Augmented Intelligence in Dermatology: Reframing AI as a Collaborative Tool

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RECENT discussions at the American Academy of Dermatology (AAD) 2026 Annual Meeting have underscored a pivotal shift in how AI is framed within dermatology, moving away from replacement-based narratives toward a model of augmented intelligence (AuI) that supports clinician expertise. This congress feature highlights key evidence surrounding human–machine collaboration, AI in diagnosis, triage, and clinical decision support, and the broader implications of these tools for dermatologic practice. It explores ongoing challenges related to algorithmic bias, real-world validation, skin of color representation, and health equity, underscoring the need for dermatologists to actively guide the responsible integration of AI into patient care.

INTRODUCTION

The rapid advancement of AI in medicine has prompted both enthusiasm and apprehensions amongst clinicians. In dermatology, a specialty deep-rooted in visual pattern recognition, these developments carry particular significance. A critical distinction must be made between AI, autonomous machine-based decision making, and AuI, in which AI-driven tools are integrated into clinical practice to enhance, rather than replace, physician judgment. This reframing is not merely semantics. The AAD's position statement on AuI explicitly endorses AuI as a model where AI technologies work in 'harmony' with dermatologists to improve patient care,[1] and recent continuing medical education initiatives suggest this concept is already entering mainstream dermatologic education.

The practical applications of AuI in dermatology are already substantial, particularly in skin cancer detection, triage, and deep neural networks capable of supporting diagnosis across more than 100 skin disorders. Yet its evolution remains incomplete. Algorithmic bias remains a pressing concern, as models trained on lighter skin tones demonstrate reduced performance across diverse skin types. Thus, the goal of AuI extends beyond technological adoption to cultivating AI literacy among dermatologists, equipping them to critically evaluate, co-create, and implement these tools equitably.[2] Rather than signaling obsolescence, AuI positions dermatologists as active participants in shaping the responsible development of the technologies that will define the future of the specialty.

> **The goal of AuI extends beyond technological adoption to cultivating AI literacy among dermatologists**

EVIDENCE FOR HUMAN-MACHINE SYNERGY

The Performance Data

The case for AuI in dermatology rests not on promise alone, but rather on a growing body of evidence demonstrating the performance of clinician and algorithm compared to either alone. This 'human with machine' paradigm has been validated across multiple study designs, within clinical settings, and among levels of provider expertise.

One foundational study training a deep neural network algorithm on 220,680 clinical images demonstrated that AuI can support malignancy detection, treatment prediction, and multi-class disease classification for 134 skin conditions. With AI assistance, clinician sensitivity and specificity significantly improved for malignancy prediction, with high accuracy in narrowing to Top 5 differential diagnoses and modest gain in Top 1.[3] This underscores AuI's role in differential generation support rather than as an autonomous diagnostician. A RCT matching patients with concerning lesions to either AI-assisted or unaided diagnostic groups found significantly higher diagnostic accuracy with AI assistance. Greater benefit was observed among non-dermatology trainees, whereas improvements in dermatology residents were not statistically significant, and a decline in Top 1 accuracy for AI-assisted differentials was observed.[4]

A more compelling showcase of human-machine synergy comes from a prospective clinical study of dermatologists collaborating with a conventional neural network (CNN) in real-world melanoma screening. Strikingly, cooperating with the CNN, dermatologists achieved 100% sensitivity with melanoma detection with increased specificity, approaching the clinical ideal of minimizing missed melanomas while reducing unnecessary excisions. Dermatologists with less dermoscopy experience experienced the greatest benefit. However, limitations from small sample size, unmasked design, lack of acral and subungual lesions, and training on predominantly White European populations underscore the need for further studies among skin of color (SOC) and diverse lesions.[5]

Across the literature, AuI benefits vary by expertise level. One review found CNNs achieved the highest diagnostic accuracy among AI models, with support vector machines also performing strongly, particularly in melanoma detection. AI-assistance improved diagnostic accuracy among all clinicians, but generalists and trainees benefited more than experienced dermatologists. Narrow classification tasks outperformed broad melanoma detection across all skin types, informing how these tools should be best deployed.[6] Another meta-analysis similarly found AI sensitivity and specificity for melanoma comparable to dermatologists, with one review reporting non-inferior or superior performance relative to dermatologists and general practitioners. However, many studies were subject to selection bias and overrepresentation of malignant lesions, underscoring the gap between curated datasets and real-world clinical practice as a key barrier to clinical translation.[7]

THE QUINTUPLE AIM FRAMEWORK

The AAD's 2019 Position Statement on Augmented Artificial Intelligence established foundational principles for AI integration into dermatology.[1] In the years since, emerging evidence has begun to operationalize these principles across each of the Quintuple Aims: enhancing patient experience, improving population health, reducing costs, improving professional fulfillment, and increasing diversity, equity, and inclusivity. This framework provides a useful lens through which to evaluate the promise and limitations of AuI in dermatological practice.

Enhancing Patient Experience

AuI has the potential to transform the patient encounter through real-time diagnostic support, reduced wait times via optimized triage, and improved communication through visual explanations of diagnostic reasoning.[8] Consumer-directed AI applications may also improve access to dermatologic information and patient confidence in identifying concerns. However, risks include inaccurate predictions, anxiety, and unnecessary healthcare utilization, highlighting the need for these tools to complement rather than replace clinical evaluation.[9]

Improving Population Health

A compelling application of AuI lies in expanding access to dermatology expertise in underserved areas. Pediatric dermatology AI models remain limited, highlighting opportunities for decision support in complex cases with restricted subspecialty access and for improving triage in rural settings. Early applications are already being tested for diagnosis of facial infantile hemangiomas and X-linked hypohidrotic ectodermal dysplasia.[10] Applications to teledermatology, in-person visits, and dermatopathology could also facilitate earlier detection. However, real-world clinical validation is lacking, with persistent challenges including dataset bias, reduced generalizability across skin tones, and issues with interpretability.[11]

Reducing Costs

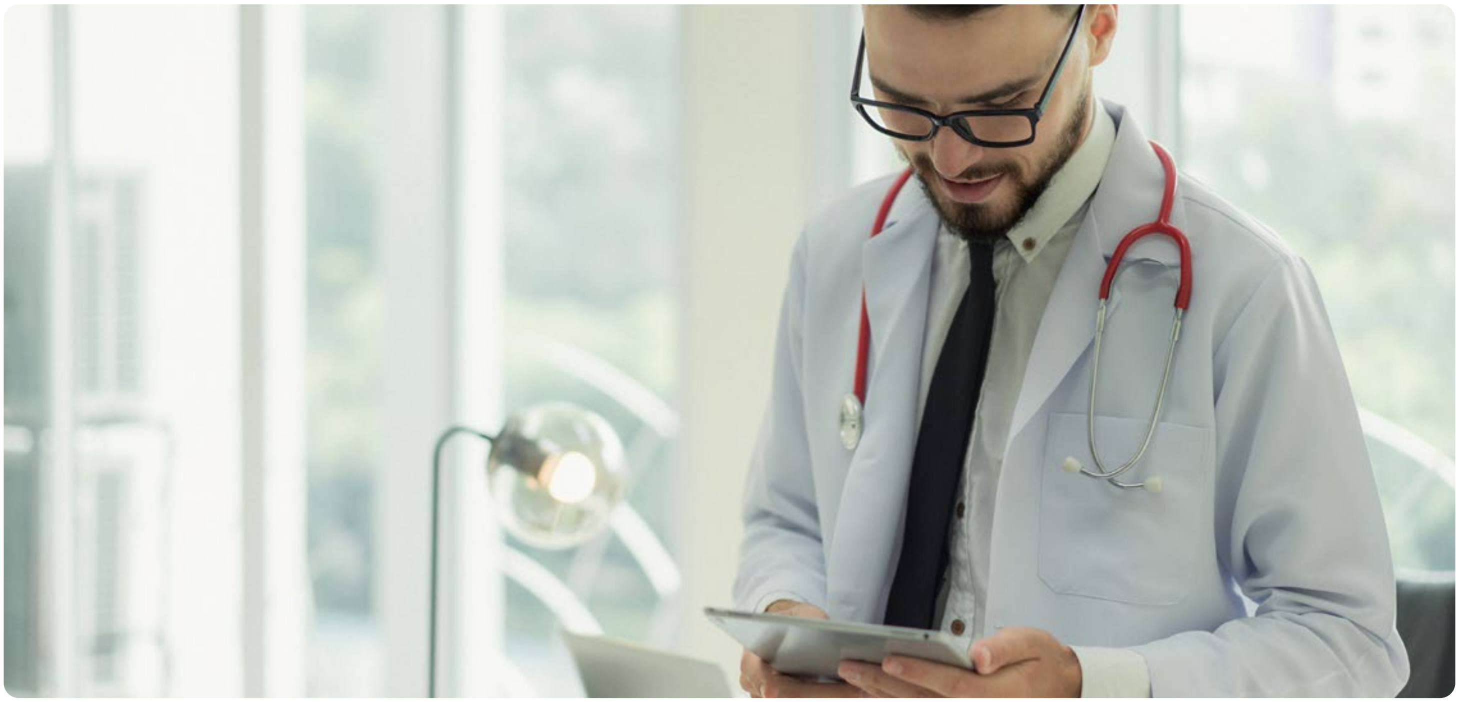
AuI may reduce unnecessary biopsy and referrals while maintaining or improving diagnostic accuracy. As demonstrated by Winkler et al.,[5] dermatologist-CNN cooperation reduced unnecessary excisions without sacrificing safety, achieving 100% melanoma sensitivity. AI-assisted triage systems may additionally optimize resource allocation by directing patients to appropriate levels of care, reducing both over and under-referrals for lesions.[8]

Improving Professional Fulfillment

The AAD position statement endorses a model in which clinicians focus on tasks aligned with their expertise while delegating algorithmic processes to machines.[1] Rather than threatening professional identity, AuI may reduce administrative burden and mitigate burnout through workflow optimization, allowing dermatologists to focus on clinical reasoning and patient relationships.[2] Evidence that AI assistance benefits generalists and trainees more than experienced dermatologists further supports this paradigm.[6]

Increasing Diversity, Equity, and Inclusivity

The fifth aim represents both the greatest opportunity and most significant barrier to responsible AuI implementation. Current AI systems demonstrate substantial performance disparities across skin tones, raising concern about whether AuI will mitigate or exacerbate existing inequities.



One study using a pathologically confirmed, diverse image dataset found that AI models performed significantly worse on darker skin tones and uncommon diseases. Notably, dermatologists labeling the dataset also showed reduced accuracy in these categories, suggesting bias exists at multiple levels of model development. Fine-tuning models helped close this performance gap between skin tones, highlighting the importance of diverse training data.[12] Another review documented that only 30% of AI programs had reported dermatological data specifically in SOC populations, underscoring persistent underrepresentation and challenges with image quality and standardization. These are factors that make current AI programs inevitable to perform worse at identifying lesions in SOC.[13] Therefore, AuI cannot overcome this barrier until explicit attention to training dataset diversity, validation across populations, and equity-focused framework developments are addressed.

> **Fine-tuning models helped close this performance gap between skin tones, highlighting the importance of diverse training data**

CRITICAL IMPLEMENTATION CHALLENGES

The Bias and Equity Crisis

The growth of AI in dermatology has been rapid, but the evidence supporting many of these tools has not kept pace. A large proportion of currently available applications still lack meaningful clinical validation or transparency. An analysis found that about 88% of AI dermatology apps had no supporting evidence, and nearly 90% did not report their regulatory status.[14] That raises real concerns about how ready these tools are for clinical use.

At the same time, performance differences across skin types remain a major issue. Models trained mostly on lighter skin continue to perform worse on darker skin tones.[12] This is not just a technical limitation; it has direct implications for equity in care. Many studies also fail to clearly describe the demographics of their datasets, making it difficult to know whether a model will actually work in diverse patient populations. The AAD has addressed this directly, stating that datasets need to reflect the populations where these tools are used. Without that, even well-designed models risk being unreliable in practice and may worsen existing disparities instead of improving them.

The Real-World Validation Gap

A lot of the excitement around AI in dermatology comes from studies using controlled or retrospective datasets. While those results can look impressive, they do not always translate to real clinical settings. This becomes clear in prospective studies. In one 2023 primary care study, AI had a Top 1 diagnostic accuracy of 39%, compared to 64% for general practitioners and 72% for dermatologists under routine conditions.[15] That gap highlights how different real-world performance can be compared to what is reported in curated datasets.

The takeaway is straightforward: strong results in controlled environments do not necessarily mean a tool is ready for clinical use. These systems need to be tested in actual workflows, where variability and uncertainty are much higher. The AAD emphasizes that validation should happen in real-world settings, with ongoing monitoring after deployment.

CONCLUSION: A CALL FOR ENGAGED LEADERSHIP

Dermatology is in a position to help shape how AI is integrated into clinical care. The specialty's reliance on visual diagnosis and pattern recognition makes it especially relevant in this space, but it also means the risks and limitations of these tools are highly visible.

The goal is not to replace dermatologists, but to support them. AI has the potential to improve diagnostic accuracy, expand access, and make care more efficient. But those benefits depend on how these tools are developed and implemented. Without careful validation, diverse datasets, and continued clinician involvement, the same systems could just as easily reinforce existing gaps in care. This is ultimately a question of ownership. Will dermatologists take an active role in shaping how these tools are used, or will they be introduced without enough clinical oversight?

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