

REVIEW ARTICLE

Artificial intelligence in skin cancer diagnosis and prognosis: A comprehensive narrative review of current applications and future perspectives

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Abstract

Skin cancer is among the most prevalent malignancies worldwide, and early, accurate diagnosis is crucial for improving patient outcomes. Recent advances in artificial intelligence (AI), particularly machine learning and deep learning, have shown substantial potential to enhance skin cancer detection, classification, and prognostic assessment. This review provides a comprehensive synthesis of current AI-based approaches for melanoma and non-melanoma skin cancers, highlighting methodological innovations and clinical applications. Literature from 2015 to 2025 was screened from PubMed/MEDLINE, Scopus, IEEE Xplore, and ScienceDirect, focusing on peer-reviewed studies reporting AI-driven diagnostic, classification, or prognostic outcomes. Deep learning models, especially convolutional neural networks, demonstrated high diagnostic performance in image-based skin cancer detection, often comparable to experienced dermatologists. AI has also shown promise in lesion segmentation, risk stratification, and prognostic modeling. However, challenges remain, including class imbalance, underrepresentation of darker skin tones, limited external validation, algorithmic opacity, and integration into clinical workflows. To enable broader clinical adoption, future research should prioritize diverse multicenter datasets, explainable AI systems, multimodal data integration, and prospective clinical validation studies. Overall, AI technologies offer significant potential to improve the accuracy and efficiency of skin cancer diagnosis and prognosis, but their translation into routine dermatological practice requires careful attention to reliability, equity, and interpretability.

Keywords: Artificial intelligence; Machine learning; Deep learning; Skin cancer; Melanoma; Diagnosis; Prognosis; Dermatology