Marie Perier-Muzet, MD
Amélie Boespflug, MD
Nicolas Poulalhon, MD
Julie Caramel, PhD
Anne-Laure Breton, MD
Luc Thomas, MD, PhD
Stephane Dalle, MD, PhD

Author Affiliations: Cancer Research Center of Lyon, Lyon, France (Perier-Muzet, Boespflug, Caramel); Department of Dermatology, Centre Hospitalier Lyon-Sud, Hospices Civils de Lyon, Lyon, France (Poulalhon, Breton, Thomas, Dalle).

Accepted for Publication: June 2, 2016.

Corresponding Author: Marie Perier-Muzet, MD, Cancer Research Center of Lyon, 28 rue Laennec, 69373 Lyon CEDEX 08, France (marie.perier-muzet@lyon-unicancer.fr).


Author Contributions: Dr Perier-Muzet had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Boespflug, Thomas, Dalle. Acquisition, analysis, or interpretation of data: Perier-Muzet, Poulalhon, Caramel, Breton, Thomas, Dalle.

Critical revision of the manuscript for important intellectual content: Perier-Muzet.

Additional Contributions: Brigitte Manship, PhD, Lyon Cancerology Research Center, provided editorial assistance, for which she was not compensated.

Funding/Support: This study was supported by Lyon 1 University, the Hospices Civils de Lyon.

Role of the Funder/Sponsor: The funding source had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Additional Contributions: Brigitte Manship, PhD, Lyon Cancerology Research Center, provided editorial assistance, for which she was not compensated.


Assessment of Accuracy of Patient-Initiated Differential Diagnosis Generation by Google Reverse Image Searching

Google users are increasingly web searching medical concerns; these search results hold the potential to influence outreach to clinicians by offering reassurance or generating concern. Accurate web information is therefore critical. For nondermatologic concerns, these web queries are via text cues. For dermatologic concerns, however, patients often lack the linguistic descriptors to accurately inform and narrow their searches. Google Reverse Image Search permits users to upload an image and search for similar images and content. We soon anticipate greater user adoption of Google Reverse Image Search to aid in self-identification of skin lesions, as well as a role for this technology to serve as adjunct to clinical dermatologic expertise, given that patients inevitably do web search their concerns before, during, and after clinical dermatologic consultation. While potentially informative, the results of such searches may generate concern and missed diagnoses may have severe implications. We thus queried Google’s ability to accurately identify similar images with matched diagnoses.

Methods | A set of 100 classic images representing 10 of the most common benign and malignant dermatologic neoplasms were selected from a non–web-indexed database of photographs taken at a US Navy Medical Center by board-certified dermatologists (Figure). Institutional review board approval was waived by Stanford University. Images were processed based on a previously described protocol1 including image cropping to remove the influence of anatomical location and then uploaded into Google’s Reverse Image Search with or without the additional text descriptor “skin.” The top 10 “visually similar images” were analyzed for presence of the correct diagnosis within these results.

Results | For malignant conditions except invasive squamous cell carcinoma (SCC), the additional text descriptor “skin” significantly increased the frequency of the correct diagnoses’ presence in the top results, and the accuracy, defined as the proportion of correct diagnoses within the top 10 unfiltered results (Table); image plus text search therefore likely restrictively filters to pages matching both. Google achieved greater diagnostic accuracy for all combined malignant and premalignant conditions searched with “skin” vs benign conditions searched with “skin” (P < .001, by Fisher exact test). The correct diagnosis was absent from the most similar images of skin cancers 20% to 30% of the time and from those of benign neoplasms 30% to 100% of the time, even when “skin” text-cued, highlighting the critical potential for misdiagnoses as well as uninformative results, with returned search images including those of cosmetic products and insects.

Discussion | However powerful Google’s visual object recognition algorithms, they are not geared toward biological image-matching; its “deep learning” methods use large amounts of presumably nonmedically annotated data to automatically learn image features,2-4 rather than relying on the historically used manual hand crafting of key image features, termed feature extraction.4 The latter is influenced by domain expertise more analogous to dermatologic training than is deep learning, with potential to hierarchically weight clinically relevant features. Anticipating that patients will in the coming years
increasingly self-generate differential diagnoses for medical conditions by both text and image searches, we highlight the present inadequacies and risk associated with the use of Google Reverse Image Search; while the present algorithms perform better with lesions representing or concerning for malignancy as well as with text cues, the error rate remains, at best, too high for the data to be safely used by those without dermatologic training. These data highlight the need for a more medically oriented toolkit, offering caution against use of the current technology. We propose Google’s partnership with the medical community in developing a hybrid approach to synergize computer learning with human medical expertise, and caution widely against the present inaccuracies and danger of patient-initiated differential diagnosis generation from input photo matches.

Julia D. Ransohoff, BA  
Shufeng Li, MS  
Kavita Y. Sarin, MD, PhD

Author Affiliations: Department of Dermatology, Stanford University School of Medicine, Redwood City, California.

Corresponding Author: Kavita Y. Sarin, MD, PhD, Department of Dermatology, Stanford University School of Medicine, 450 Broadway St, Pavilion C, Second Flr, Redwood City, CA 94063 (ksarin@stanford.edu).

Accepted for Publication: May 12, 2016.

Published Online: June 29, 2016. doi:10.1001/jamadermatol.2016.2096

Table. Google Reverse Image Search’s Ability to Diagnose Malignant and Benign Dermatologic Conditionsa

<table>
<thead>
<tr>
<th>Lesion Type</th>
<th>Diagnostic Rate Frequencyb</th>
<th>P Value</th>
<th>Accuracyc</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK/SCCIS</td>
<td>0.1 0.7</td>
<td>.02</td>
<td>0.03 0.13</td>
<td>.02</td>
</tr>
<tr>
<td>Angiokeratoma</td>
<td>0.0 0.0</td>
<td>...</td>
<td>0.00 0.00</td>
<td>...</td>
</tr>
<tr>
<td>BCC</td>
<td>0.1 0.7</td>
<td>.02</td>
<td>0.04 0.17</td>
<td>.005</td>
</tr>
<tr>
<td>Benign nevus</td>
<td>0.2 0.7</td>
<td>.07</td>
<td>0.06 0.17</td>
<td>.25</td>
</tr>
<tr>
<td>Dermatofibroma</td>
<td>0.0 0.0</td>
<td>...</td>
<td>0.00 0.00</td>
<td>...</td>
</tr>
<tr>
<td>Hemangioma</td>
<td>0.0 0.0</td>
<td>...</td>
<td>0.00 0.00</td>
<td>...</td>
</tr>
<tr>
<td>Melanoma</td>
<td>0.2 0.8</td>
<td>.02</td>
<td>0.03 0.28</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Nevus spilus</td>
<td>0.0 0.0</td>
<td>...</td>
<td>0.00 0.00</td>
<td>...</td>
</tr>
<tr>
<td>Seborrheic keratosis</td>
<td>0.1 0.0</td>
<td>&gt;.99</td>
<td>0.01 0.00</td>
<td>&gt;.99</td>
</tr>
<tr>
<td>Invasive squamous cell carcinoma</td>
<td>0.4 0.7</td>
<td>.37</td>
<td>0.07 0.10</td>
<td>.61</td>
</tr>
</tbody>
</table>

Abbreviations: AK, actinic keratosis; SCCIS, squamous cell carcinoma in situ; ellipses, no correct results were returned for the comparison.

a All comparisons by Fisher exact test.

b The frequency of diagnosis identification is defined as the frequency with which the correct diagnosis appeared 1 or more times within the top 10 search results.

c The diagnostic accuracy is defined as the proportion of the top 10 images returned containing the correct diagnosis. Accuracy was increased by the text cue “skin.”
Exploring Coping Strategies for Patients With Hidradenitis Suppurativa

Hidradenitis suppurativa (HS) is a chronic inflammatory skin disease that causes intensely sore nodules and abscesses that result in scars and dyspigmentation. Patients with HS can experience severe pain and discharge that may be malodorous. Hidradenitis suppurativa may lead to negative impacts on work and income, interpersonal relationships, self-worth, psychological health, as well as sexual dysfunction and distress. However, studies on the impact of HS on patients’ quality of life (QOL) do not comprehensively address patients’ coping and resilience strategies. For example, Esmann and Jemec conducted a study on the psychosocial effects of HS, the findings of which were in line with other published studies demonstrating the negative impacts of HS. However, they briefly mentioned instances of positive impacts of social support (eg, a woman being supported by a romantic partner to wear a sleeveless top and consequently feeling a sense of triumph). Whereas, to our knowledge, research on HS and positive coping is nonexistent, long-standing research on other skin disorders, such as psoriasis, shows that patients use multiple coping strategies. The objective of this study was to explore the coping strategies of individuals with HS.

Methods | Patients evaluated in the Department of Dermatology with a recorded diagnosis of HS were recruited in June 2015. Patients were excluded if they were not fluent in English, did not have HS, or had HS for less than 6 months. After giving verbal consent and confirming English fluency, semi-structured interviews were performed in person by 1 interviewer (JSK) using an interview guide. Some examples of the questions asked in these interviews are:
  • What bothers you the most about your HS? How do you handle that?
  • Please tell me the major ways in which HS affects your life.

Results | Twenty-one patients participated: 16 (76.2%) participants were women and 5 (23.8%) were men; mean (SD) age was 46.8 (13) years (range, 23-74 years); with varied ethnicities (13 [61.9%] non-Hispanic white, 3 [14.3%] Hispanic, 2 [9.5%] black, 1 [4.8%] Asian, and 2 [9.5%] with mixed ethnicity); mean (SD) disease duration was 20.5 (12.7) years; Hurley stage 2

Box. Major Themes With Representative Quotations Related to Coping With HS

Positive coping

Positive reframing

“I’ve had to do a lot of soul searching and pep talks and say well in spite of these scars (...) you still look good. You still can think highly of yourself and still be sexy. You just have to wear different underwear certain days of the week but that’s ok.”

Use of humor

 “[talking about sexual intercourse] And sometimes we just laugh because he has fibromyalgia and I have this. And sometimes we add a little humor because we have to.”

Active coping

“I haven’t had a really bad one since last summer since I’ve been on this lotion. So I mean it really has helped.”

Negative coping

Behavioral disengagement

“And like I smelled half the time from the boils itself I smell it. I smell the infection. And it’s like sometimes it turns my stomach. That’s why I don’t raise my hand.”

Social isolation

“I pretty much stopped dating because I just didn’t know how to deal with it.”

Support of others

Friends, family, or others

[about youngest son] “So his way of helping me get through the days is we’ve had an ongoing game of war for the last 6 years and when I don’t feel good we get the cards out. And we’ll sit there and play best 3 out of 5. And then he sits there with me. Because he knows I can’t get up and do stuff with him.”

“I told my friend... and he was so cool about it. He’s like ‘hey that’s ok. That’s something that you took your time to tell us, that’s fine.’ (...) And I got 2 different positive reactions.”

“It has helped [sharing their condition with someone else], and I’ll tell you for sure, that it has helped that my girlfriend is educated too. It would be harder to explain something like this to a person who doesn’t want to read about it and understand it.”