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Melanoma Diagnostic Accuracy in a Total Body Photography System with an AI Dermoscopy App

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Background

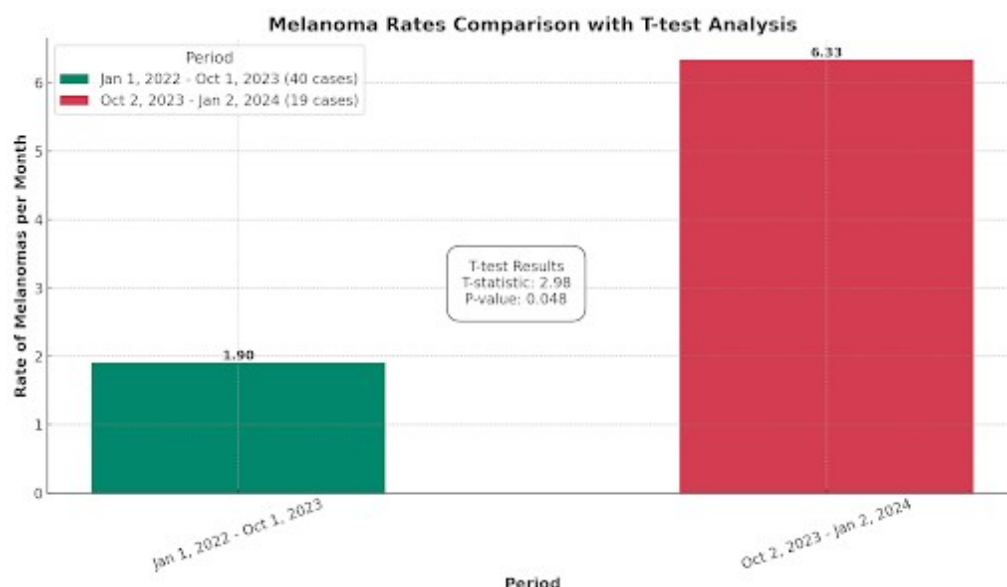
A total body photography system, Melanoscan, is augmented by a rapid bedside SQL query of AI classified images on an Android app. This study evaluates the impact of adding the SQL query to melanoma detection and surveillance. Employing deep learning for lesion segmentation and classification, we explore the efficacy of real-time SQL queries in a melanoma screening inside a specialized skin cancer center.

Methods

Utilizing the Melanoscan App's skin cancer risk query function, we access a database of 155,000+ dermatoscopy images. AI algorithms, including ResNet and EfficientNet for segmentation and various CNN architectures for classification, helped identify lesions at increased melanoma risk among patients attending the clinic. We analyze melanoma detection rates before and after integrating this function (January 1, 2022 - October 1, 2023, vs. October 2, 2023 - January 2, 2024), using statistical methods to assess these AI models' effectiveness. We evaluated NNT within 2023 to assess the effect of biopsy numbers on outcomes.

Results

Implementing the Companion App's query function led to a substantial rise in melanoma detection—40 cases in the 21 months before vs. 19 in the 3 months after. This marked improvement (t-statistic of 2.98, p-value of 0.048) showcases the AI integration's success in early melanoma detection



melanoma detection rates before and after integrating the AI risk Query (January 1, 2022 - October 1, 2023, vs. October 2, 2023 - January 2, 2024)

. Adding skin vs. background segmentation and multi-view Melanoscan image feature generation enhanced spot detection accuracy. The NNT improved from 3.57 in the first three quarters of 2023 to 2.22 in the last quarter, indicating increased detection efficiency. However, the observed difference was not statistically significant (p-value of 0.146), suggesting potential variability. a detailed examination of melanoma detection efficiencies and operational improvements from January to December 2023 is presented in the accompanying table. Notably, the fourth quarter showcases significant advancements following the intervention

2023 Quarter	Melanoscans M	Dermoscopy D	D/M	App Queries	MEL Score Avg
1	733	2824	3.85		0.113
2	713	2938	4.10		0.127
3	757	3209	4.25		0.117
4	624	3257	5.22	531	0.122
2023 Period	Biopsies	Melanomas	NNT	p-value	
1st 3 Quarters	50	14	3.57	0.146	
Last Quarter	40	18	2.22	0.146	

2023 Melanoscan and App System Usage and Number Needed to Treat

Conclusions

Integrating the Melanoscan™ system with an AI-driven skin cancer risk query function significantly improved melanoma detection rates. Incorporating deep learning for lesion analysis highlights AI's essential role in advancing dermatological oncology toward more personalized and precise care. Despite the NNT improvement indicating enhanced detection efficiency, the need for further research to solidify these findings and explore broader clinical and public health applications remains critical. [PMID19723475][PMID30624234]

References:

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Keywords

Melanoma screening, total body photography, artificial intelligence, dermoscopy, dermatoscopy,

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