

Prevalence and Impact of Health-Related Internet and Smartphone Use Among Dermatology Patients

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Practice Points

- Patients frequently consult online resources for information about dermatologic conditions, including suspected skin cancers.
- It is important for dermatologists to guide patients to reliable sources of information if there is interest in using the Internet and/or smartphones to learn about dermatologic conditions.
- Although reliable online information can be a good source of educational material for patients, it is important to emphasize that these resources should not replace in-person physician evaluation, particularly in cases of possible skin cancer.

Health information is increasingly accessible via the Internet and smartphone applications (apps), and patients may perceive these resources as tools for self-education and/or self-diagnosis. The objective of this study was to assess the characteristics of dermatology patients who use the Internet and/or smartphone apps to access health information and to evaluate the impact that these resources have on patients' health care-seeking behavior and interactions with physicians. Online resources offer both opportunities and challenges

for dermatologists. Because patients often consult online resources for information about dermatologic conditions and may rely on these resources instead of seeking the care of a dermatologist, it is important for dermatologists to be involved in the development of high-quality online content that educates the public while also emphasizing the need to seek in-person medical care.

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Patients increasingly use the Internet and/or smartphone applications (apps) to seek health information and track personal health data,^{1,2} typically in the spirit of being a more educated consumer. However, many patients use the Internet in an attempt to self-diagnose and independently find treatment options, thus avoiding (in their opinion) the need to seek in-person medical care. Additionally, electronic access to health information has expanded beyond computers to smartphones with apps that can provide users with a simple interface to personalize the health information they seek and receive.

Prior studies have shown that seeking online health information and health-related social media is more common among women, younger patients,

those with a college education, and those with a higher income.^{3,4} However, the prevalence of health-related Internet and smartphone use among dermatology patients as well as how patients ultimately use this information is not well studied. This information about patient behavior is important because of the potential harm that may come from patient self-diagnosis, which may delay or prevent treatment, as well as the benefits of patient self-education, which may expedite diagnosis and treatment.⁵ We surveyed a heterogeneous patient population at 2 dermatology offices in a major academic medical center to assess the prevalence and predictors of Internet and smartphone use to obtain both general medical and dermatologic information among dermatology patients. We also evaluated the impact that health information obtained from online sources has on a patient's degree of concern about cutaneous disease and the likelihood of seeing a dermatologist for a skin problem.

Methods

Survey and Participants—This study was approved by the institutional review board at the University of Pittsburgh, Pennsylvania. All patients aged 18 years or older who presented to the department of dermatology at 2 offices of the University of Pittsburgh Medical Center from September 2013 through July 2014 were invited to participate in an anonymous 33-question survey regarding their use of the Internet and smartphone apps to obtain health information and make health care decisions. Patients were asked to complete the survey prior to seeing a health care provider and return it to a locked box by the front desk before leaving the office. Survey questions were designed by physicians with content expertise (J.A.W. and L.K.F.) and were reviewed by a statistician with survey expertise (D.G.W.). The survey included questions about patient demographics, Internet and smartphone use (both general and health related), and specific sources accessed. The survey also inquired about the impact of health information obtained via the Internet and smartphone apps on respondents' degree of worry about a hypothetical skin condition or lesion using a 5-point Likert scale (1=no worry; 5=very worried). Respondents also were asked which skin conditions they previously researched online and whether their findings impacted their decision to see a dermatologist. Additionally, respondents were asked to list the smartphone apps and other online health resources they had used within the last 3 months. Prior to distribution, the survey was piloted with 10 participants and no issues with comprehensibility were noted.

Statistical Analysis—We described demographic traits (eg, age, sex, race/ethnicity, level of education,

income) and factors associated with access to health care (eg, specialist co-pay, travel time from dermatology office) of respondents using proportions. We evaluated respondents' access to and use of Internet- and smartphone-based health information using proportions and used χ^2 tests to quantify differences by sex and age (<50 years and \geq 50 years).

We analyzed the impact of Internet and smartphone-based health information on patient worry about skin conditions by obtaining median worry on a 5-point Likert scale. Due to the nonparametric nature of the data, we used the Mann-Whitney *U* test to quantify differences by sex and age (<50 and \geq 50 years). We used multiple logistic regression to identify factors associated with 3 outcomes: (1) using the Internet to self-diagnose a dermatologic disease, (2) using the Internet to obtain dermatology-related information within the last 3 months, (3) and previously refraining from visiting a dermatologist based on reassurance from online resources. Predictors included the aforementioned demographic and health-care access-related traits. We also categorized smartphone apps used by respondents (ie, fitness/nutrition, reference, self-help, health monitoring, diagnostic aids, electronic medical record) and calculated the proportion of respondents with 1 or more of each type of app on their smartphones. Analyses were conducted in Stata 13.1 and IBM SPSS 22.0.

Results

Of 1000 patients who were invited to participate in the study, a total of 775 respondents completed the survey, yielding a response rate of 77.5%. The majority of respondents were aged 30 to 60 years (mean age [standard deviation], 44.5 [17.2] years; median age [interquartile range], 44 [29–59] years), female (66.7%), and non-Hispanic white (83.3%) (Table 1). The majority of respondents (88.8%) had completed at least some college. Nearly all respondents had medical insurance (97.8%), but annual household income and insurance co-pay varied considerably. Only 10.8% of respondents traveled more than an hour to our offices.

The majority of respondents had access to home Internet and owned a smartphone (Table 2). Use of the Internet to obtain health-related information in the 3 months prior to presentation was more common among females (77.9% vs 70.1%; $P=.03$) and respondents younger than 50 years (83.4% vs 62.5%; $P<.001$); the same was true for dermatology-related information (females: 43.2% vs 31.0%; $P=.003$; aged <50 years, 51.6% vs 22.2%; $P<.001$). The majority of respondents

Table 1.

Participant Demographics

Characteristic	Response (N=775)^a
Age, y	
Mean (SD)	44.5 (17.2)
Median (IQR)	44 (29–59)
Sex, n (%)	
Male	216 (33.3)
Female	432 (66.7)
Race/Ethnicity, n (%)	
White	612 (83.3)
Black	67 (9.1)
Asian	26 (3.5)
Hispanic	7 (1.0)
Native American/Alaskan Indian	2 (0.3)
Other	21 (2.9)
Highest level of education completed, n (%)	
No college	83 (11.3)
Some or all of college	398 (54.1)
Graduate school	255 (34.6)
Annual household income, n (%)	
\$0–\$50,000	253 (37.6)
\$50,001–\$100,000	220 (32.7)
>\$100,000	199 (29.6)
Health insurance coverage, n (%)	
Yes	751 (97.8)
No	17 (2.2)
Median PCP co-pay, \$ (IQR)	15 (15–20)
Median specialist co-pay, \$ (IQR)	25 (10–40)
Travel time to the dermatology office, n (%)	
<20 min	305 (41.7)
20–60 min	347 (47.5)
>60 min	79 (10.8)

Abbreviations: SD, standard deviation; IQR, interquartile range; PCP, primary care physician.

^aNot all patients provided responses. Percentages reflect the total number of respondents for each characteristic.

indicated that they use the Internet to obtain health-related information both before and after they see their doctor. Most respondents indicated that they sometimes discuss health-related information found on the Internet with a physician. Smartphone use to obtain health-related information was more common among respondents younger than 50 years versus those who were 50 years or older (55.5% vs 24.1%; $P<.001$), as was smartphone use to diagnose skin problems (20.0% vs 6.3%; $P<.001$).

In multivariable analysis, use of the Internet or a smartphone to obtain health-related information was associated with younger age (<50 years) and a higher level of education (both $P<.001$). Use of the Internet to obtain dermatology-related information ($P<.001$) and use of a smartphone to help diagnose a skin problem ($P=.001$) was associated with younger age (<50 years) only. Income, sex, co-pay to see a dermatologist, and travel time to the dermatology office were not associated with use of online resources for general or dermatology-specific health-related information or assistance with diagnosing a skin problem.

Of 204 respondents who indicated that they previously attempted to self-diagnose a skin condition using the Internet, the most commonly researched condition was skin cancer/moles/unknown spots (64.7%), followed by rashes (40.7%), acne (20.6%), cosmetic issues (16.2%), psoriasis (12.7%), dermatitis (3.4%), warts (1.5%), tick bites (1.0%), and lupus (1.0%) (some respondents selected more than one condition). Only 7.0% of respondents indicated that they previously had refrained from visiting a dermatologist based on reassurance from online resources. Compared to the rest of the surveyed population, these respondents were younger ($P=.001$), but there were no significant differences in sex, highest level of education, household income, or travel time to the dermatology office. The most commonly researched condition among these respondents was acne (12 respondents), and 11 respondents indicated that they had attempted to self-diagnose a mole or potential cancer using online sources.

Of 557 respondents who owned a smartphone, 31.8% reported using at least 1 health-related app (mean number of health apps per respondent, 1.5). Of the apps that respondents used, 45.9% focused on fitness/nutrition, 28.7% provided reference information, 13.4% were a patient portal for receiving information from their electronic medical record, 8.6% provided a health monitoring function, 1.9% served as a diagnostic aid, and 1.5% provided coping assistance and emotional support for individuals with cognitive or emotional

Table 2.

Health-Related Internet and Smartphone Use Among Respondents by Sex and Age

Characteristic/ Behavior	Responses, n (%) ^a					
	Sex			Age		
	Males (n=216)	Females (n=432)	P Value	<50 y (n=424)	≥50 y (n=297)	P Value
Have access to home Internet	201 (93.1)	404 (95.1)	.30	404 (96.2)	266 (91.1)	.005
Have used the Internet to obtain health-related information in the past 3 mo	150 (70.1)	334 (77.9)	.03	352 (83.4)	183 (62.5)	<.001
Have used the Internet to obtain dermatology-related information in the past 3 mo	66 (31.0)	185 (43.2)	.003	222 (51.6)	65 (22.2)	<.001
Use the Internet to obtain health-related information			.81			<.001
Before seeing a doctor	53 (25.1)	101 (23.7)		114 (27.0)	50 (17.4)	
After seeing a doctor	14 (6.6)	29 (6.8)		22 (5.2)	32 (11.2)	
Before and after seeing a doctor	122 (57.8)	260 (61.0)		262 (62.1)	163 (56.8)	
Never	22 (10.4)	36 (8.5)		24 (5.7)	42 (14.6)	
Discuss information found on the Internet with a doctor			.17			.25
Always/almost always	51 (26.7)	113 (28.6)		103 (25.5)	78 (31.2)	
Sometimes	114 (59.7)	248 (62.8)		256 (63.4)	143 (57.2)	
Never	26 (13.6)	23 (8.6)		45 (11.1)	29 (11.6)	
Own a smartphone	141 (66.2)	331 (77.0)	.004	367 (87.0)	162 (55.5)	<.001
Use smartphone to obtain health-related information	58 (41.1)	164 (49.7)	.09	203 (55.5)	39 (24.1)	<.001
Have health-related apps on smartphone	36 (25.3)	113 (34.4)	.06	126 (34.4)	39 (24.2)	.02
Use my smartphone to help diagnose skin problems	24 (17.1)	52 (15.8)	.72	73 (20.0)	10 (6.3)	<.001

^aNot all patients provided responses. Percentages reflect the total number of respondents for each characteristic.

conditions; only 1 respondent reported using an app related to dermatology.

All respondents were asked to rate their anticipated degree of worry if the Internet or a smartphone app suggested that a skin lesion was benign versus dangerous on a 5-point scale. Overall, the median worry rating increased from 3 to 5 when information accessed via the Internet or a smartphone app suggested a lesion was dangerous rather than benign. A change in worry of 2 or more points was seen in 36.1% of females and 49.1% of males ($P=.002$) when information obtained via the Internet indicated a lesion was dangerous and in 47.5% of females and 58.8% of males ($P=.006$) when a smartphone app indicated that a lesion was dangerous. When information obtained via the Internet indicated a lesion was dangerous, a change in worry of 2 or more points was seen in 41.8% of respondents who were younger than 50 years and in 41.1% of those who were 50 years or older ($P=.93$). When a smartphone app indicated a lesion was dangerous, a change in worry of 2 or more points was seen in 50.2% of respondents who were younger than 50 years and in 52.2% of those who were 50 years or older ($P=.61$).

Discussion

In this cross-sectional study, we found that health-related Internet and smartphone use among dermatology patients is common and may impact both patients' degree of concern about a skin lesion as well as the likelihood of seeking in-person medical care if they are reassured by the results of their online findings. Age and level of education were associated with Internet and smartphone use to obtain dermatology-related health information but not factors related to health care access. More patients used the Internet or a smartphone to obtain general medical information versus dermatology-related information. Respondents who indicated that they used the Internet to obtain health-related information tended to do so before visiting their physician.

Our finding that a patient's level of worry about a hypothetical skin condition or lesion is influenced by health information obtained via the Internet or a smartphone app is concerning. One study found that participants who used a popular search engine to look for information about vaccine safety and dangers were directed to Web sites with inaccurate information more than 50% of the time, and 65% of the information they obtained from these sites was false.⁶ In our study, approximately 25% of respondents had previously

consulted online resources to attempt to self-diagnose a skin condition. Online sources about dermatologic conditions were consulted most frequently for information about potential skin cancers, moles, and unknown spots. A prior study showed that smartphone apps that claim to aid patients in determining whether a skin lesion is low or high risk for melanoma often are inaccurate and are associated with a high rate of missed melanomas.⁵ Even though we surveyed patients who did end up seeing a dermatologist, some respondents had previously opted out of seeing a dermatologist based on information they had found online. Because our study was conducted among patients who chose to seek care at a dermatology office, the problem is likely greater than estimated from our findings because we had no way of reaching individuals who decided to completely forgo a visit with a dermatologist.

Although use of the Internet to obtain health-related information was common among older adults in our population, it was nearly universal in younger adults. Health-related smartphone use was more than twice as common in younger versus older adults, which could be due to an increased comfort with technology and its integration into daily life. The fact that age and education were associated with Internet use for dermatology-related health information but not household income or travel time to the dermatology office suggests that information seeking is not due to lack of resources limiting access to dermatologic care but rather to the greater role that rapid access to online information plays in patients' lives. Our findings are similar to another study that examined the use of online sources for general health information.⁷

This study has several limitations. First, there may have been some selection bias. We specifically aimed to understand the health-related Internet and smartphone use among dermatology patients, thus restricting our sample to this population. By doing so, we were unable to assess the use of such resources by the general population, particularly those individuals who chose not to see a dermatologist at all based on their own online research. Our findings may not apply to other practices and regions of the country, as we implemented our study in one geographic location and in offices of an academic practice. Although our sample size and diversity with regard to income, education, and age suggest that our results are likely generalizable to many settings, it is important to note that nearly all respondents in this study had health insurance and our findings are thus not necessarily applicable to those individuals who are uninsured.

Conclusion

Our findings suggest that the availability of online health information regarding dermatologic conditions provides dermatologists with both opportunities and challenges. Many patients consult online resources for health information, and the popularity of this practice is likely to increase with time, particularly as newer smartphones with features designed to allow users to monitor their health are developed with health-conscious consumers in mind. Most large health care systems provide patients with resources to view laboratory results and communicate with physicians online. It is important for dermatologists to be involved in the development of high-quality online content that educates the public while also emphasizing the need to seek in-person medical care, particularly in potential cases of skin cancer. It also is important for patients to be involved in the content development process to ensure that the messages they take away from online resources are the ones physicians wish to convey. Ideally, online forms of education will increase patients' sense of self-efficacy while encouraging appropriate consultation for potentially harmful skin conditions.

REFERENCES

1. Atkinson NL, Saperstein SL, Pleis J. Using the Internet for health-related activities: findings from a national probability sample. *J Med Internet Res*. 2009;11:e4.
2. Ybarra M, Suman M. Reasons, assessments and actions taken: sex and age differences in uses of Internet health information. *Health Educ Res*. 2008;23:512-521.
3. Bhandari N, Shi Y, Jung K. Seeking health information online: does limited healthcare access matter? *J Am Med Inform Assoc*. 2014;21:1113-1117.
4. Thackeray R, Crookston BT, West JH. Correlates of health-related social media use among adults. *J Med Internet Res*. 2013;15:e21.
5. Wolf JA, Moreau JF, Akilov O, et al. Diagnostic inaccuracy of smartphone applications for melanoma detection. *JAMA Dermatol*. 2013;149:422-426.
6. Kortum P, Edwards C, Richards-Kortum R. The impact of inaccurate Internet health information in a secondary school learning environment. *J Med Internet Res*. 2008;10:e17.
7. Mead N, Varnam R, Rogers A, et al. What predicts patients' interest in the internet as a health resource in primary care in England? *J Health Serv Res Policy*. 2003;8:33-39.