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EDITORIAL
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ROLE OF ARTIFICIAL INTELLIGENCE IN FRACTURE LIAISON SERVICE SETTING

ULOGA VEŠTAČKE INTELIGENCIJE U FORMIRANJU SLUŽBE ZA PREVENCIJU SEKUNDARNIH PRELOMA

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Effective secondary fracture prevention reduces the risk of further fragility fractures, delivering benefits for patients, their families, caregivers, healthcare systems, social care, and society at large [1]. The importance of screening adults aged over 50 who present to healthcare systems with a fragility fracture to diagnose and manage osteoporosis is increasingly recognised as a clinical, political, and societal priority. Secondary fracture prevention also aligns with the UN Decade of Healthy Ageing's objectives to combat ageism, support bone health, and foster age-friendly communities, integrated care, and long-term care systems [2]. The fracture liaison service (FLS) model of care, developed to deliver systematic secondary fracture prevention, has been demonstrated to be both clinically and cost-effective [3]. Organisational and patient-level indicators have been established to guide local implementation and assess FLS delivery for service improvement [4,5]. Evidence-based risk assessment tools and osteoporosis therapies have also been developed, enabling the identification of adults at imminent fracture risk who may benefit from more potent treatments. Healthcare systems are now establishing local FLSs to deliver these expected benefits. However, a significant challenge to universal FLS coverage is the lack of workforce capacity and capability. Globally, there are insufficient numbers of medical staff, nurses, administrators, and other healthcare professionals available to address the needs of the many patients requiring secondary fracture prevention.

Digital solutions, such as artificial intelligence (AI), present a potential solution to this workforce challenge. IBM defines AI as the use of machine learning models to process medical data, offering healthcare professionals critical insights that improve health outcomes and patient experiences. AI models have already been developed within the field of bone health, with some being integrated into clinical workflows.

While AI models are likely to deliver on their performance expectations, ensuring that these benefits translate into tangible value for patients remains a challenge. This translation depends on the level of AI awareness among healthcare professionals. Despite AI being perceived as a technological innovation, its integration into clinical workflows requires a broad understanding among the clinical workforce. Medical professionals need to comprehend how AI operates, including its underlying assumptions, risks, and mitigation strategies. However, few healthcare professionals are currently trained in AI methodologies, a clear opportunity for the bone community to work together.

AI has the potential to enhance multiple stages of the FLS journey [6]. There is a critical need for FLSs to efficiently identify patients at very high fracture risk. AI can significantly improve the efficiency and effectiveness of identifying high-risk patients by utilising opportunistic vertebral fracture assessment via plain radiography, CT, or MRI scanning, as well as using medical coding data.

Once identified by the FLS, patients require comprehensive assessments involving questionnaires, DXA scans, and laboratory testing. The interaction between the FLS and the patient should be personalised, respecting the patient's health literacy, language preference, and social context. For example, most FLSs do not evaluate adherence to oral therapies for other long-term conditions when recommending osteoporosis treatments. Incorporating these aspects into assessments and treatment recommendations however, increases workforce demands. Current AI solutions can draft patient-clinician con-

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sultations. Future AI systems could interact with patients directly, using chatbots capable of communicating at the patient's language proficiency level and tailoring information to their literacy and education. These assessments could be conducted at a time and place convenient for the patient and caregiver, including weekends and outside traditional working hours.

AI systems could also integrate with patient calendars to schedule bone density scans or laboratory tests at mutually convenient times, ensuring high levels of participation. Algorithms could review the patient's medical history, beliefs, and reimbursement options, allowing flexible and reflective decision-making processes. Unlike current systems that often expect patients to make treatment decisions within the initial consultation, AI could enable consultations to occur over multiple interactions, providing patients with time to digest information and consult with trusted stakeholders.

AI-driven treatment recommendations would align with current regional and national guidelines, ensuring immediate updates to clinical practices and removing local unwarranted variations. AI could present benefits and risks in preferred formats, such as percentages, graphical interfaces, or personalised patient stories based on patient preferences. Initial AI systems would likely produce assessments and recommendations that require clinical confirmation by a human. Over time, AI models, trained on extensive datasets with feedback on outcomes in terms of adherence, re-fracture or unwanted events, could develop decision-making capabilities surpassing local, regional, or national expertise.

Beyond initial consultations, AI has the potential to support ongoing patient care. Current FLS systems often struggle to maintain patient contact at 16 and 52 weeks post-treatment initiation. AI could facilitate continuous engagement, offering tailored reminders for treatment adherence, trusted advice on managing concerns, and rapid responses to side effects. AI also presents opportunities to optimise the performance of FLS systems as a whole. By analysing data from other FLSs, AI could flag early variations with potential future impacts and share successful strategies from comparable services.

However, to maximise AI's benefits, the bone health community needs to upskill in AI processes. Key knowledge areas include AI training, implementation, monitoring, and post-market surveillance. Operationalising AI in healthcare requires addressing several considerations. These include understanding the parameters used to train AI models, recognising potential limitations and biases, and ensuring appropriate regulatory approvals, such as FDA or CE. Installing AI in a hospital involves a multidisciplinary process, including contractual agreements, IT infrastructure adaptations, and rigorous information governance (IG) assurance. IG processes ensure the safe and secure flow of patient-identifiable and non-identifiable data. Once procurement, IT approval, and IG assurance are secured, shadow testing using recent historical data is crucial. Shadow testing identifies any mismatches between training data and local data, involving patient representatives to ensure risks and benefits are thoroughly evaluated.

To realise value from AI, its insights must translate into changes in the patient journey, supported by appropriate resources. For instance, using AI to identify more vertebral fractures will increase the demand for FLS appointments, DXA scans, laboratory tests, and treatments. Services that fail to account for these downstream costs risk destabilising existing FLS systems.

Current AI models still have limitations, necessitating a human-in-the-loop approach. AI systems require clinical confirmation for identifying vertebral fractures, as radiologists often disagree on mild fractures or anomalies like Schmorl's nodes. Post-marketing surveillance of AI tools is critical to ensure consistent performance. For example, AI models must adapt to variations in imaging techniques, such as low-dose CT scans for lung cancer screening. Other surveillance options include parallel AI models can detect deviations from expected performance and flag areas for improvement.

Osteoporosis management has seen transformative innovations, from advanced therapies to diagnostic tools. AI represents the next phase and could address the mismatch between demand and capacity in bone health care. To realise AI's potential, the bone health community should embrace training in AI, sharing experience and expertise in local AI implementation and monitoring processes, thereby ensuring as many patients as possible benefit from these advancements.

References

1. Eisman JA, Bogoch ER, Dell R, Harrington JT, McKinney RE Jr, McLellan A, et al. Making the first fracture the last fracture: ASBMR task force report on secondary fracture prevention. J Bone Miner Res. 2012;27(10):2039-46.

2. Global Coalition of Aging. Your community's bone health: a playbook for age-friendly cities and communities [Internet]. 2024 [cited 2025 15 Jan]. Available from: https://globalcoalitiononaging.com/wp-content/uploads/2024/03/Age-Friendly-Bone-Health-Playbook.pdf

3. Pinedo-Villanueva R, Burn E, Maronga C, Cooper C, Javaid MK. Expected benefits and budget impact from a micro-

simulation model support the prioritization and implementation of fracture liaison services. J Bone Miner Res. 2023;38(4):499-511.

4. Akesson K, Marsh D, Mitchell PJ, McLellan AR, Stenmark J, Pierroz DD, et al. Capture the Fracture: a Best Practice Framework and global campaign to break the fragility fracture cycle. Osteoporos Int. 2013;24(8):2135-52.

5. Javaid MK, Sami A, Lems W, Mitchell P, Thomas T, Singer A, et al. A patient-level key performance indicator set to measure the effectiveness of fracture liaison services and guide quality improvement: a position paper of the IOF Capture the Fracture Working Group, National Osteoporosis Foundation and Fragility Fracture Network. Osteoporos Int. 2020;31(7):1193-204.

6. Gupta A, Maslen C, Vindlacheruvu M, Abel RL, Bhattacharya P, Bromiley PA, et al. Digital health interventions for osteoporosis and post-fragility fracture care. Ther Adv Musculoskelet Dis. 2022;14:1759720X221083523.

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