

Hackathon Research for Team #30

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Challenge Name

Dermatology

Research Inquiries

1. What is the most common diagnosis of patients using tele-dermatology?
2. Is there a correlation between image quality and success rate of diagnosis?
3. Is there an existing model that combines dermoscope images with pathological findings?

Findings

1) Telemedicine is effective in patients with three of the most common skin conditions diagnosed in dermatology. It has not only proven to be an effective diagnostic tool, but also has been shown to be effective for monitoring the treatment progression of these diseases.

A [large](#) study from Brazil published in Frontiers assessed the concordance between inflammatory dermatoses diagnoses made by in-person dermatologists and teledermatologists. The most common inflammatory dermatoses diagnosed by teledermatologist was **Dermatophytosis**. Additional frequent diagnosis were acne, chloasma and Atopic Dermatitis.

ICD-10 code	Dermatosis	Patients (n)	Male (n)	Female (n)	Photographed lesions (n)
B35	Dermatophytosis	3,064	843	2,221	3,496
L70	Acne	2,662	851	1,811	3,217
L81.1	Chloasma	1,749	121	1,628	1,840
L20.9	Atopic dermatitis	1,648	603	1,045	2,058
L85.3	Xerosis	1,632	478	1,154	1,815
L57.9	Solar lentigo	1,584	223	1,361	1,870
L21.9	Seborrheic dermatitis	1,259	426	833	1,421
L23/L24/L25	Contact dermatitis	1,203	325	878	1,333
L81.0	Post-inflammatory hyperpigmentation	1,139	256	883	1,303
L81.5	Leukoderma	1,029	829	200	1,102
L65	Telogen effluvium	881	20	861	891
L30.5	Pityriasis alba	796	282	514	881
L64.9	Androgenetic alopecia	765	135	630	774
B36.0	Pityriasis versicolor	727	264	463	862
L60	Nail disorders	586	94	492	629
L40.0	Psoriasis	551	249	302	760
L80	Vitiligo	550	228	322	694
B08.1	Molluscum contagiosum	366	168	198	423
L30.1	Dyshidrosis	358	84	274	387
L28	Lichen simplex chronicus	340	157	183	368
L63	Alopecia areata	331	135	196	348
L71	Rosacea	248	60	198	257
I83.1	Stasis dermatitis	202	92	110	209
L30.0	Nummular dermatitis	201	59	142	218
L74.5	Focal Hyperhidrosis	200	86	114	209
L50	Urticaria	139	40	99	154
Total		24,210	7,108	17,112	27,519

A smaller [study](#) compared diagnostic agreement between telemedicine on social networks (Twitter and MedPics) and standard teledermatology services. The common diagnosis were **purpura (8.3%), eczema (6.7%), mycosis (6.7%), and viral infections (6.7%)**. In addition, they concluded that diagnostic agreement using social network images may serve as a reliable telemedicine tool.

- 2) Telemedicine may be described as a modern technology supporting health care at a distance. Dermatology, as a visually-dependent specialty, is particularly suited for this kind of the health care model.

Poor image quality is a significant issue in teledermatology. A [study](#) from September 2022, introduced **ImageQX**, a first of its kind explainable image quality assessor which leverages domain expertise to improve the quality and efficiency of dermatological care in a virtual setting. The authors found

that around 20% of the images collected through the mobile application were labeled as poor quality by dermatologists.

A [report](#) from JAMA Dermatology reviewed 2915 patient-submitted images. **Fifty five precepts** of the images were useful for medical decision-making and 62.2% were of sufficient quality. The study results suggest that images are most likely to be useful when they are in focus and reviewed by experienced attending physicians for wound surveillance.

The recommended standards for teledermatology are detailed in the '[QUALITY STANDARDS FOR TELEDERMATOLOGY](#)', published by

In conclusion, by reviewing the literature in the field of teledermatology, we can conclude that good image quality is necessary for the diagnosis of skin conditions in dermatology.

- 3) Several models for diagnosis of skin pathologies exist and potentially can be used in telemedicine. The majority is still under research and yet to be in everyday clinical use.

[Study](#) evaluated an artificial intelligence (AI)-based tool that assists with diagnoses of dermatologic conditions. Artificial intelligence assistance was associated with improved diagnoses by primary care physicians and nurse practitioners. The benefit could be quantified as an improved diagnosis of 1 in every 8 to 10 cases.

[Another study](#) from 2022 evaluated the utility of (AI) in telemedicine triage and diagnosis of malignant lesions. 100 images were presented to AI software and to three dermatologists and then compared the diagnosis to the biopsy results. The **AI correctly identified 63% of the cases**, a similar success rate as the dermatologists.

[Study](#) used convolutional neural networks (CNN) and artificial neural networks (ANN) for melanoma detection based on dermoscopic images. **The accuracy for CNN+ANN model was high (92.34%)**.

[Another study](#) evaluated the ability of AI to detect skin lesions in unprocessed clinical photographs. The algorithm reviewed 673 patients with different skin pathologies (185 malignant, 305 benign, and 183 normal conditions) and **was able to localize and diagnose skin cancer** without manual preselection of suspicious lesions by dermatologists.

In this [study](#), CNN had a similar sensitivity and higher specificity in detecting melanoma in dermoscopic images.

The use of models in dermatology and teledermatology is not limited only to malignant conditions. A [group from France](#) developed an algorithm for acne grading from smartphone photographs.

In conclusion, we could not find models that interpret pathological findings from dermoscope image. The existing models have **high accuracy in the diagnosis of malignant and non-malignant skin conditions by dermoscope images**, but AI algorithms analyzing pathologic data only work on laboratory slides

References:

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