Dermatol Ther (Heidelb)
https://doi.org/10.1007/s13555-023-01031-w

BRIEF REPORT

Public Perceptions, Factors, and Incentives Influencing Patient Willingness to Share Clinical Images for Artificial Intelligence-Based Healthcare Tools

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Received: July 6, 2023 / Accepted: September 7, 2023

ABSTRACT

Introduction: The use of artificial intelligence (AI) as a diagnostic and decision-support tool is increasing in dermatology. The accuracy of image-based AI tools is incumbent on images in training sets, which requires patient consent for sharing. This study aims to understand individuals' willingness to share their images for AI and variables that influence willingness.
Methods: In an online survey administered via Amazon Mechanical Turk, sketches of the hand, face, and genitalia assigned to two use cases employing AI (research vs. personal medical care) were shown. Participants rated willingness to share the image on a 7-point Likert scale.
Results: Of the 1010 participants, individuals were most willing to share images of their hands (81.2%), face (70.3%), and lastly genitals (male: 56.8%, female: 46.7%). Individuals were more willing to share for personal care versus research (OR 0.77 [95% CI 0.69–0.86]). Willingness to share was higher among males, participants with higher education, tech-savvy participants, and frequent social media users. Most participants were willing to share images if offered monetary compensation, with face images requiring the highest payment (mean $18.25, SD 20.05). Only 38.7% of individuals refused image sharing regardless of any monetary compensation, with the majority of this group unwilling to share images of the genitals.
Conclusions: This study demonstrates overall public support for sharing images to AI-based

Prior Presentation: The study's abstract was presented as a poster at the American Academy of Dermatology Annual Meeting in March 2023 in New Orleans, Louisiana.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s13555-023-01031-w.

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Published online: 22 September 2023

tools in dermatology, with influencing factors including image type, context, education level, technology comfort, social media use, and monetary compensation.

Keywords: Artificial intelligence; General dermatology; Survey; Clinical research

Key Summary Points
Accuracy of image-based artificial intelligence (AI) tools in dermatology is incumbent on recruiting patient images for training sets.
This study aimed to investigate individuals' perceptions towards sharing their images for AI in dermatology.
Willingness to share images for AI is influenced by several factors, including image location, purpose, education level, comfort with technology, frequency of social media use, and amount of monetary compensation.
Further research is needed to understand how to create equitable and representative datasets for AI in dermatology.

INTRODUCTION

Artificial intelligence (AI) is a growing tool in medicine defined by the process of applying automation to intelligent behavior, thereby identifying patterns and making predictions [1]. AI has diverse applications in medicine, including enhanced diagnostics, risk prediction, personalized treatment, telemedicine, and optimizing workflow [2]. In addition, the use of AI as an adjuvant tool has the power to expand access to healthcare support in rural or underserved areas [3]. There has also been growing public popularity of online AI-powered chatbots, such as ChatGPT and Google Bard, which analyze text or images inputted by users and generate human-like responses, including medical recommendations [4]. As AI becomes prevalent in both the medical field and general public, it is important to understand how receptive patients are to using AI and its value as an enhancement to physician care [5–7].

As a visually oriented medical specialty, dermatology presents a unique opportunity for the integration of image-based diagnosis using AI, which has demonstrated pattern recognition capabilities across various image types in dermatology, including clinical, dermoscopic, and histopathologic images [8]. The diagnostic accuracy of image-based AI has been shown to be comparable to evaluation by a board-certified dermatologist when tested independently. Furthermore, some studies have demonstrated that integrating image-based AI into an assessment by a dermatologist can augment overall accuracy compared to either group alone [9, 10].

Development of accurate AI-based tools in dermatology requires training by large datasets of images that capture a representative cross-section of diagnoses in patients with varying skin tones and lesion locations [5]. Existing training datasets predominately consist of White patient images, limiting the representativeness of the true patient population [11]. Additionally, skin conditions presenting in sensitive anatomic sites (e.g., face and genital areas) are often underrepresented or absent from datasets [12].

Building representative datasets relies on patients' consent to contribute their clinical images to AI. Previous studies examining factors influencing public attitudes towards sharing electronic health information found that participants most value the specific purpose or context in which their information will be used. In studies looking at willingness to share genetic data, participants were less likely to share if their data were identifiable [13, 14]. Currently, there is limited data on public attitudes regarding sharing clinical images specifically for AI. This study aims to understand individuals' perceptions towards sharing their images for AI and to determine how willingness to share images is affected by image sensitivity, context, demographics, comfort with technology, and monetary compensation.

METHODS

This cross-sectional survey study was administered online to a convenience sample of adult US respondents via Amazon Mechanical Turk. Amazon Mechanical Turk is a crowdsourcing platform that outsources online tasks to workers with predetermined qualifications for compensation. Participants were required to be $\geq$ 18 years of age and English-speaking to complete the survey [15]. Sketches of body parts (hand, face, and either male or female genitalia) were distributed based on participants' selected gender and assigned to two use cases employing an AI-based tool: research or personal healthcare. Participants selected their willingness to share based on the body part and specific context on a 7-point Likert scale (1 = not willing, 4 = neutral, 7 = very willing). Participants who selected neutral or below were then prompted to select an amount of compensation, if any, that would make them willing to share ($5–$50 with the option to select "No amount of money"). Participants were asked to rate their levels of technology savviness using the validated Sudzina measure of tech savviness [16]. Participants were also asked to rate their comfort level using common technologies including smartphone, laptop, email, and social media. Finally, participants were asked to select how frequently they share personal images on social media (Supplementary Material).

Continuous variables were summarized using averages and standard deviations, while categorical variables were summarized using counts and percentages. Unpaired *t*-tests were employed to test associations. A linear regression model was computed to assess correlations. All analyses were performed using JASP version 0.14.1, and two-sided p values < 0.05 were deemed statistically significant.

Study approval was received from the Mass General Brigham Institutional Review Board (protocol number: 2022P000911). Ethics committee approval was not required. The study was performed in accordance with the Helsinki Declaration of 1964 and its later amendments. All subjects provided informed consent to participate in the study.

RESULTS

Of the 1010 completed responses (99.7% completion rate), respondents had a mean age of 36.5 years (SD 12.12; range 18–79), were 55.7% male (n = 563), and were 76.1% White (n = 769). Most respondents were employed (n = 851, 84.3%) and had a college or post-college education (n = 854, 84.6%), Table 1.

Overall, participants were most willing to share images of their hands (81.2%) and face (70.3%) and least willing to share images of genitals (male: 56.8%, female: 46.7%). In terms of context of AI, participants were more willing to share images for personal medical care rather than for research purposes for the face (mean difference: 0.38, 95% CI [0.22, 0.54]) and male genitals (mean difference: 0.37, 95% CI [0.13, 0.60]) (Table 2).

Among participants who were neutral or unwilling to share, 38.7% of individuals would not share images regardless of any monetary compensation, with the largest proportion unwilling to share images of their genitalia. The image that respondents required the highest amount of compensation to share was the face (mean $18.25, SD 20.05) and the lowest was for the female genitals (mean $14.86, SD 21.14).

Odds ratios (ORs) were used to assess whether participants' willingness was modified by demographics, comfort with technology, and social media use (Table 3). Compared to males, females were overall less willing to share their images (OR 0.81 95% Cl [0.73–0.91]). Individuals with college or post-college education were overall more willing to share images (OR 1.5 [95% Cl 1.30–1.74]). Individuals who perceived themselves as tech savvy and believed others considered them as tech savvy were more willing to share images (OR 1.74 95% Cl [1.55–1.95], OR 1.94 95% Cl [1.74–2.18], respectively). Respondents who share images on social media at least monthly were also more willing to share images (OR 1.82 95% Cl [1.63–2.03]). No significant differences in willingness to share were observed by age groups (18–35 years vs. 36 + years) or race.

Table 1 Participant demographics

Participant emographics	***n***
Total number of participants	1010
Age	**Mean ± SD**
Mean age	36.47 ± 12.12
	n **(%)**
Gender	
Male	563 (55.7)
Female	428 (42.4)
Prefer not to answer	19 (1.9)
Race/ethnicity	
White/Caucasian	769 (76.1)
Black or African American	39 (3.9)
Asian	136 (13.5)
American Indian, Alaska Native, Indigenous	8 (0.8)
Pacific Islander/Native Hawaiian	2 (0.2)
South Asian	10 (1.0)
Hispanic	32 (3.2)
Other/Prefer not to answer	14 (1.4)
Employment Status	
Employed	851 (84.3)
Student	40 (4.0)
Retired	40 (4.0)
Not currently employed	68 (6.7)
Prefer not to answer	11 (1.1)
Education	
Some high school (secondary school)	12 (1.2)
High school (secondary school) graduate	139 (13.8)
College (university) graduate	641 (63.5)
Post-college (university) graduate	213 (21.1)
Prefer not to answer	5 (0.5)

DISCUSSION

As AI technology continues to play an active role as an adjuvant to medical diagnostics and decision-making, it is imperative to understand public perceptions and willingness to take part in the development and use of these tools. To our knowledge, this is the first study investigating public attitudes towards image sharing for medical AI.

Our study demonstrates overall public support for sharing images to AI-based tools in dermatology, with some variation based on image sensitivity, context, demographics, and comfort with technology. Both image sensitivity and context affected participants' willingness to share. Individuals are more willing to share images of their hands versus their face and genitalia, indicating that more recognizable and sensitive images impact preferences. This pattern is also reproduced in the context of monetary compensation; the largest proportion of unwillingness to share despite monetary compensation was for genital images. While willingness to share hand images was largely not affected by context of AI, individuals were more likely to share face and genitalia images for personal healthcare over research, suggesting that the purpose of imaging sharing for AI may be more important when evaluating sensitive images.

Participants' demographics also influenced their willingness to share. Those with higher education levels, who perceive themselves to be tech savvy, and who regularly share images of themselves on social media were more willing to share their images for AI, suggesting that those with an understanding of potential advantages of AI or a baseline willingness to share personal information online may have greater willingness to share. Although we did not identify consistent differences in willingness to share by age group and race, these results suggest that those who do not understand the risks and benefits (e.g., those with less education, less comfort with technology, underserved populations) may be more reluctant to contribute to the development of AI

Table 2 Average willingness to share by image type for personal care versus research

Body location	Personal care		Research		Unpaired *t*-test	
	Number of participants willing to share images[a], *n* (%)	Average Likert scale score	Number of participants willing to share images[a], *n* (%)	Average Likert scale score	Mean difference [95% CI]	*p* Value
Hand	830 (82.2%)	5.77 ± 1.46	811 (80.3%)	5.67 ± 1.51	0.10 [Reference]	0.138
Face	750 (74.3%)	5.31 ± 1.69	671 (66.4%)	4.93 ± 1.90	0.38 [0.22–0.54]	0.003
Male genital	343 (59.7%)	4.56 ± 1.97	310 (53.9%)	4.19 ± 2.16	0.37 [0.13–0.60]	< 0.0001
Female genital	225 (51.6%)	4.06 ± 2.17	182 (41.7%)	3.72 ± 2.26	0.34 [0.05–0.64]	0.023

7-Point Likert scale (1 = not willing, 4 = neutral, 7 = very willing)
[a]Willing = Likert scale score > 4

tools. It is important to consider the impact this may have on diversity of data sets [17, 18].

AI-based tools in dermatology have the potential to enhance patient care across several domains. In addition to improving the accuracy and efficiency of diagnoses, AI can serve as a decision support system for dermatologists by providing workup and treatment options based on patient data. By automating administrative tasks, AI can streamline workflow in clinical settings and reduce administrative burden on providers and clinical staff [19, 20]. Another major advantage of AI lies in its ability to continuously learn and stay up-to-date with the latest medical knowledge, leading to ongoing improvement in supporting dermatologists. Future potential for AI in dermatology includes personalized treatment plans tailored to each patient's history and presentation, discovering clinical patterns in diseases, assessing risk of disease development and proactively suggesting appropriate screening measures, accelerating drug development, and empowering patients by providing them with real-time insights into their health [21, 22].

At present, one weakness of image-based AI is inadequate representation of the diversity of real-life patient populations in training datasets. While our study provided insights into factors influencing public hesitations towards image sharing for AI, future studies are necessary to explore potential solutions that encourage patient participation in contributing to the development of more representative AI datasets. Other weaknesses of image-based AI include limited integration of patient history into image analysis, limited data sharing between institutions, variability in image quality, and a lack of a standardized protocol for recruiting patient images for AI [12, 21].

Previous studies have investigated patient perspectives regarding image sharing for another increasingly popular medical technology: teledermatology [23, 24]. While some teledermatology may incorporate AI to enhance decision-making support, not all teledermatology services use AI [21]. It is important to recognize that teledermatology and AI are two distinct entities, and patients who use teledermatology are sharing images for their own diagnosis and evaluation. As suggested in our results, sharing images for personal use was considered more acceptable than for research purposes. Future work must evaluate evolution in perspectives of image sharing in the post-pandemic era.

These results must be interpreted in the context of our study design, which was limited

Table 3 Odds ratio of willing to share versus neutral or unwilling to share based on image type and context

Variable	Odds ratio for willingness to share [95% CI]
Body part	
Hand	Reference
Face	0.55 [0.47–0.63]
Genital	0.46 [0.40–0.54]
Context	
Personal	Reference
Research	0.77 [0.69–0.86]
Gender	
Male	Reference
Female	0.81 [0.73–0.91]
Age	
18–35	Reference
36+	0.93 [0.83–1.03]
Race	
White	Reference
Non-White	1.13 [0.99–1.28]
Education	
High school only	Reference
College or post-college graduate	1.5 [1.30–1.74]
People consider me tech savvy	
Disagree/neutral	Reference
Agree	1.94 [1.74–2.18]
I consider myself tech savvy	
Disagree/neutral	Reference
Agree	1.74 [1.55–1.95]
Frequency of image sharing	
Never/rarely	Reference
At least monthly	1.82 [1.63–2.03]

by a study population that was predominantly male, Caucasian, more educated, and familiar with technology. Additionally, the use of sketches may invoke a different response compared to seeing photographs of body parts and may influence willingness to share. Our study did not evaluate other image types utilized by AI in dermatology, including dermoscopic and confocal images. While we were able to develop conclusions based on our survey, we were unable to determine participant understanding and there are likely more modifiers that would affect participant willingness to share images. Further efforts are necessary to replicate these results in a more diverse study population with greater variation in socioeconomic status, race, and familiarity with technology.

CONCLUSIONS

As image-based AI technology becomes increasingly integrated into healthcare, it is crucial to address public concerns and factors influencing image sharing. Our study demonstrated differences in willingness to share images based on sensitivity of images, context of AI, and demographics, which provide insight into current challenges related to dataset diversity and data-sharing protocols. Given that the development of accurate AI tools in dermatology is dependent on patients contributing their clinical images, monetary compensation may be warranted to incentivize patient participation [25]. In addition, implementing standard security measures to protect patient data and privacy, while ensuring patient understanding of risks and benefits of their participation, is vital in facilitating image sharing for AI [26]. Ultimately, addressing public attitudes is not only essential for the equitable development of AI-based tools but also crucial for fostering patient trust and engagement with AI in healthcare.

ACKNOWLEDGEMENTS

We thank the participants of the study.

Author Contributions. Sophia Ly, Sophia Reyes-Hadsall, Lara Drake, Caroline Nelson,

John S. Barbieri, and Arash Mostaghimi contributed to the study conception and design. Material preparation, data collection, and analysis were performed by Sophia Ly, Sophia Reyes-Hadsall, Lara Drake, and Guohai Zhou. The first draft of the manuscript was written by Sophia Ly, Sophia Reyes-Hadsall, and Lara Drake, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding. No funding or sponsorship was received for this study or publication of this article.

Data Availability. All data generated or analyzed during this study are included in this published article or as supplementary information files.

Declarations

Conflict of interest. Arash Mostaghimi declares financial interest and a position on the advisory board of Fig. 1 Beauty, Inc., Eli Lilly and Company, Pfizer Inc., and Hims. AM receives fees as a consultant from AbbVie, Concert Pharmaceuticals, Pfizer Inc., and 3Derm Systems. AM is the founder of Lucid, Inc., and receives research funding from Incyte Corporation, AclarisTherapeutics Inc., Eli Lilly and Company, and Concert Pharmaceuticals. All other authors have no conflicts of interest to declare.

Ethical approval. Study approval was received from the Mass General Brigham Institutional Review Board (protocol number: 2022P000911). Ethics committee approval was not required. The study was performed in accordance with the Helsinki Declaration of 1964 and its later amendments. All subjects provided informed consent to participate in the study.

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