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What patients see online: assessing the online identities of Pennsylvania dermatologists

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Abstract

Introduction: Patients use the internet to search for health-related information. We sought to characterize the information that patients find when searching for dermatologists on Google.

Methods: The Centers for Medicare and Medicaid Services (CMS) Physician Comparable Downloadable File was utilized to identify all Medicare-participating dermatologists practicing in Pennsylvania (PA). A custom Google-based search engine was used to search each dermatologist. Up to the top 10 results for each physician were then sorted into: (1) physician, hospital, or healthcare system, (2) third-party, (3) social media, (4) academic journal articles, or (5) other.

Results: Within the CMS, 519 health care providers (53.9% male, 46.1% female) self-identified as dermatologists practicing in PA. At least one search result was obtained for each physician (4,963 total search results). About 30.6% (1,519) search results were hospital, health system, or physician-controlled websites, and 26.6% (1,318) were third-party websites (1,318; 26.6%). Social media websites accounted for 601 (12.1%) hits whereas peer-reviewed academic journal websites generated 135 (2.7%) results. One-way chi-square analysis showed domains were not randomly distributed across the five categories ($P < 0.0001$).

Conclusion: Dermatologists should be better aware of their digital presence and the strategies to better control their online identity.

Introduction

An increasing number of patients are looking online to find healthcare information and learn about their dermatologists [1-7]. One study found that 47% of dermatology outpatients used the internet to find medical information, with over two-thirds of these patients perceiving online information as beneficial [6]. Google serves as an important resource for patients to research health concerns and evaluate healthcare providers [1, 2]. As 92% of people only view the first page of search results, the first 10 search results on Google may have the greatest influence on a patient's perception of a physician [8].

The purpose of this study was to analyze the prevalence of different types of websites that appear in Google search results for Pennsylvania dermatologists. We hypothesized that the results would predominantly be third-party websites and that there would be a lack of social media sites, particularly for older physicians.

Methods

The methods follow those previously described in the radiology, radiation oncology, and neurosurgery literature [9-11].

Study Population

A list of dermatologists practicing in PA was created with The Centers for Medicare and Medicaid Services (CMS) Physician Comparable Downloadable File

Keywords: dermatology, digital identity, online reputation, Google, URL

(PCNDF), [12]. The PCNDF includes physicians enrolled in Medicare fee-for-service in the United States. National Provider Identifier (NPI) numbers were used to access the data and eliminate duplicate entries on September 23, 2016. A total of 519 Pennsylvania dermatologists were included in the analysis.

Data collection

Institutional review board approval was waived as data was collected through publicly available federal databases and web-accessible sources. The list of all Medicare-participating dermatologists in Pennsylvania was obtained from the PCNDF and downloaded as a text file. Analysis of the file was performed using the Python programming language and the Python Data Analysis Library (Pandas), a software library for working with data in Python [13]. Specific information was pulled from the PCNDF data set, including first and last name, gender, medical school graduation year, degree, and NPI number. The following search term was generated for each dermatologist: "[first name] + [last name] + [degree] + dermatology + [city] + [state]." Since the majority of the dermatologists in the PCNDF data set had an MD degree as opposed to a DO degree, MD was assumed when the degree was not reported.

A custom search engine (CSE) in Google was utilized to search the 519 entries efficiently. The list was passed through the CSE application programming interface. Default parameters were used in the application programming interface, but the duplicate content filter was applied to avoid obtaining separate entries from nearly identical links. The search term for each dermatologist was submitted to CSE, which then returned the first 10 website URLs (total N=4, 963 results). Pandas was then used to save the URL results in a text file. Python version 2.7 was used to build the script for sending and receiving data from Google [13].

The American Medical Association FREIDA Residency and Fellowship Database was consulted in November 2017 to compile a list of academic dermatology programs in Pennsylvania [14]. Departmental websites were accessed to create a database of academic dermatologists, which was then utilized to verify academic versus non-

academic status of each member of the study population.

The website domain (i.e., twitter.com, vitals.com) of each URL was manually categorized into one of five categories: 1) directly controlled by a physician, hospital, or healthcare system; 2) controlled by a third-party healthcare information websites; 3) social media platform; 4) primary academic journal websites, and 5) not otherwise classifiable (i.e. legal websites, non-healthcare-related websites, websites containing non-reputable and/or unverified healthcare information). Two independent reviewers assessed each URL. Any discrepancies between the two reviewers were assessed by a third reviewer and resolved through consensus.

Numerical ratings and comments were collected manually from the ratings websites (vitals.com or healthgrades.com URLs).

Data Analysis

Descriptive statistics were compiled based on the 4,963 URLs that were obtained, including the

Table 1. Demographic data of Pennsylvania dermatologists.

Characteristic	Value (%)
Total Number of PA Dermatologists	519
Male Sex	280 (53.9)
Female Sex	239 (46.1)
<i>Degree Type</i>	
MD	131 (25.2)
DO	14 (2.7)
None Listed	372 (71.7)
<i>Academic and Non-academic Status</i>	
Academic	131 (25.2)
Non-academic	388 (74.8)
<i>Graduation Year from Medical School</i>	
Before 1965	6 (1.2)
1965-1974	38 (7.3)
1975-1984	106 (20.4)
1985-1994	110 (21.2)
1995-2004	124 (23.9)
2005-2016	135 (26.0)
Not Listed	1 (0.2)

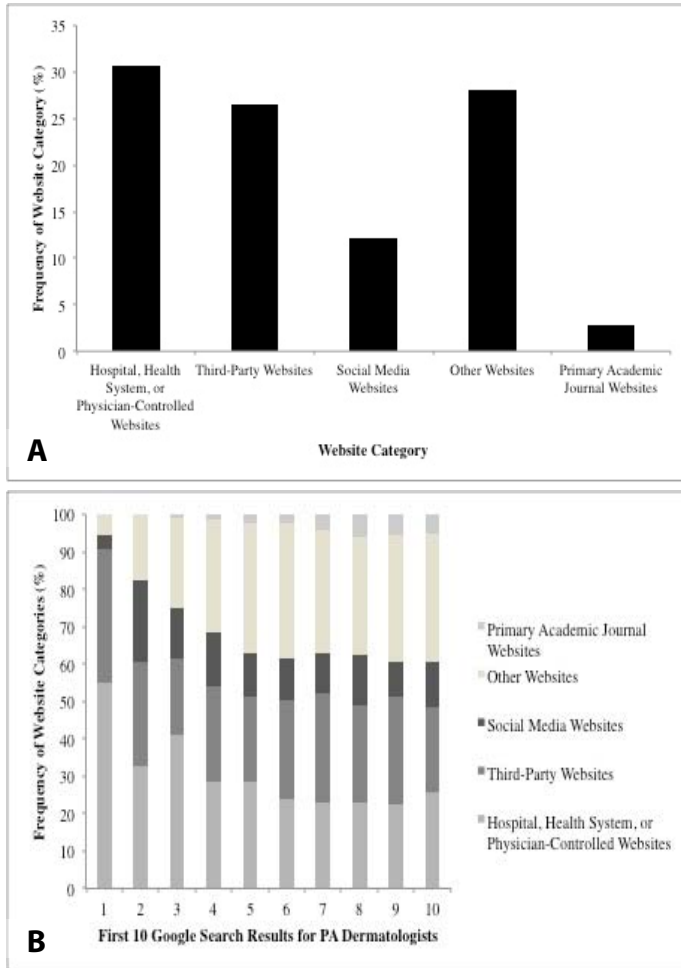


Figure 1. A) Frequency of website types within top 10 search results for Pennsylvania dermatologists. B) Frequency of website types categorized by search position within top 10 Google search results for Pennsylvania dermatologists.

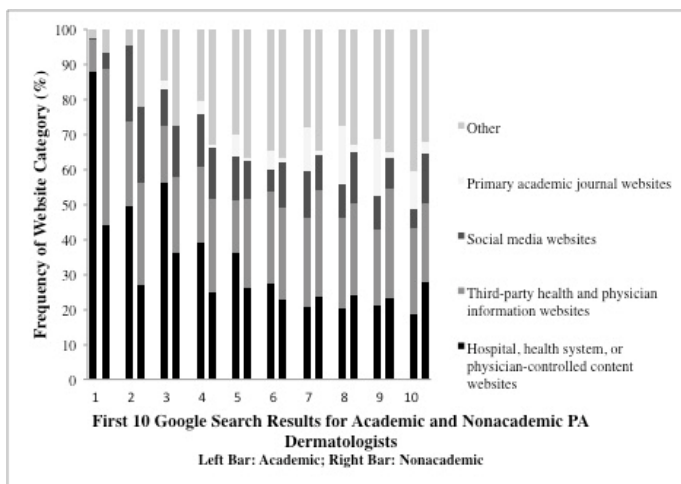


Figure 2. Website types categorized by search position within top 10 Google search results for academic and non-academic Pennsylvania dermatologists.

frequency of each website type appearing as the first Google search result. The frequencies in domain categories were compared among dermatologists in relation to academic status and age ranges, which were estimated by medical school graduation years. Descriptive statistics were also calculated for the ratings, including frequency of numerical scores, average number of ratings, and average numerical score.

A chi-square analysis was performed to determine statistical significance in domain frequency differences among academic and non-academic dermatologists. In addition, a one-way chi-square test was applied to the whole study population to determine if there were significant differences among the frequencies of the five website categories. Prism for Mac OS X (version 7.0c, GraphPad Software, Inc, San Diego, CA) was used for analysis with a significance level of $P < 0.05$.

Results

The demographics for this study population are shown in **Table 1**. A total of 519 physicians in PA self-identified as dermatologists. Of those, 131 (25.5%) were classified as academic and 388 (74.8%) as non-academic. At least one search result was obtained for each of the 519 dermatologists (100%). About 54% of the Pennsylvania dermatologists were male and 46% were female; this proportion is similar to that reported by the AAMC’s 2016 Physician Specialty Data Report, which listed 52.9% of all U.S. active dermatologists as male and 47.1% as female [15].

Table 2 shows the 10 domains that appeared most often in the search results. Six of the top ten domains were third-party websites and two were social media websites. There were no primary academic journal sites in the top ten domains. The most common domain was healthgrades.com, a third-party website.

Figure 1A presents the frequency of website types for the top 10 search results of Pennsylvania dermatologists. From the search results, *hospital, health system, or physician-controlled websites* (i.e. upmc.com) were the most frequent domains with 1,519 hits (30.6%). *Third-party websites* (i.e.

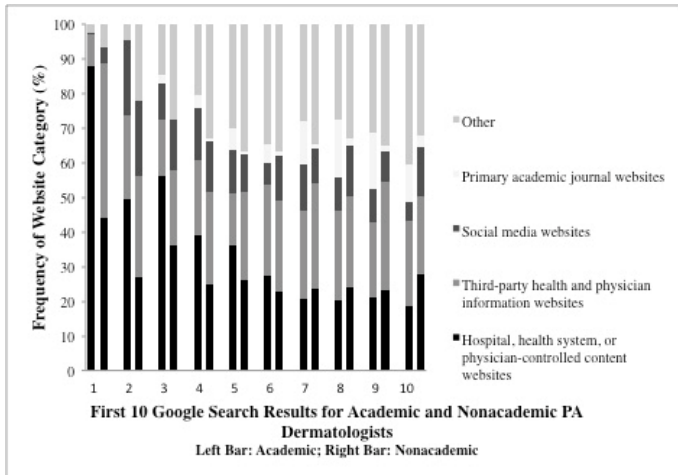


Figure 3. Frequency of website categories in the top 10 search results of Pennsylvania dermatologists, categorized by medical school graduation year.

healthgrades.com) accounted for 1,318 search results (26.6%), while *social media* websites (i.e. doximity.com) and *primary academic journal* websites comprised only 601 (12.1%) and 135 (2.7%) of the results, respectively. The domains were randomly distributed across the 5 website categories as determined by chi-square analysis ($P < 0.0001$)

Figure 1B displays the frequency of website categories for the first 10 search results of Pennsylvania dermatologists. *Hospital, health system, or physician-controlled* websites were the most common sites in the top 4 positions. In all ten positions, *primary academic journal* websites were the least common website type. *Social media* was the second least common category in all the positions except for position two.

Figure 2 compares the frequency of website categories for the first 10 search results for academic and non-academic Pennsylvania dermatologists. In

position 1, *hospital, health system, or physician-controlled* websites was the most common website for academic physicians (87.7% of the results for academics, 44.0% for non-academics), while *third-party* websites were the most common type of website for non-academic physicians (9.2% of results for academics, 44.6% for non-academics). *Primary academic journal* websites were the least common for both academic and non-academic physicians, particularly in the first position where there were no primary academic journal websites for all physicians.

Figure 3 shows the frequency of website categories for the top 10 search results of Pennsylvania dermatologists when separated by medical school graduation year. For dermatologists that graduated in 1984 and before, *other* websites (i.e. sharecare.net, angieslist.com) constituted the majority of the top 10 results. This was followed by *third-party* and *hospital- or physician-controlled* websites. For graduates from 1985-1994, *third-party* websites were of the majority, followed by *hospital- or physician-controlled* and *other* websites. For more recent graduates from 2005-2017, *hospital- or physician-controlled* websites contributed to most of the top 10 results, with *other* and *third-party* websites following thereafter. *Social media* websites did not make up the majority of the top 10 results for any graduation year. There was an overall increase in the proportion of *social media* websites within the first 10 search results, since *social media* websites contributed to 10.2% for graduates before 1964 and 12.4% for graduates after 2004. However, the highest frequency of *social media* websites was actually among graduates from 1985-1994, with 13.7% of the top 10 results coming from *social media* websites.

Table 2. Top 10 domain websites in the first page of Google search for PA dermatologists.

Rank	Domain Name (URL)	Domain Type	Number of Search Hits
1	healthgrades.com	Third-party	401
2	sharecare.com	Other	382
3	doximity.com	Social media	346
4	health.usnews.com	Third-party	343
5	pennteam.org	Hospital/health system-controlled	185
6	medicinenet.com	Third-party	174
7	angieslist.com	Other	150
8	wellness.com	Third-party	134
9	doctor.webmd.com	Third-party	132
10	vitals.com	Third-party	94

The number of patient ratings on each rating URL ranged from 0 to 237 with an average of 18.81 (SD 2.32). On the rating sites, the physicians were rated numerically from 1 to 5 stars. **Figure 4** displays the frequency of the number of stars (from 1 to 5). Of all 6,532 ratings, 4,718 (72.2%) were 5 stars, 339 (5.2%) were 4 stars, 142 (2.2%) were 3 stars, 199 (3.0%) were 2 stars, and 1,134 (17.3%) were 1 star. There was an overall average of 4.47 stars awarded to each physician.

The number of comments ranged from 0 to 145 (average: 7.23, SD 9.65), with 0 to 214 positive comments (average: 4.90, SD 16.54) and 0 to 90 negative comments (average: 2.02, SD 6.02). The positive comments most commonly mentioned the physician's personality, professionalism, thorough nature, and perceived good care. Negative comments were most commonly about treatments that were perceived to be ineffective or have adverse outcomes, personality, wait time, and staff. Eighteen physicians of 300 (6.0%) replied to comments with a total of 84 replies. Of these replies, 77 were to positive comments thanking the reviewer for their comment. Seven replies were to negative comments, apologizing to the patients for a negative encounter. None of the replies from the physicians contained any HIPPA violations or patient information.

Discussion

Over the past decade, the proportion of physicians being rated and the absolute number of ratings per

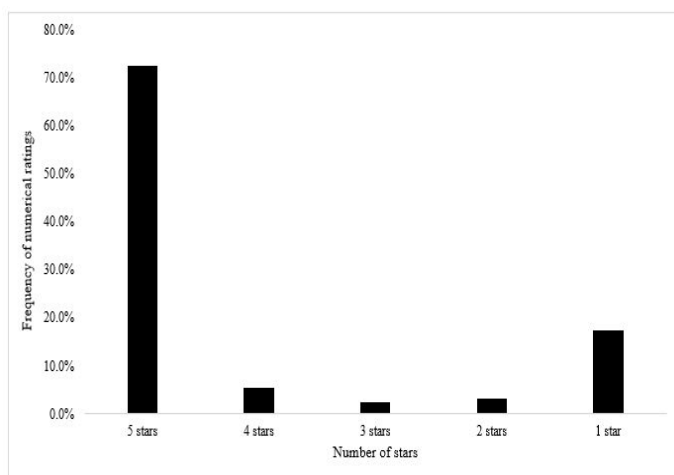


Figure 4. Frequency of stars on physician rating websites.

physician have steadily increased [16]. The goal of this study was to assess the online presence of Pennsylvania dermatologists using a specialized Google search tool and a federal dataset. We found that the majority of the online identities of Pennsylvania dermatologists consist of *third-party* and *other* websites (e.g. angieslist.com). Such findings align with analyses of the web-based identities of radiation oncologists [10] and neurosurgeons [11].

These results are of particular concern given that patients are increasingly utilizing physician rating (PR) websites when selecting physicians or searching for information on health care providers [17, 18]. Interestingly, the number of patients who utilize PR websites is disproportionately high in comparison to the number of patients who write such reviews [19]. A patient survey analysis conducted by Curry et al. revealed that 26% of survey respondents utilized PRs as a resource, but only 2% of respondents reported ever posting a review [20]. Thus, it is clear that current online physician reviews are likely skewed, largely related to an inadequate number of reviews. Given these findings, it is important that dermatologists encourage their patients to post reviews, thus establishing more representative profiles. By maintaining positive online identities and reviews dermatologists can increase their referrals and maintain high levels of patient trust.

Ratings

On physician rating websites (vitals.com and healthgrades.com), numerical ratings were most commonly 5 stars, followed by 1-star ratings. The overall average rating was high (4.47 stars), which is consistent with a previous study analyzing online ratings of dermatologists that also found high ratings across popular physician rating websites [21]. Although the average rating was high, there may be a regional bias similar to how physicians in eastern Canadian provinces were more likely to receive better ratings than those in central or western Canada [22]. Future studies comparing the ratings of dermatologists across the United States may shed more light on this interesting variation. There were more positive comments, but there were also a fair amount of negative comments. Very few physicians

replied to comments (6.0%). The physicians who did reply did not divulge any patient information or violate HIPPA. More physicians should consider replying to both positive and negative comments on their websites. By thanking reviewers for posting positive comments and apologizing to patients with negative comments, physicians may help foster positive patient relationships and address any problems. A few physicians who replied to negative comments provided an email address or phone number to further discuss the patients' poor experiences. This strategy may allow the physician to delve more into the problem on a more private platform, while still maintaining patient privacy. Additionally, several of the negative comments were about staff or office problems. By reviewing comments online, physicians may be more aware of the perceived environment of their workplace.

Social Media

Social media platforms are another medium for physicians to increase their outreach and visibility. Yet this study found that only 12.1% of the top 10 search results were *social media* websites, with 5.7% for academic and 14.1% for non-academic physicians. Previous studies demonstrate a similar lack of social media presence in the fields of radiology, radiation oncology, and urology [9, 10, 23]. Although it may be expected that younger physicians would be more active on social media, this was not found to be the case. We found that older physicians graduating from medical school between the years 1965-1984 had the highest percentage (13.7%) of social media websites of total results (**Figure 3**). This dropped to 12.4% of physicians graduating between 1995-2017 (**Figure 3**), indicating that a striking number of younger dermatologists have not established a professional social media presence.

Despite the scarcity of physician social media websites, social media use has rapidly expanded in the U.S. and studies demonstrate that many patients use it for healthcare advice [24-27]. Since physicians cannot customize third-party websites, information patients see regarding their education, practice, and contact information may be outdated or inaccurate. On a physician's personal social media page, they

can ensure an accurate representation of their business and garner more patients.

Social media can also be beneficial as a tool for dermatologists to stay connected with their patients. Many patients desire online communication with their physicians. Communication, both in person and online, may improve the physician-patient relationship, patient satisfaction, and perceived quality of care [28-30]. A group from the University of Houston found that 41% of patients were frustrated with having to visit the doctor to ask simple questions which could have been resolved by simpler means [30]. Utilizing online tools to disseminate information on general skin health, dermatologists may quell these frustrations, allow for more focused appointments, and improve patient compliance with treatment regimens [31].

By utilizing social media appropriately, dermatologists can create a useful public health platform to provide patients with accurate skin health information. In the long-term, this may serve as a preventative health measure. They may choose to post pictures of common skin conditions or warning signs to educate and empower patients to take an active interest in their health. Since physicians would control what is posted, the medical information would likely be more accurate than information that patients obtain from less credible sites [31]. This is an especially useful tool, when used correctly, in an image-based field like dermatology [32].

However, expanding into the online social media realm comes with drawbacks. A survey conducted by the AMA showed that only 11% believed the internet was useful in providing health information to patients [33]. This is related, in part, to issues with creating and maintaining websites, including "start-up time, computer/network finances, time spent verifying the accuracy of information on Web sites, and liability issues" [33]. Given the visual nature of the field, patients may want to send providers photos and receive instant feedback, which is not possible and inappropriate. Furthermore, shifting components of the healthcare process onto the web may widen healthcare disparities, given that younger, wealthier, and higher educated

populations are more likely to research health information online [34]. Therefore, dermatologists using social media as an outlet should consider their patient population and appropriately inform patients of limitations, to maintain professionalism. When used appropriately and in moderation, social media posts related to general dermatological topics may benefit both patients and providers by enhancing satisfaction and outcomes.

Strategies to improve online presence

This study revealed that Pennsylvania dermatologists lack controllable digital identities. There are several ways they can improve their presence online. Considering the impact of PR websites, physicians should verify their contact information on these websites (healthgrades.com, vitals.com, rateMDs.com). They may also utilize professional social networking websites by creating profiles with accurate biographies and curriculum vitae. Of the search results obtained, social media websites made up the 2nd and 3rd most common domains (**Table 2**), so they would certainly be visible and accessible to patients. Creating personal websites may also be beneficial, allowing dermatologists to share clinical opinions and/or research interests. Dermatologists in private practice can utilize "Google My Business," a unique tool allowing businesses to control their online presence on Google Search and Google Maps. By taking these measures, dermatologists can improve their online presence and control what patients see online.

Limitations

As the analysis was performed on dermatologists practicing in Pennsylvania, these results may not be applicable to all dermatologists. Furthermore, the most commonly occurring social media domain was *doximity.com*, which utilizes national physician registries to create placeholder profiles for nearly all

U.S. physicians. However, only 12% of physicians with profiles actively control their accounts [35]. Thus, this study may erroneously overestimate the social media presence of Pennsylvania dermatologists.

There are other inherent limitations associated with employing a Google CSE, which have been described in previous studies with CSE [10]. The search results obtained for each physician through CSE may not fully replicate those returned by a patient-initiated end-user level Google search, which would be customized to each individual's search and internet usage patterns. However, CSE remains the only legal means of obtaining search results at scale without violating the Terms of Service of Google Search.

Future Directions

Future studies may assess the digital identities of all dermatologists practicing in the United States. A similar analysis of the online presence of cosmetic or procedural dermatologists, dermatopathologists, or other subspecialists may also be of interest. Additionally, potential differences in online content for international dermatologists could be evaluated.

Conclusion

We found that the vast majority of dermatologists in Pennsylvania fail to exercise control over their online identities. Search results for dermatologists are predominated by third-party websites, and lack social media and physician-controlled websites. It would be beneficial for dermatologists to improve their social media presence, in order to directly communicate with patients, disseminate health information, and advertise their practices.

Potential conflicts of interest

The authors declare no conflicts of interests.

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