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AN AI-AGENT FOR PERSONALIZED TIME TO REPEAT BONE MINERAL DENSITY MEASUREMENT

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Background: The optimal time interval for repeat bone mineral density (BMD) measurements is currently unclear, contributing to the global crisis of osteoporosis under-management. We developed a predictive algorithm, called *"Time to Osteoporosis"* model, to personalise the time interval to repeat BMD measurements for an individual with a specific risk profile. The model was integrated into **BONEcheckGPT**, a conversational platform powered by an AI agent to facilitate its implications in clinical practice.
Methods: We used online data of participants from the Osteoporotic Fracture in Men Study in the USA (MrOS) and the Study of Osteoporotic Fractures (SOF) who had 2+ BMD measurements. The current analysis included 5298 men and 5169 women with an average age of 73.5 (±5.8) and 73.0 (±4.7) years, respectively. BMD was measured using Hologic DXA (company, country); and osteoporosis was defined as a T-score $\leq$ -2.5. Fractures were radiologically confirmed. First, we employed a multistate Markov-Cox model to quantify the effects of the predictors on the transition risks based on cumulative transition probability of events to either osteoporosis or fragility fractures, accounting for their complex interrelationships, confounding effects and a competing risk of death. A personalised *"Time to Osteoporosis"* was estimated from the cumulative transition probability functions derived from the model. The "Time to Repeat BMD Measurement" was defined as the time when the predicted risk exceeded a clinical threshold, enabling follow-up before high-risk status. This estimate was then incorporated into BONEcheckGPT by embedding the time-to-event algorithm within the AI agent's internal decision logic. The AI agent autonomously extracts relevant input features from user prompts, processes them through the underlying prediction model.
Results: During a median follow-up of 14.1 years (IQR: 8.9–18.9), 3118 (29.8%) participants developed osteoporosis or sustained fragility fractures, and 4360 (41.7%) died. The algorithm for predicting the optimal time to repeat BMD measurements for each individual's risk profile included sex, age, baseline BMD, history of prior fracture after age 50, and history of falls within the past 12 months. (Figure). For example, a 70-year-old woman with a T-score of −2.2 and one fall within the last year was estimated to have a 23.6% risk of developing osteoporosis or experiencing a fragility fracture within 2 years. Her personalised time to repeat BMD measurement would therefore be 1.3 years. In clinical practice, doctors and patients can easily estimate a personalised time to repeat BMD using BONEcheckGPT [https://bonecheck.org/ChatGPT] with the corresponding demo available here [https://youtu.be/4il9pH-4rO4].
Conclusions: We developed an AI agent for predicting the risk of osteoporosis and the optimal time to repeat BMD measurements. The tool can empower informed decision-making process and improve doctor-patient risk communication, leading to improved patient outcomes associated with osteoporosis.
Keywords: Osteoporosis, AI agent, Multistate Modelling, Time to Osteoporosis
Supplementation:

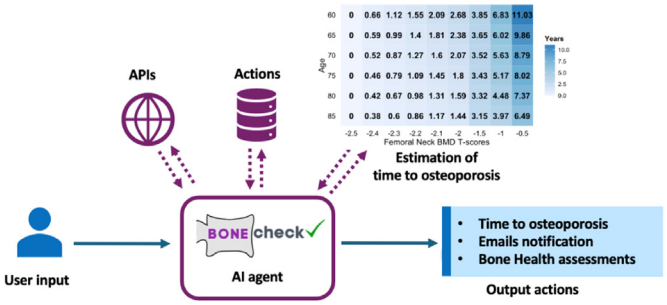

Figure 1. AI agent for time to osteoporosis

PHASE ANGLE DERIVED FROM BIOELECTRICAL IMPEDANCE AS A PREDICTIVE INDICATOR OF SARCOPENIA IN OLDER ADULTS WITH DIABETES

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Background: Sarcopenia is highly prevalent among individuals with type 2 diabetes mellitus (T2DM). The phase angle (PhA), derived from bioelectrical impedance analysis (BIA), has emerged as a potential marker for muscle integrity. However, limited research has evaluated its predictive value for sarcopenia in diabetic populations.
Methods: A single-center, cross-sectional study was conducted at Phramongkutklao Hospital in Thailand from December 2023 to November 2024. A total of 390 patients aged 60 years and older with confirmed T2DM were enrolled. Sarcopenia was diagnosed using the Asian Working Group for Sarcopenia (AWGS) 2019 criteria. PhA was measured via BIA. Receiver operating characteristic (ROC) curve analysis was conducted to determine optimal PhA cutoff values using Youden's index.
Results: The overall prevalence of sarcopenia was 14.4%. The mean PhA among all participants was 4.26 ± 0.71°, with significantly lower values in sarcopenic individuals (3.61 ± 0.69° vs. 4.37 ± 0.65°, $P < 0.001$). In multivariable logistic regression, lower PhA was independently associated with increased risk of sarcopenia (males: OR = 3.83, 95% CI: 1.74–8.42, $P = 0.001$; females: OR = 7.02, 95% CI: 2.66–18.48, $P < 0.001$). ROC analysis indicated that PhA was a strong predictor of sarcopenia (AUC = 0.798, 95% CI: 0.730–0.867, $P < 0.001$). Optimal PhA cutoffs were 4.3° for males (AUC: 0.809, 95% CI: 0.706–0.912) and 3.6° for females (AUC: 0.790, 95% CI: 0.691–0.889).
Conclusions: PhA is a valuable predictive measure for sarcopenia in older adults with T2DM. Sex-specific cutoff values improve screening accuracy. Incorporating PhA into routine clinical assessments may facilitate the early detection and implementation of intervention strategies for sarcopenia in