radiofrequency echographic multi-spectrometry (REMS) offers portable, radiation-free assessment suitable for community screening. How REMS-derived metrics relate to objectively measured multi-site muscle strength in real-world settings remains insufficiently characterized.

Objectives: To determine the association between REMS T-scores at the lumbar spine and femoral neck and isometric muscle strength at upper limb, lower limb, and trunk; and to identify independent determinants of T-scores among age, sex, body mass index (BMI), and strength.

Methods: In a cross-sectional study, 288 community-dwelling adults (111 men, 177 women; mean age 57 years) attending a mobile wellness program underwent REMS assessments at the lumbar spine and femoral neck, standardized isometric strength testing with a bioDensity™ device (Chest Press, Leg Press, Core Pull, Vertical Lift), anthropometry, and FRAX® questionnaires. Pearson correlations examined crude associations between T-scores and each strength measure. Multiple linear regression models for lumbar and femoral neck T-scores included age, sex, BMI, and the site-relevant strength measure with the strongest univariable correlation.

Results: Both lumbar and femoral neck T-scores correlated positively with lower-limb and trunk strength (e.g., Leg Press and Vertical Lift for the femoral neck; Vertical Lift and Core Pull for the lumbar spine; all $p<0.01$), whereas upper-limb strength (Chest Press) showed no consistent relationship. In multivariable models, older age and female sex were independently associated with lower T-scores, while higher BMI and higher site-relevant strength remained significant positive determinants of T-scores (all $p<0.05$). Effect sizes were moderate, consistent with biomechanical locality.

Conclusions: In community settings, REMS-derived lumbar and femoral neck T-scores are independently associated with axial and lower-limb isometric strength after accounting for age, sex, and BMI, whereas upper-limb pushing strength is not. These findings reinforce the bone–muscle unit concept and support combined strategies of early screening with REMS and targeted high-intensity resistance training focused on hip and trunk musculature to mitigate osteosarcopenia and fracture risk.

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THE POTENTIAL ROLE OF CALCITRIOL IN MAINTAINING CALCIUM LEVELS IN OSTEOPOROSIS PATIENTS RECEIVING DENOSUMAB

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Objectives: Denosumab, a potent anti-resorptive agent for osteoporosis treatment, effectively improves bone mineral density and reduces fracture risk. However, hypocalcemia following its administration remains a clinical concern. This study aimed to evaluate whether the concomitant use of calcitriol with denosumab has a preventive effect on hypocalcemia.

Methods & Materials: In this propensity score-matched cohort study, we analyzed data from adult patients who received at least one dose of denosumab for osteoporosis between 2020 and 2022. Individuals who received calcitriol with denosumab were 1:1 matched to those who received denosumab alone (n=87 for each group; denosumab with calcitriol [DC] and denosumab only [DO]). The change in serum albumin-corrected calcium from baseline within three months after denosumab administration was evaluated. A linear mixed model was used to compare calcium changes between the two groups. Hypocalcemia was defined as a corrected serum calcium <8.5 mg/dL (2.1 mmol/L), and its incidence was also compared between groups.

Results: Among 174 patients (87 in each group), DC group showed a smaller decline in calcium levels (-0.06 mg/dL) within three months after denosumab administration compared to the DO group (-0.32 mg/dL), with a between-group mean difference of 0.33 mg/dL (95% confidence interval [CI], 0.14 to 0.51, p = 0.001). The incidence of hypocalcemia was lower in the DC group than in the DO group (21% vs 37%, p = 0.019). A subgroup analysis restricted to patients with chronic kidney disease [CKD] (eGFR <60 mL/min/1.73m²) revealed a greater protective effect of calcitriol, with a between-group difference of 0.62 mg/dL (95% CI, 0.21 to 1.04, p = 0.013), suggesting that calcitriol supplementation may be particularly beneficial for patients with impaired renal function.

Conclusions: Calcitriol supplementation may help reduce the risk of denosumab-induced hypocalcemia, with a more pronounced effect in patients with CKD.

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ACTIVATION OF TGR5 BY OLEANOLIC ACID AND LITHOCHOLIC ACID ACTIVATED VITAMIN D METABOLISM AND TGR5 SIGNALING IN VITRO AND IMPROVED BONE PROPERTIES IN VIVO

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Objective: Takeda G protein-coupled receptor 5 (TGR5) has been reported to be a potential target for regulating bone health, but the effect and mechanisms are far from clear. We previously found that oleanolic acid (OA), a naturally occurring agonist of TGR5, can modulate 1,25(OH)$_2$D$_3$ synthetase CYP27B1 in kidneys and bones, leading to improved bone properties. Therefore, the present study aims to determine the role of TGR5 in the regulation of CYP27B1 and bone health.

Material and Methods: Human osteosarcoma MG-63 cells and human renal proximal tubular HKC-8 cells were treated with OA, or lithocholic acid (LCA), one of the most potent endogenous agonists of TGR5, in the presence or absence of TGR5 antagonist. Expression and activity of CYP27B1 and phosphorylation of CREB were measured. To study the role of TGR5 in regulating bone health, bone properties were compared between wild type (WT) and TGR5 knockout (KO) male and female mice at 2, 6 and 15 months of age. Furthermore, 4-month-old ovariectomized (OVX) TGR5 KO mice and WT littermates were administrated with OA or LCA at a dose of 25mg/kg for 8 weeks to determine their effects on bone properties.

Results: *In vitro* studies showed that OA and LCA upregulated the expression ($p<0.05$) and activity ($p<0.05$) of CYP27B1 in both HKC-8 and MG-63 cells, but inhibiting of TGR5 abolished these promotive effects, indicating that TGR5 was involved in the regulation of both renal and extra-renal vitamin D metabolism. Moreover, activation of TGR5 resulted in rapid induction of CREB phosphorylation ($p<0.05$) and subsequent activation of CYP27B1 transcription ($p<0.05$), suggesting that TGR5/p-CREB signaling mediated the regulatory effects of OA and LCA on the transcription of CYP27B1. *In vivo* experiments showed that TGR5 knockout had no impact on bone properties in 2-, 6-, 15-month-old and OVX mice. However, TGR5 activation by OA or LCA was found to improve bone properties in OVX mice. Both OA and LCA treatment improved bone mineral density and microarchitectural properties in WT mice ($p<0.05$), and notably, no such improvement was observed in TGR5 KO mice.

Conclusions: OA and LCA can upregulate the expression of CYP27B1 and enhance bone properties in a TGR5-dependent manner.

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ETHNIC-SPECIFIC RISK FACTORS FOR OSTEOPOROSIS AND FRAGILITY FRACTURES IN ELDERLY HAKKA WOMEN

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Objective: The aim of this study was to determine the prevalence and identify risk factors for osteoporosis and osteoporotic fractures in Hakka women.

Materials and Methods: We retrospectively analyzed 1,429 Hakka women aged ≥50 years who underwent dual-energy X-ray absorptiometry (DXA) at a single center in Taiwan. Medical records were reviewed to identify fragility fractures at the spine, hip, and distal radius.

Results: The mean age of participants was 73.3 years, with average height 153.2 cm, weight 56.8 kg, and body mass index (BMI) 24.2 kg/m². Mean T-scores were −2.03 at the lumbar spine and −1.80 at the hip. The prevalence of osteoporosis was 40.9%. Regression analysis showed age was negatively associated with bone mineral density (BMD) at all sites ($p < 0.001$). Body weight was positively associated with hip BMD ($\beta = 0.091$, $p = 0.012$), while height and BMI were not independently significant after adjustment. Fragility fractures occurred in 43.7% of participants, most commonly vertebral fractures (32.0%). Fracture prevalence increased across BMD categories: 29.0% in normal, 41.3% in osteopenia, and 53.9% in osteoporosis groups ($p < 0.001$). Logistic regression demonstrated age as a strong predictor of fracture risk ($\beta = 0.089$, OR = 1.093, 95% CI 1.079–1.108, $p < 0.001$), with risk rising 9.3% per year. BMI demonstrated a non-linear relationship with fracture risk, which declined with increasing BMI until approximately 27.6, where the lowest predicted risk (38.5%) was observed.

Conclusions: Osteoporosis and fractures are highly prevalent in elderly Hakka women, with age emerging as the most consistent determinant of bone loss and fracture risk. Body weight positively influences hip BMD, while a BMI of approximately 27 appears to confer the lowest fracture risk. These findings highlight the importance of ethnic-specific data in fracture risk stratification and support the role of maintaining adequate body weight as a modifiable factor. Early identification of high-risk individuals and tailored prevention strategies are essential in aged populations to reduce the burden of osteoporotic fractures.

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EFFECTS OF A MULTICOMPONENT INTEGRATED CARE ON MUSCLE MASS IN COMMUNITY-DWELLING OLDER ADULTS WITH OSTEOPOROSIS: A SUB-ANALYSIS OF A RANDOMIZED CONTROLLED TRIAL

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Objective: This study aimed to assess the effects of multicomponent integrated care on muscle mass in community-dwelling older adults with osteoporosis.

Methods: This sub-analysis of the randomized controlled HOPE trial in Taiwan included community-dwelling adults aged ≥50 years with osteoporosis. Participants were randomized into three groups, all maintaining their routine community activities with varying levels of additional interventions: UC (usual care, n=124): no additional intervention (control). OC (osteoporosis care, n=123): osteoporosis treatment per clinical guidelines when indicated. MIC (multicomponent integrated care, n=95): comprehensive care including osteoporosis treatment (when indicated), sarcopenia management, pharmaceutical care, exercise training, and nutritional support. Exercise program consisted of weekly 1-hour sessions for three months in the 1st year, escalating to twice-weekly 1-hour sessions for six months in the 2nd year. Skeletal muscle index (SMI) was measured by bioelectrical impedance analysis (BIA) at baseline, 1-year, and 2-years. GEE assessed longitudinal changes, and ANOVA compared percentage changes among groups.

Results: A total of 342 participants (300 females and 42 males; mean age 74.76 ± 8.46 years) were included. After the 2-year intervention, significant differential SMI trajectories were observed in females (time*group interaction, p=0.038) but not in males (p=0.522). Among females, the percentage changes in SMI across the three groups did not differ significantly over the full two years (UC, −0.27±6.85; OC, 0.66±4.98; MIC, 1.00±9.22; p=0.418). However, analysis of the 2nd year interval revealed significant group differences (p=0.017), with the MIC group (increase of 1.11%) showing greater improvement compared with the UC group (decrease of 1.20%, p=0.026). No statistically significant difference was observed between the OC group (increase of 0.56%) and the UC group (p=0.085).

Conclusion: The findings suggest that the MIC is effective in attenuating muscle loss among community-dwelling older adults with osteoporosis. Notably, the beneficial effects were more pronounced when participants increased their weekly exercise frequency, highlighting the importance of sustained physical activity in optimizing intervention outcomes.

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PERIODONTITIS INDUCES SKELETAL MUSCLE ATROPHY THROUGH ACTIVIN A SECRETION

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Objective: To identify periodontitis-derived factors that negatively affect muscle and bone tissues.

Material and Methods: Using a ligature-induced periodontitis model in mice, we evaluated the impact of periodontitis on the musculoskeletal system with dual-energy X-ray absorptiometry, micro-CT, muscle weight measurements, and histological analysis.

Results: We found that fat mass and food intake remained unchanged in mice with periodontitis, but confirmed systemic reductions in both muscle and bone mass. This led us to hypothesize that certain proteins might be secreted systemically during periodontitis. Bulk RNA-seq and RT-qPCR analyses revealed seven highly expressed secreted genes in gingiva affected by periodontitis, with a particularly notable elevation in the expression of the *Inhba* gene, which encodes activin A, a well-documented inducer of muscle atrophy. Indeed, serum levels of activin A were significantly increased in mice with periodontitis, suggesting that activin A expressed in periodontitis-affected gingiva may induce systemic muscle atrophy. RNA FISH and scRNA-seq analyses further demonstrated that in periodontitis, gingival fibroblasts and epithelial cells undergo marked proliferation and upregulate *Inhba* expression with the infiltration of *Inhba*-expressing myeloid cells into the gingiva. Similar patterns of *INHBA* upregulation in gingiva and elevated serum activin A in humans were confirmed by scRNA-seq and ELISA, respectively, implying that activin A-mediated muscle atrophy in periodontitis may also occur in humans. To counteract muscle atrophy associated with activin A in periodontitis, we locally administered si*Inhba* into periodontitis-affected gingiva. Although si*Inhba* injection did not prevent the progression of periodontitis, it significantly reduced serum activin A levels and increased muscle weight and fiber size compared to siCtrl injection.

Conclusion: Our findings confirm the detrimental impact of periodontitis on the musculoskeletal system and identify activin A as a key mediator of muscle atrophy, suggesting it as a therapeutic target.

This work was supported by the National Research Foundation of Korea (NRF) grants (RS-2024-00336924 and RS-2025-02214577).

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N-BUTANOL FRACTION OF THE FRUIT OF LIGUSTRUM LUCIDUM AIT. BENEFITS ON SKELETAL MUSCLE OF AGEING OVARIECTOMIZED MICE AND RATS BY ALLEVIATING SENESCENCE-RELATED EVENTS

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Objective: Fructus Ligustri Lucidi (FLL, the fruit of *Ligustrum lucidum* Ait) is used in traditional Chinese medicine for treating aging-related symptoms. The decline of circulating estrogen leads to a predisposition to musculoskeletal disorders such as sarcopenia. This study aimed to explore the regulations of the n-butanol phenol glycosides-enriched fraction of FLL on muscular function and senescence-relevant biological events in skeletal muscle.

Material and Methods: The naturally ageing rats and the D-gal-evoked ageing mice, both of which underwent bilateral ovariectomy, were orally administered by intragastric gavage with the n-butanol fraction of FLL for 8 weeks. Muscular functions were determined by grip strength test and weight-loaded swimming test. The frozen sections of mice gastrocnemius and rats tibialis anterior were applied for types of staining. The senescence-associated hallmarks, the (pro)fibrotic factors, and the components of renin-angiotensin system (RAS) as well as the insulin signaling, were detected in serum and muscle by ELISA, PCR, and immunoblotting.

Results: The FLL fraction dose-dependently elevated muscle mass, improved muscle strength, and augmented cross-sectional area of gastrocnemius fibers, furthermore, it reversed the changes in expression of myogenic regulatory factors, inhibited senescence-associated secretory phenotypes and protein expression of senescent hallmarks, repressed the over-activity of muscular RAS demonstrated by the down-regulation of renin and Ang II, as well as reduced fibrotic area and protein expression of type I and III collagens in gastrocnemius. Moreover, the abnormal alterations in protein expression during insulin resistance were improved in muscle. The *in vivo* study in 20-months-old ovariectomized rats confirmed the benefits of this fraction on muscle mass and myofiber area, and the inhibitory effects on the accumulation of SA-ß-gal and collagen molecules and on the enhancement of muscle myostatin level and RAS activity, moreover, it promoted the distribution percentage of type II myofibers in tibialis anterior.

Conclusion: The n-butanol phenol glycosides-enriched fraction of FLL would be a potential source for novel and/or lead drugs in treatment of muscle atrophy and sarcopenia in aged women.

Acknowledgments: This work was supported in part by Shanghai Eastern Talents Program (2024) and Cangzhou Leading Talent Program of Science and Technology (2024).

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RESEARCH PROGRESS OF DNA METHYLATION IN OSTEONECROSIS OF THE FEMORAL HEAD

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DNA methylation, maintenance, and demethylation are essential for maintaining normal physiological functions. Recent studies have revealed that DNA methylation plays a crucial role in the progression of osteonecrosis of the femoral head. DNA methylation regulates the differentiation direction of bone marrow mesenchymal stem cells, affects angiogenesis, and is involved in the proliferation and apoptosis of osteocytes, holding significant potential for early diagnosis and treatment of the disease. This paper introduces the concept and process of DNA methylation, with an emphasis on its molecular mechanisms in osteonecrosis of the femoral head. Furthermore, we propose that modulating different states of DNA methylation, such as inhibiting the function of DNA methyltransferases to induce DNA demethylation, could impact the disease progression of osteonecrosis of the femoral head, offering new insights for its treatment.

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MECHANISMS AND INTERVENTION OF CCL3⁺ MACROPHAGE POLARIZATION IN BISPHOSPHONATE-ASSOCIATED FRACTURE NONUNION

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Objectives: Bisphosphonates (BPs) are widely used in the treatment of osteoporosis; however, long-term exposure has been linked to fracture nonunion in some patients. The underlying mechanisms remain unclear. This study aimed to investigate the relationship between prolonged BP use and fracture healing outcomes using large-scale population data, multi-omics approaches, and experimental models, and to explore novel targeted intervention strategies.

Material and Methods: We analyzed UK Biobank data with logistic regression and restricted cubic spline models to relate BP exposure to fracture outcomes. UKB–Olink proteomics and bone marrow single-cell RNA-seq identified differential proteins and cellular sources. In vitro, RAW264.7 cells were exposed to alendronate (ALN) to assess AP-1 activity, CCL3 chromatin accessibility and M1 marker expression; AP-1 inhibition was tested. A rat model of chronic ALN exposure with standardized femoral fracture assessed serum CCL3, radiographic healing and histology; M1-ACCH was applied at fracture sites.

Results: Continuous BP use reduced fracture incidence (HR = 0.81) but longer duration independently increased nonunion risk (HR = 1.08); restricted cubic spline analysis identified 5.9 years as a threshold. Proteomics and PPI analyses nominated CCL3 as a hub; single-cell data localized CCL3–CCR1 signaling to monocyte–macrophage populations with elevated AP-1 activity and M1 markers in nonunion tissue. ALN increased AP-1 activation, enhanced CCL3 promoter accessibility and transcription, and promoted M1 polarization; AP-1 knockdown reversed these effects. Serum CCL3 rose with ALN exposure and correlated with delayed healing. M1-ACCH accelerated fracture union and improved bone mass in ALN-treated rats.**Conclusion(s):** Prolonged BP therapy (>5.9 years) is an independent risk factor for fracture nonunion mediated by AP-1–driven CCL3 upregulation and aberrant CCL3–CCR1 signaling that promotes M1 macrophage polarization. Serum CCL3 combined with treatment duration may improve risk stratification. M1-ACCH is a promising targeted therapy for BP-associated nonunion and warrants prospective clinical evaluation.

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EVALUATION OF THE COST-EFFECTIVENESS OF FRAX®-BASED HIP FRACTURE INTERVENTION THRESHOLDS FOR OSTEOPOROSIS MANAGEMENT IN MAINLAND CHINA

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Objective: Population aging has significantly increased the burden of osteoporosis in mainland China. This analysis aims to establish FRAX®-based fracture risk thresholds for cost-effective osteoporosis intervention in high-risk patients.

Material and Methods: A previously validated Markov microsimulation model was used to estimate the cost-effectiveness of guideline-recommended first-line treatments for osteoporosis (alendronate, zoledronate, denosumab) compared with no treatment in mainland China. To establish appropriate intervention thresholds, FRAX®-based intervention cost-effectiveness thresholds (cost-effectiveness approach) and the cost-effectiveness of osteoporosis interventions in subjects with prior fragility fractures and no other risk factors (translational approach) were calculated using the Chinese FRAX® model. Direct medical costs (2023 US dollars), quality-adjusted life years (QALYs) were estimated. The primary outcome was the incremental cost-effectiveness ratio (ICER).

Results: At different starting ages, denosumab consistently dominated other strategies and was cost-effective in people aged 70 years and older. This study supports a 10-year absolute probability of hip fracture of 0.98% for women and 0.64% for men as a cost-effective threshold for osteoporosis treatment in mainland China. Using the translational approach, denosumab was cost-effective for over the age 55 years in women and 50 in men with a history of fracture. The latter approach results in a significant underutilization of the potential of current cost-effective fracture prevention interventions.

Conclusion: In mainland China, at the age-dependent FRAX® intervention threshold, denosumab is economically beneficial for people over 70 years old. Using FRAX®-based hip fracture thresholds (≥0.98% for women, ≥0.64% for men) promotes cost-effective osteoporosis management, enabling targeted treatment allocation.

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Disclosure: Lin Tian, Shu-Ying Liu, Jing Li, Lin-Ke Shi, Xu-Hui Wu, Qin-Yi Wang, Chuo Luo, Zhi-Feng Sheng declare that they have no conflict of interest.

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MANAGEMENT OF FALLS AND FRAGILITY FRACTURES FOR OLDER ADULTS IN A VIRTUAL EMERGENCY DEPARTMENT: A RETROSPECTIVE, POPULATION-BASED COHORT STUDY

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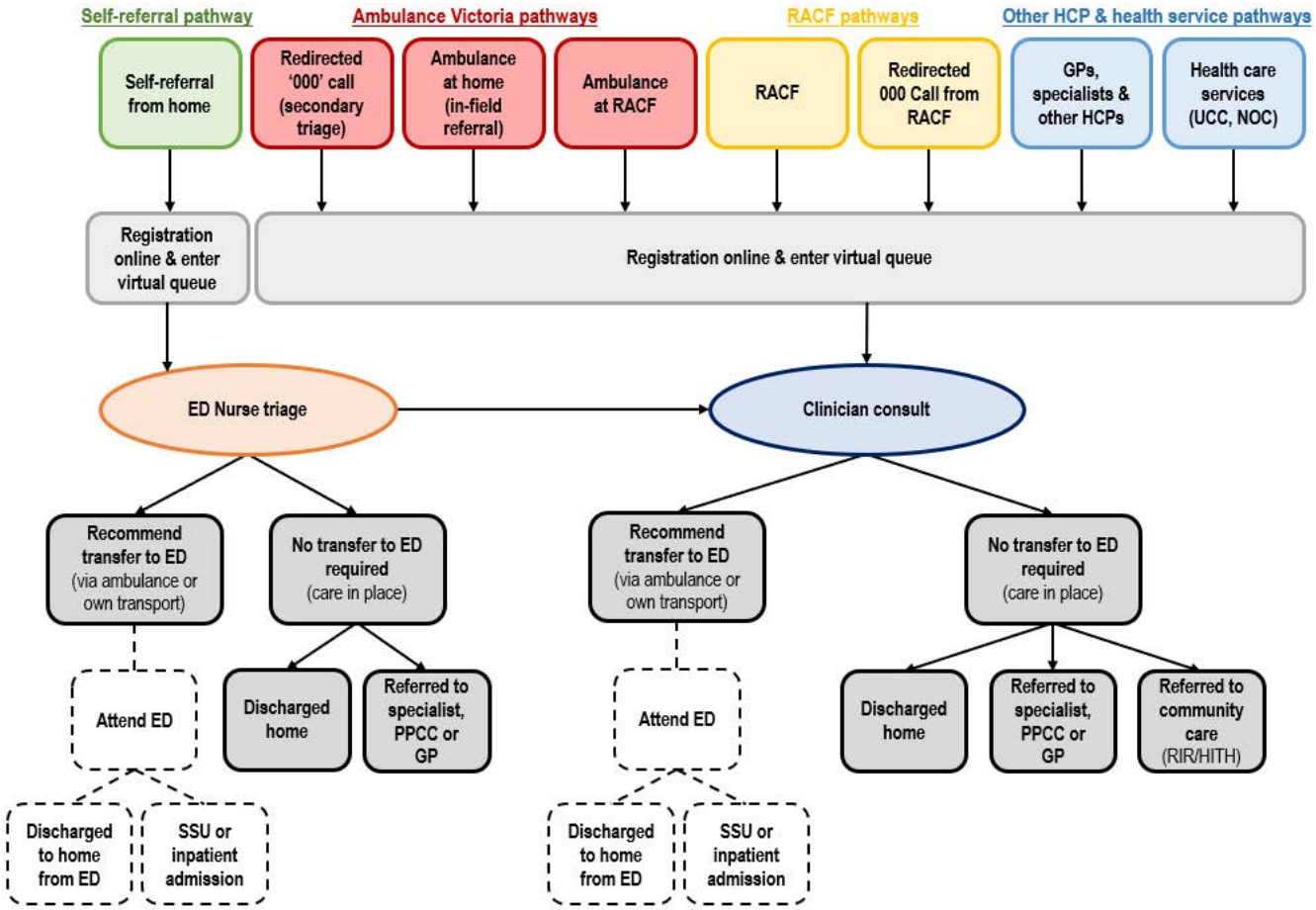
Objectives: Embedding digital health technologies into health care is now a global priority to meet care demands of our healthcare systems. This study explored whether a virtual emergency department is associated with a reduction in hospital transfers from older patients following a fall or fracture.

Materials and methods: The Victorian Virtual Emergency Department (VVED) was launched in October 2020 to deliver emergency specialist telehealth consultations to patients in the Northern Hospital's catchment area (Figure 1). Since expanding statewide in February 2022, the VVED has consulted with more than 600,000 patients across Victoria (currently averaging >800 daily presentations making it the busiest ED in the world). Data was retrospectively obtained from the VVED administrative dataset for all residential aged care patients aged >65 years who had a discharge diagnosis code of a 'fracture', 'broken bone (excluding teeth)' or 'fall' between July 2022-June 2024. Only fractures at major osteoporotic fracture sites were included in the study – hip, vertebrae, wrist or humerus. Descriptive and multivariable logistic analyses were performed.

Results: There were 1699 VVED presentations related to falls (n=1325) or fractures (n=374) during the study period (mean age: 86.8 years; 59% female; 86% born in Australia). Overall, only 364 patients were advised to transfer to a hospital, translating to a 79% diversion rate from physical ED. Patients with fracture were almost 5 times more likely to be transferred to hospital compared to those with a fall (OR=4.91; 95% CI: 3.75-5.59; p<0.001). Only 1 patient (<0.5%) died within 30 days of their VVED presentation, however this was related to cardiac disease.

Conclusions: Approximately 75%-90% of aged care patients or older adults who suffer a fall or fall-related fracture are transferred to hospital (in line with Australian clinical practice guidelines). This was reduced by over 50% in our study. The VVED model of care has reformed healthcare delivery in Australia by offering a secure, innovative, and convenient alternative to traditional emergency care that benefits both patient outcomes and healthcare resource allocation.



ED=Emergency Department; GP=General Practitioner; HCP=Health Care Provider; HITH=Hospital in the Home (including Palliative Care services); NOC=Nurse on Call; PPPC=Priority Primary Care Center; RACF=Residential Aged Care Facility; RIR=Residential In-reach Team; SSU=Short Stay Unit; UCC=Urgent Care Center

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ASSOCIATIONS OF GAIT SPEED, GRIP STRENGTH, DEPRESSIVE SYMPTOMS, AND THEIR COMBINATIONS WITH FRACTURE RISK IN OLDER ADULTS

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Background: Fractures impose a significant burden on older adults and may lead to early mortality. This study examined the individual and combined associations of slow gait speed, weak grip strength, and depressive symptoms with the risk of fractures in a large cohort of community-dwelling older Australians.

Methods: Participants aged ≥70 years from the ASPirin in Reducing Events in the Elderly (ASPREE) trial were included. Gait speed was assessed by timing a 3-meter walk at the usual pace. Grip strength was measured using a handheld dynamometer and recorded in kilogram force. Depressive symptoms were evaluated using the 10-item scale developed by the Centre for Epidemiologic Studies. Fracture data were obtained from hospital records, medical imaging, and death certificates. Sub-distribution hazard ratios (sHR) and 95% confidence intervals (CI) were estimated using the Fine–Gray model, accounting for death as a competing risk.

Results: A total of 16,357 participants were included in the final analysis. The incidence rates of any fracture and major osteoporotic fractures (MOF) were 23.6 and 9.7 per 1,000 person-years, respectively. The sHR for any fractures was 17% higher among participants with slow gait (sHR=1.17; 95%CI: 1.04-1.31) and 23% higher among those with depressive symptoms (1.23; 95%CI: 1.01-1.51), compared to those without these conditions. Weak grip was not significantly associated with fracture risk. The co-occurrence of slow gait and weak grip was associated with a 23% higher risk of any fracture (sHR=1.23; 95%CI: 1.04-1.46). The combination of slow gait and depressive symptoms was associated with a 46% higher risk of any fracture and a 65% higher risk of MOF (sHR=1.46; 95%CI: 1.06-2.01 and 1.65; 95%CI: 1.03-12.63, respectively). Weak grip combined with depressive symptoms was associated with a 47% higher risk of any fracture and a 58% higher risk of MOF (sHR=1.47; 95%CI: 1.08-2.00 and 1.58; 95%CI: 1.01-12.48, respectively). These associations were strong among male participants and those with diabetes.

Conclusions: The combination of slow gait with either weak grip or depressive symptoms was more strongly associated with fracture risk than each factor alone, highlighting the importance of incorporating both physical function and mental health assessments in clinical evaluations of older adults.

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INTEGRATING GENETIC AND CLINICAL RISK FACTORS IN OSTEOPOROSIS: INSIGHTS FROM A NEXT-GENERATION SEQUENCING APPROACH

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Osteoporosis (OP) remains a major global health challenge, leading to substantial morbidity, mortality, and healthcare costs. Current clinical risk assessment tools and traditional genetic markers often fail to provide reliable individualized predictions. With the advent of Next-Generation Sequencing (NGS), it is now possible to comprehensively analyze multiple genetic variants simultaneously at high resolution. This is the first comprehensive population-based study in Eastern Europe aiming to systematically investigate the association of a broad panel of bone metabolism-related genes with disease risk.

Material and Methods: The study cohort included 456 individuals recruited at the 1st Minsk City Hospital (Belarus): 251 OP patients and 205 controls. DNA from peripheral blood was subjected to targeted sequencing of 68 genes implicated in bone metabolism using the Illumina platform. Benjamini-Hochberg's multiple testing correction was applied.

Results: A total of 1,238 single nucleotide variants (SNVs) were identified. Adjusted statistical analysis revealed significant associations between osteoporosis risk and multiple variants. Among established risk loci, the rs1800012 T allele in *COL1A1* was associated with a 1.8-fold increased risk (p = 0.002), while *VDR* rs731236 correlated with reduced BMD (p = 0.005). Novel associations were also identified, including *RANKL* rs9533156 G (increased susceptibility, p = 0.01), *OPG* rs2073617 T (protective effect, p = 0.004), *SPP1* rs4754 A (decreased BMD, p = 0.003), *ESR1* rs2234693 C (increased risk, p = 0.007), and *RUNX2* rs59983488 T (impaired bone formation, p = 0.002). Several variants showed population-specific frequencies distinct from those reported in European cohorts, highlighting the uniqueness of the Belarusian dataset. By integrating genetic and clinical factors, we have laid the groundwork for a polygenic risk prediction model *(Figure)*, indicating that the combined burden of multiple variants yielded a total OR of 4.2, underscoring the cumulative impact of genetic predisposition.

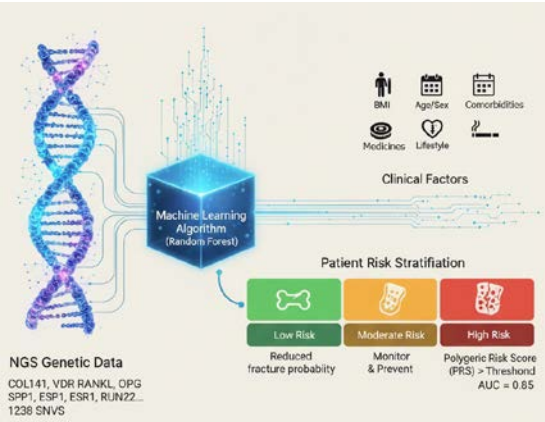

Figure: A predictive model integrating genetic and clinical data for osteoporosis risk stratification

Conclusion: This study demonstrates the power of NGS to uncover both known and novel risk alleles in a regional cohort. Our findings provide the basis for the development of a national genetic screening panel.

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Abstracts

SY1

UTILIZING DATABASE-DRIVEN KPIS TO STANDARDIZE HEALTHCARE QUALITY IN FRAGILITY FRACTURE MANAGEMENT

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Overview: Lessons learned from international experiences by publishing KPI results for Hip and Non-Hip on public platforms and databases.

Abstract: As populations age globally, fragility fractures, particularly hip fractures, present an increasing burden on healthcare systems, especially in "super-ageing societies" such as Japan. This presentation will explore the role of database-driven Key Performance Indicators (KPIs) in standardizing healthcare quality in fragility fracture management, highlighting lessons learned from initiatives in Australia, Ireland, New Zealand, and the UK. Drawing from these countries' experiences, the talk will focus on the implementation and impact of Fracture Liaison Services (FLS) aimed at reducing secondary fractures through comprehensive patient assessments, adherence to clinical guidelines for the management of osteoporosis, and proactive falls prevention strategies. A key part of the discussion will include New Zealand's national quality improvement program, where FLS teams participate in the Australian and New Zealand Fragility Fracture Registry (ANZFFR). This registry facilitates real-time benchmarking of care, enabling FLS teams to continuously track and enhance performance. The talk will also cover the experience in Australia, Ireland, and the UK, where similar registry initiatives and KPIs have driven improvements in fracture prevention and patient outcomes. The publication of KPI results for hip and non-hip fractures on public platforms fosters transparency, drives accountability, and accelerates the adoption of best practices. The presentation will underscore the value of international collaboration and data-driven strategies in enhancing fracture care and achieving global standards.

Paul Mitchell: Biography

Paul Mitchell is an Adjunct Professor in the School of Medicine at the University of Notre Dame Australia. He is also a member of the Executive Committee of the Asia Pacific Consortium on Osteoporosis and a Strategic Advisor to the Board and Management of Osteoporosis New Zealand.

Since 2005, Paul has developed programmes to improve fragility fracture care and prevention throughout the world. This includes initiatives at the global, regional and national level to implement the Fracture Liaison Service (FLS) model of care. Paul has published and presented extensively on implementation of FLS and was a co-author of the 2012 International Osteoporosis Foundation (IOF) World Osteoporosis Day Report on the IOF Capture the Fracture® Programme.

Paul serves on the Editorial Boards of *Osteoporosis International* and *Archives of Osteoporosis* and contributes as a peer reviewer to several esteemed journals, including *Public Library of Science One* and *BMJ Open Quality*.

In 2016, he was awarded the IOF President's Award in recognition of his contribution to the global activities of IOF. In 2024, Paul was a recipient of a Fragility Fracture Network (FFN) Lifetime Achievement Award.

SY2

ADVANCING SECONDARY FRAGILITY FRACTURE PREVENTION IN JAPAN: EXPERIENCE FROM THE NATIONAL HIP FRACTURE DATABASE AND CLINICAL STANDARD UPDATES

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The Fragility Fracture Network Japan Hip Fracture Database, is a registry system for patients with proximal femoral fractures launched in 2017, uses the minimum common denominator database (MCD) in accordance with international standards. This registry was designated as a facility standard for the “Emergency Prosthesis Insertion Premium/Emergency Reduction and Fixation Premium” and the “Secondary Fracture Prevention and Continuous Management Fee” in the 2022 medical fee revision. As of July 2025, 660 hospitals nationwide participate, with the database accounting for 50,000 cases per year. The results of 21,167 cases registered between January 1 and December 31, 2022 were analysed. The median age at injury was 86 years, with 30.3% being 90 years or older. 77.4% were female and 22.6% were male. Surgery was performed within 48 hours of injury in 48.5% of cases. The mean length of hospital stay in the group operated on within 48 hours was 26.8 days, compared with 29.6 days in those operated on more than 48 hours. The one-year mortality rate was 13.1% in the group operated on within 48 hours and 15.3% in those operated on more than 48 hours. The early surgery group showed a shorter length of hospital stay and improved survival. The osteoporosis treatment rate was 72.7% at the time of discharge and 68.8% one year later. The marked increase in osteoporosis treatment suggests the impact of the reimbursement revision. While the rate of early surgery is improving, there is still variation between facilities. Database-driven policy initiatives have enhanced the quality of clinical practice, and future efforts should focus on generating cost-effectiveness evidence. The FFN Japan, together with the Japan Osteoporosis Society, developed the "Fracture Liaison Service Clinical Standard (FLS-CS)" in 2019 promote efficient and effective secondary fracture prevention., and the FLS scheme has become widely adopted. To further improve osteoporosis treatment rates and continuation, revisions have been made to the FLS-CS, including the introduction of key performance indicators (KPIs) to further enhance its effectiveness. As the new CS becomes more widely implemented, it is expected to clarify issues at each medical institution and drive continuous improvement.

SY3

CURRENT STATUS AND FUTURE PROSPECTS OF HEALTHCARE DIGITAL TRANSFORMATION (DX) IN JAPAN

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[1]Director, Health Insurance Data Planning Office, Division for Health Care and Long-term Care Integration, Health Insurance Bureau, Ministry of Health, Labour and Welfare (Japan)

Japan is facing the profound challenges of an ageing and declining population. To sustain universal health coverage while ensuring an efficient and high-quality healthcare delivery system under these circumstances, the Ministry of Health, Labour and Welfare (MHLW) is promoting Healthcare Digital Transformation (DX) as a key national policy.

As a central pillar of this initiative, Japan has introduced an online eligibility verification system—an advanced mechanism for confirming public health insurance status—across nearly all medical institutions and pharmacies nationwide, thereby establishing a solid digital foundation for healthcare services.

In parallel, the government is promoting the use of the "My Number Card," an IC-chip-equipped national ID card held by approximately 80% of citizens, as a health insurance card following strict identity verification. With patients' consent, this system allows medical institutions to securely access past clinical and prescription records derived from the national database of health insurance claims, enabling more personalized and data-driven care.

Furthermore, the MHLW is advancing a range of initiatives to enhance both patient convenience and quality of care, including the rollout of electronic prescriptions to prevent duplicate medication, services that enable the sharing of electronic medical record data among healthcare providers, and new systems that allow emergency responders and hospitals to access essential medical information during emergencies.

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