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Title: Economic evaluation of AI-based oral disease screening: a systematic review

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Abstract: Artificial intelligence (AI) has made a significant contribution to dentistry, particularly in improving screening and diagnostic accuracy. This systematic review assessed the cost-effectiveness and broader economic implications of incorporating AI into oral disease screening. **Methods** We included studies that conducted economic analyses and/or cost-effectiveness evaluations of AI-driven tools compared with conventional techniques for detecting oral diseases. We searched Cochrane Library, CINAHL, Embase, PubMed, Scopus, and Web of Science. The search strategy combined terms related to economic evaluation, artificial intelligence, and oral diseases. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and was registered in PROSPERO (CRD42024548039). Articles published up to January 12, 2025, were included. **Results** Of 334 records identified, four studies met the inclusion criteria - all these studies dealt with dental economic evaluations, and were conducted in the German dental care settings. All four evaluated AI-assisted detection of dental or proximal caries on bitewing radiographs. Across studies, AI generally improved diagnostic performance, particularly sensitivity. In one modelling study, a U-Net-based system achieved higher accuracy than dentists (0.80 vs. 0.71). Three model-based economic evaluations reported lower costs and greater tooth-retention outcomes with AI than with conventional assessment. Costs ranged from & euro;298 to & euro;378 for AI and from & euro;322 to & euro;419 for conventional care. Tooth retention ranged from 62.4 to 64.0 years with AI and from 60.4 to 62.0 years with conventional care. In contrast, the randomized trial found that AI-supported assessment increased sensitivity but was associated with more invasive treatment decisions. This resulted in similar costs (& euro;330 vs. & euro;330) and identical mean tooth retention (49 years) compared with standard assessment. **Overall**, the evidence suggests a potential economic benefit of AI in caries detection, but uncertainty remains under real-world treatment conditions. **Conclusions** AI-assisted screening may offer economic value in dental caries detection, particularly when improved lesion detection is linked to appropriate downstream management.



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