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Authors

Patel, Shivani
Eluri, Madhu
Boyers, Lindsay N
et al.

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Commentary

Update on mobile applications in dermatology

Shivani Patel BS¹, Madhu Eluri BS², Lindsay N Boyers BA³, Chante Karimkhani BA⁴, Robert P Dellavalle MD PhD MSPH^{5,6,7}

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¹Medical University of South Carolina, Charleston, SC

²Case Western Reserve University School of Medicine, Cleveland, OH

³Georgetown University School of Medicine, Washington, D.C.

⁴Columbia University College of Physicians and Surgeons, New York, NY

⁵Department of Dermatology, University of Colorado Anschutz Medical Campus, Aurora, CO

⁶Department of Epidemiology, Colorado School of Public Health, University of Colorado Anschutz Medical Campus, Aurora, CO

⁷Department of Dermatology, Denver Veterans Administration Hospital, Denver, CO

Correspondence:

Robert P. Dellavalle, MD, PhD, MSPH
Chief, Dermatology Service
Department of Veteran Affairs Medical Center
1055 Clermont Street, Box 165
Denver, CO 80220
Tel: (303) 399-8020, ext. 2475
Fax: (303) 393-4686
Email: robert.dellavalle@ucdenver.edu

Abstract

Background: As the use of mobile devices surpasses that of personal computers, medical applications increasingly provide easy access to a diverse range of health care resources.

Purpose: To analyze changes in the number of dermatologic mobile applications since 2012.

Methods: We examined five mobile platforms (Apple, Android, Windows, Nokia, and Blackberry) for dermatology-related diagnoses applications. The apps were categorized by purpose, cost, and target audience.

Results: A total of 365 dermatologic mobile applications were analyzed with 225 new mobile applications found since 2012. Since the last query, there was a decrease in market share of reference materials (26.6% in 2012 to 15.9% in 2014) and self-surveillance/diagnosis applications (17.9% in 2012 to 12.9% in 2014) while teledermatology apps increased from 3.5% of total apps in 2012 to 9% in 2014.

Conclusions: Dermatology apps continue to proliferate with minimal regulation. As technology continues to advance and physicians have greater access to mobile- health information, novel advancements in diagnosis may lead to more time-and-location-flexible patient care.

Introduction

In 2014, 169 million people in the United States owned a smartphone, and mobile application devices surpassed personal computers for total internet usage. Nearly 42% of smartphone users downloaded mobile applications [1, 2]. Within healthcare, nearly 90% of providers have access to a smartphone, a growth of approximately 30% since 2009 [3]. Mobile health, or “mHealth”, involves the use of mobile applications for medical purposes [4]. As the number of mobile application devices increases daily, “mHealth” provides greater access to diagnosis and treatment.

In dermatology, mobile applications can serve a multitude of purposes related to the visual diagnosis, including photo storage and teledermatology consultation. Healthcare providers can also download mobile applications for educational aids and reference materials. Owing to the ever-changing nature of mobile applications and smartphone functionality, we conducted a secondary query of dermatology-related mobile applications to analyze changes since the last search in 2012 [5].

Methods

During July 2014, we searched publicly available mobile applications on five platforms: Apple, Android, Windows, Blackberry, and Nokia. The following search terms were selected: (1) dermatology, (2) psoriasis, (3) rosacea, (4) acne, (5) skin cancer, (6) melanoma, (7) eczema, and (8) teledermatology. Consumer reviews were recorded, and for apps existing on multiple platforms, the reviews were totaled. Applications regarding cosmetics, product advertisements, private practices, photoshop, or claims to cure skin disease were excluded.

The application was then assigned to a category: general dermatology reference, disease guide, self-surveillance/diagnosis, educational aid, sunscreen/UV recommendations, calculator, teledermatology, journal, conference, photograph storage/sharing, dermoscopy, pathology, and *other*. The target audience was recorded as healthcare provider, patient, or both. The cost of the mobile application was also recorded. Since the current study solely involves non-human subjects, IRB approval was not necessary.

Results

A total of 365 dermatology-related apps were included, with 316 unique apps (Table 1). The applications were sorted into their respective function: general dermatology reference (n=58 [15.9%]), self-surveillance/diagnosis (47 [12.9%]), disease guide (72 [19.7%]), educational aid (48 [13.2%]), sunscreen/UV recommendations (34 [9.3%]), calculator (16 [4.4%]), teledermatology (32 [8.8%]), conference (5 [1.4%]), journal (12 [3.3%]), photograph storage/sharing (14 [3.8%]), dermoscopy (5 [1.4%]), pathology (3 [0.8%]), other (19 [5.2%]). Most apps fell within the category of disease guide, focusing primarily on acne, eczema, and psoriasis.

Of the 49 apps shared, 48 existed on two operating systems, whereas 1 app was available on three platforms. The majority of apps were offered free of charge (n=231 or 63.3%), and paid apps ranged from \$0.99 to \$229.99 (median=\$3.99). The most expensive apps were medical textbooks. Of the paid apps, 3 apps had additional usage fees. Handyscope is listed at \$6.99 but also requires the purchase of a \$696.22 Handyscope attachment for use. Online DermClinic, a photograph storage site, costs \$0.99 for download but premium storage accounts are an additional \$89 per month. Although 231 apps were available free of charge for download, 17.7% (n=41) of the apps required additional purchases or a membership for use. Mobile journal applications were free to download but the user must have an annual subscription to the journal to view on their online interface. Annual fees for journal subscriptions varied from \$66 to \$399.99. Teledermatology and online consultation apps included additional fees for each requested consult. DermOnCall, a teledermatology application, costs \$59 per online visit. Other consultation reports and mole photograph submission varied from \$4.99 to \$69.99. Several teledermatology applications, including SpotCheck and Skin of Mine, allow the patient to choose a specific dermatologist with varying fees but are only available in certain states. Mobile apps for annual dermatology conferences only provided access to registered conference members. Disease guides, such as Fitzpatrick’s Dermatology, provided free mobile access to a few chapters, but cost an additional \$200.00 for full access. Other applications, such as VisualDx, provide a free 30 day trial after which the user must pay a monthly fee unless paid for by an institutional license.

The market audience was distributed almost evenly between healthcare provider (n=159 or 43.5%) and patient (n=173 or 47.3%) whereas several apps were available for both groups (n=33 or 9.0%). The ten most reviewed apps ranged from UV index measurements to mole surveillance (Table 2).

A total of 225 new dermatology-related apps existed on the market compared to the initial search in July 2012. There was a decrease in market share percent with mobile applications for reference materials (26.6% in 2012 to 15.9% in 2014) and self-surveillance/diagnosis applications (17.9% in 2012 to 12.9% in 2014). The number of teledermatology apps increased in market share from 3.5% of total apps in 2012 to 8.8% in 2014 (Table 1).

Conclusions

The present study documents recent advances in dermatology-related mobile applications. Within the past two years alone, more than 200 new dermatological applications were released on several operating systems. Our analysis also demonstrates the volatility in the mobile market, as several of the top reviewed dermatologic applications in 2012 no longer exist. The median price of dermatology apps has also increased (\$2.99 in 2012 to \$3.99 in 2014).

The increase in teledermatology apps within the market in the last two years parallels advances in healthcare consultation services and photo-resolution, including Super Retina display, on mobile devices. Teledermatology applications can serve a multitude of purposes. With poor access to dermatologists in rural areas, teledermatology is a reasonable alternative to care for the underserved and global populations. AccessDerm, sponsored by the American Academy of Dermatology, is one particular application that provides consultations to remote areas in the United States. As the average wait time to see a dermatologist currently exceeds 4 weeks, teledermatology can also provide a quicker method for skin evaluation. Primary care doctors may find utility in teledermatology to screen patients with skin concerns via a quick dermatology consult prior to a referral [6, 7]. Teledermatology may also substitute for follow up visits, because patients may be able to track treatment progress via photographs sent directly to their dermatologist without an office visit.

The most reviewed teledermatology app, DermLink.md, was released in September 2012 and provides 24/7 online care with a consultation within two business days. Apps such as these provide high quality care in a convenient and cost-effective manner. As access to healthcare continues to improve and more patients seek the advice of a dermatologist, teledermatology can serve as a triage platform to analyze the need for an office-based referral and manage care for certain patient populations. However, these consultation fees are not covered by insurance companies and may pose a barrier to underserved patients.

There are several limitations in this current study. Although mobile applications are growing in popularity, our analysis may overestimate the use of teledermatology in the mobile platform. Web-ready applications for dermatologic consultations may provide an easier method for patients inquiring about an acute complaint rather than downloading a mobile application device. Popular web-based teledermatology resources, such as Direct Dermatology, do not have mobile based equivalents for their services. To our knowledge, there is no database of web-based teledermatology services available to provide a more accurate representation of its recent growth. The mobile platforms were searched by two independent researchers (SP and ME) accounting for some degree of subjectivity. Lastly, quantification of user reviews of mobile applications may have limitations. User reviews do not reflect the number of times the app was used and has its own bias in portraying the quality of the mobile application [8]. Number of downloads per mobile application or number of users may provide more information about its popularity; however, most mobile platforms do not publicly reveal that information.

The future direction of mobile applications is unclear but there are many potential benefits. Mobile applications may provide patients with easier access to reference material for a particular disease, physicians with a portal to store images, and healthcare professionals in training with educational resources, among others [8]. However, there is no editing process prior to mobile application release. Risks regarding inaccurate or inapplicable information must be weighed prior to suggesting mobile application devices to our patients or for our own use. Several applications on the market, such as Rheumatology Calculator, have already been scrutinized for providing misleading information regarding diagnostic severity. Dermatology applications that involve similar assumptions may also provide false, and often worrisome, recommendations. In early 2014, the FDA tightened jurisdiction over many "mHealth" devices that provide direct diagnosis or treatment to ensure patient safety and monitor application functionality [4].

New mobile apps are released daily and they provide a wide variety of information for patients and healthcare providers. As technology advances, mobile applications may replace certain aspects of current healthcare, but physicians must be aware of the quality of mobile applications prior to using or recommending the resource to patients.

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Appendices

Table 1. Total Dermatology Mobile Applications in 2014 versus 2012

Category	Android	Apple	Blackberry	Nokia	Windows	Total, No (%)	Total (2012), No (%)
Reference	14	43	0	0	1	58 (15.9)	61 (26.6)
Self-Surveillance/diagnosis	19	24	1	1	2	47 (12.9)	41 (17.9)
Disease Guide	33	21	13	0	5	72 (19.7)	39 (17.0)
Educational Aid	21	26	1	0	0	48 (13.2)	20 (8.7)
Sunscreen/UV Recommendations	10	19	2	0	3	34 (9.3)	19 (8.3)
Calculator	2	13	1	0	0	16 (4.4)	12 (5.2)
Teledermatology	8	23	0	0	1	32 (8.8)	8 (3.5)
Conference	3	2	0	0	0	5 (1.4)	6 (2.6)
Journal	5	7	0	0	0	12 (3.3)	6 (2.6)
Photograph storage/sharing	4	9	1	0	0	14 (3.8)	5 (2.2)
Dermoscopy	0	5	0	0	0	5 (1.4)	2 (0.9)
Pathology	1	2	0	0	0	3 (0.8)	2 (0.9)
Other	4	13	2	0	0	19 (5.2)	8 (3.5)
Total Applications, No (%)	124	207	21	1	12	365 (100.1)	229 (100.0)

Table 2. Most Reviewed Dermatology Mobile Applications in 2014

Application	No. of Reviews	Category	Application Description	Platform	Cost \$
Ultraviolet-UV Index	647	UV recommendation	Displays current UV index with advice on sun protection	Apple	Free
Visual Dx	455	Reference	Offers over 29,000 images for 1,300 skin conditions	Android, Apple	30 day free trial, then requires subscription
FotoSkin	401	Photograph	User can perform periodic	Android,	Free

		storage	photograph registry for disease surveillance	Apple	
Doctor Mole	270	Self-Surveillance	User captures photo of moles and the application gives instant “ABCDE” feedback	Android, Apple	4.99
EPAs SunWise UV Index	95	UV recommendation	Provides hourly UV intensity	Android	Free
Acne Treatment	89	Disease Guide	Disease guide for managing and coping with acne	Android	Free
SpotMole Plus	84	Self-Surveillance	User captures photo of moles and the application detects melanoma risk, Ad free version of SpotMole	Android	1.71
SpotMole	84	Self-Surveillance	User captures photo of moles and the application detects melanoma risk	Android	Free
Dermatology	84	Educational aid	Guide to common dermatologic conditions including images and symptoms	Android, Apple	4.99
Skin Conditions	74	Reference	Guide to symptoms, prevention, and treatment of skin disease	Android	Free