OPPORTUNISTIC DETECTION OF OSTEOPOROTIC VERTEBRAL FRAGILITY FRACTURES USING AI
A LITERATURE REVIEW OF SOCIETAL IMPACTS

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BACKGROUND

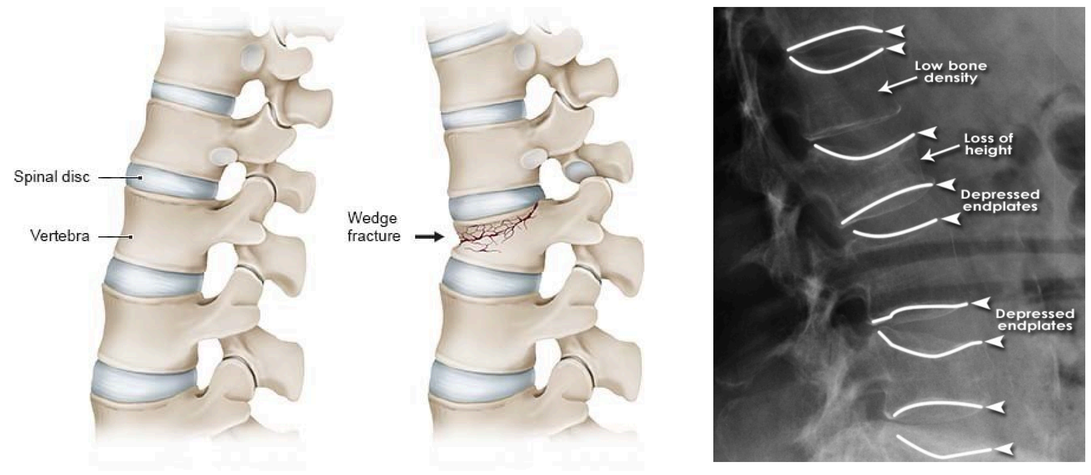
Vertebral fragility fractures (VFFs), a hallmark of osteoporosis, are a major global health concern associated with significant morbidity and mortality [1].

Early identification of VFFs enables timely osteoporosis assessment, treatment initiation and reduction in future fracture risk [2, 3]. Despite this, VFFs are chronically underreported with up to 70% of incidental VFFs on imaging missed [4].

Artificial intelligence (AI) offers a promising opportunity to address this gap by enabling systematic, opportunistic detection across existing imaging [2].

METHOD

A literature review was conducted to explore the societal impacts of AI-based opportunistic VFF detection.



RESULTS

A range of AI-based technologies for automated VFF detection have been developed. Early pilots indicate strong performance with sensitivity and specificity that varies among different models, but remains high across most studies [5, 6, 7]. This suggests AI models may improve accuracy and efficiency of diagnosing VFFs in clinical practice. It may also reduce reporting variation, particularly in regions without subspecialist radiologists, helping to narrow geographical inequalities in diagnostic quality and reach patients who may otherwise remain undiagnosed [2].

However, there is significant heterogeneity and study biases within different AI models. Models may be influenced by different variables such as imaging protocols and fracture severity, raising concerns about false positives and potential over investigations [5, 8]. Furthermore, there is limited transparency about characteristics of patient populations in training datasets in the clinical evidence, with concerns about underrepresentation of demographic groups including younger people, ethnic minorities, people with comorbidities, atypical morphology, or previous treatments [2]. Without rigorous external validation, these limitations may inadvertently reinforce existing inequalities [5, 9].

The impact on treatment and outcomes of osteoporosis patients have not been demonstrated yet due to lack of prospective studies. However, the value of AI-enabled VFF detection will depend on robust referral pathways and downstream fracture management services [2, 3, 10]. Increased detection rates may overwhelm referral pathways, which already face capacity and geographical variation [11]. Without proportional investment in follow-up services, increased detection may inadvertently exacerbate inequalities [2, 3]. Conversely, AI-derived data could illuminate the true unmet need and support equitable planning and expansion of fracture liaison services in underserved regions [2].

CONCLUSION

Opportunistic detection of VFFs using AI is potentially transformative for patients. The technology could significantly reduce the societal burden of osteoporosis by enabling proactive and effective case finding and instigate appropriate referral and treatment to prevent further fractures and associated morbidity and mortality.

However, it requires diverse training data sets, robust workflow integration, and significant investment in downstream care pathways to ensure safe, effective, and equitable deployment.

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