Use of Mobile Applications in Dermatology

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Abstract

Smartphones and applications related to the same are ubiquitous now. As dermatologists, we have a wide array of smartphone apps at our disposal which we can use to improve our practice in all aspects—clinical, academic, research, and administrative. This article provides an overview of available apps, tips on using apps—both general and specific for dermatology, as well as discusses the scientific validity of some of these apps and the future of smartphone apps in the context of dermatology.

Key words: Mobile app, smartphone, telemedicine

Introduction

The number of smartphone users has been increasing steadily over the last decade all over the world. In India, by 2022, the number of smartphone users is expected to increase to approximately 859 million.[1] The approximate number of applications (“apps” for short) available for smartphones, at the end of the second quarter of 2019, on Google Play store, and Apple store, was 2.46 million and 1.96 million, respectively.[2]

The concept of “mHealth” (mobile health) refers to medicine and public health services through mobile device usage and reinforcement. The most common type of mHealth use is in the form of SMS and mobile applications. Diabetes has the highest number of mHealth applications as far as a single disease is concerned.[3,4] At the end of the second quarter of 2019, there were about 40,596 medical related apps on Google Play store[5] and 47,878 on the Apple app store.[6]

The number of dermatology apps available has also increased significantly over the last decade. The growth of dermatology apps, in terms of numbers, has been shown to correspond to the growth of the number of apps in general. Some of the most popular apps in dermatology are in areas of teledermatology and dermatology reference material.[7,8]

This article discusses the common categories of apps relevant to the practicing dermatologist, and delves into detail regarding some of the important individual apps.

Classification

Medical apps in general can be categorized according to the primary function of the app.

Broadly, healthcare apps can be classified into two categories:[9]
1. Apps primarily for the healthcare provider
2. Apps primarily for the patient/lay public.

Apps for the dermatology healthcare provider can be categorized into the following:
- General utilities (chat/meeting apps, scanning apps, notes, calendars/reminders, timers, presentation tools/remotes, data storage)
- Educational resources (textbooks, journals, conferences, drug formularies/dispensing guides, medical association apps, teaching tools)
- Practice aids (Photography/videography related apps, dermoscopy, histopathology, calculators, electronic medical records, teledermatology apps, online practice forum, and appointment systems).

Choosing an app

As a dermatologist, one’s choice of apps will obviously need to be tailored according to one’s practice. For example, mole mapping apps or apps helping in early detection of melanoma may not be very relevant if one practice in an area where melanoma cases are hardly seen.

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If there are many apps for the same indication, the factors affecting choice would be:

- To make sure that one really needs an app before one decides to install it.
- Cost (free or paid) – Obviously, if an effective app is available free, it will make sense to choose it over a paid app. However, it is still important to check in detail what extra benefits are offered in the paid version. For example, sometimes the only difference between a free and paid app is that the paid version is ad-free. Most apps offer a trial version for paid apps and this can be used to get feel of the app and understand the pros and cons of the same.
- User friendliness -- Chances are, the more complicated an app, the less people use it. App interfaces need to be simple, yet effective. However, interfaces, which look complicated initially, might actually just need a couple of days of practical use to make it feel simple.
- Storage and confidentiality (for conditions involving patient data) – It is important to go through the end user agreements in detail to ensure that the app ensures data confidentiality, especially in the case of patient images or health records. To read the fine print carefully, before one clicks “agree” for any app.
- Ease of access across platforms (android, iOS, Windows) – especially for apps that require collaboration with other doctors or involve patient log in. To check compatibility with one’s device, operating system and also to give preference to apps which are available across platforms, so that one can continue to use them in case one decides to migrate to a different platform.
- To look at the reviews page. For all apps, there are positive and negative reviews; to go through both to get a true picture. Also to ask people who have already used the app.
- To update apps whenever an update is available.
- For patient-targeted apps, It is better to try using them oneself so that one is in a position to effectively advise patients regarding the same. One may also flag or report apps which are giving out misleading information or in any other way can lead to patient harm.
- To delete apps which have become redundant (e.g., conference apps)
- Need to contact the developers in case one feels that there is some way the app can be improved. Developer contacts are usually available along with other details related to the app, like reviews, number of downloads, system requirements, and size of the app.

**Popular apps for dermatologist**

Dermatologists frequently use general apps in their daily practice. General productivity related apps like Evernote, Presentation apps, Grammarly, document creators/editors, Scanning tools, etc., are quite useful for doctors in general.

A variety of photography (and storage) related apps are available. Photo-editing apps like Adobe Photoshop express and Snapseed are very useful, as are apps like “DSLR photography training” which give tips on settings for DSLR photography. Other apps which are useful in smartphone photography include ImitoCam Enterprise, an app which can be used to document cases as well as follow-up. The app is connected to a backend service “imitoConnect” for linking into an electronic medical record (EMR) system. Smartphone Torch related apps can be useful in patient examination. Instant messaging apps, like Whatsapp, can be used for following up of patients as well as taking opinions from colleagues, within existing legal frameworks. Instant messaging apps have been found to be useful in various aspects such as: disease management, triage, screening, home monitoring, education, and administrative work.

General healthcare apps which serve as point of care aid, which are frequently used by dermatologists in their practice, include general apps like Medscape, UpToDate, AccessMedicine, and Epocrates. Other general apps, which can be useful to the dermatologists are education/teaching related apps, like Socrative. Socrative helps to make classes more interesting by using quizzes, quick polls, and learning games. Concept map/mind map apps can also be useful as teaching tools (like “miMind - Easy Mind Mapping” app).

Survey apps, like Survey Monkey and instant poll tools, like Slido, are other useful tools. Slido can be used for instant live polls during presentations, panel discussions, or classes. Dermatologists also utilize online appointment apps (like Practo in India). A variety of electronic medical record (EMR) apps are also available across platforms (like “Medical Records”). There are also apps which can help patients to organize their medical records (like “Andaman”).

**Apps specific for dermatology**

A study by Tongdee and Markowitz, used “App Annie” an app analyzer to evaluate rankings for mobile apps in dermatology (only for the iOS platform). Of the 29 apps, which were included in the final rankings, 18 were patient oriented apps and 11 targeted physicians. None of the included apps targeted both physicians and patients. The highest rankings were for self-surveillance/teledermatology apps and reference apps. The majority of self-surveillance apps were related to skin cancer detection. This study also suggested that a general shift in the demographics of app users to a younger age group might have significant effect on the relative popularity of apps, both among physicians and patients. For example, reference apps might be more popular because in general residents or medical students...
may more commonly use these. Patients who suspect that they have an STD and who take images of the skin lesions and consult a board certified specialist, can use an interesting new app called “STD triage—Anonymous doctor.”

Point of care aid like “Derm101” are frequently used by dermatologists (besides the general reference apps like Medscape or UpToDate). However many of these point of care apps are either paid, or require a separate subscription. Among the paid reference apps, some of the most popular ones are: dermatology DDx (unbound medicine)—containing multiple high quality images and serving as a point of care reference for dermatologists. Another group of paid apps is the Fitzpatrick’s Dermatology Flash cards, Fitzpatrick’s Dermatology, 9th Edition, 2-Vol. Set and Fitzpatrick’s Atlas and Synopsis of Dermatology (8th edition), all “ready references” developed by Usatine media.

Dermoscopy related apps are also becoming increasingly popular. In addition to apps by dermoscope manufacturers, there are other apps, which help in-patient initiated teledermoscopy. One such app is “Sklip” which combines a simple dermoscope which the patient needs to purchase and which can be attached to any smartphone, with expert consultations for dermatoscopy assessment and follow up of moles. It also provides a free basic dermoscopy tutorial for the general public. YouDermoscopy—this app has a game like interface with different levels for getting trained in basic dermoscopy. Available on both android and iOS, the app is free. “Dermoscopy two step algorithm” is another useful dermoscopy training app. “DermEngine” and “Molescope” are two apps by MetaOptima technology, which combines features of dermoscopy, image storage/organization, and teledermatology. Dermatopathology related apps—for dermatopathology records and related teleconsultations included apps like Dermapth Droid and also reference apps like “MyDermPath+”. Cosmetic and plastic surgery is another area where smartphone apps have been used effectively.

Smartphone apps have also been developed to provide information to consumers about chemical substances in cosmetic products, which can be useful in the context of contact dermatitis. Among society/association related apps, some of the popular ones available include the IADVL derma app (Indian Association of Dermatologists, Venereologists and Leprologists), “Dermatology A-Z” and “Dermatology World” (American Academy of Dermatology). Medical Student: Dermatology (by British Association of Dermatologist) and EADV events (European Academy of Dermatology and Venereology).

There are a multitude of journal apps, some of the most popular being Journal of American Academy of Dermatology, International Journal of Dermatology, British Journal of Dermatology, and Journal of Clinical and Aesthetic Dermatology.

There are many apps which help students learn skin anatomy, including 3D anatomy models, like “Skin Anatomy” and apps for studying skin dermatomes, which can come useful in conditions like herpes zoster.

There are many lecture-based apps which also cover dermatology topics (like “Dr. Najeeb Lectures”) and some specifically for dermatology (like “Dermatology by Dr. Manish Soni”). There are also apps which can help in examination preparation for medical students and residents like “Dermatology Exam StudyToken,” “DYP Guide for Dermatology,” and “Dermatology Exam Review App: Study Notes & Quizzes.” Apps for mnemonics, specifically for dermatology are also available (like “Dermatology Mnemonics”). An app “scoring/calculator apps” for dermatology related indices like PASI and SCORAD is available (“Scorad phone,” “SCORAD—SCORing Atopic Dermatitis Calculator,” and “PASI Calculator—Psoriasis Area Severity Index”).

**How efficacious are dermatology related apps?**

As apps continue to grow, it has been suggested that the most important role of dermatologists is to take advantage of the technology, ensure judicious use, and also make sure that there is some kind of regulation of the scientific content and minimize harm. There are some studies dealing with the efficacy of specific apps, but there is a need for larger high quality studies. A study by Masud et al., graded 44 dermatology apps, using a rubric based on four criteria—objectives, content, accuracy, and design. The study found that only 9 out of 44 apps scored high on the rubric, indicating that most of the major apps need revisions to improve effectiveness. It has been shown that some of the popular apps are not necessarily associated with high scientific validity.

A systematic review of smartphone-based teledermatology, including 12 studies related to automated smartphone based apps concluded that evidence of safety and efficacy of automated smartphone medical apps is still lacking. A recent study from the Netherlands involving 199 lesions also concluded that the smartphone based rating of the automated risk assessment for basal cell carcinoma was poor. A review of two cohorts of lesions published in two studies regarding the use of smartphone applications for triaging suspicious...
melanoma concluded that accuracy of these applications was low and that there were a significant number of missed melanomas.[19] A study using simulated patients to evaluate telemedicine websites and apps conclude that there are concerns with respect to transparency, choice, thoroughness, diagnostic, and therapeutic quality.[20]

Artificial intelligence apps like SkinVision have been used for fractal and classical image analysis for the risk assessment of skin lesions for melanoma and non-melanoma cancers, and have shown to have high specificity and sensitivity.[21] Interestingly, another study has shown that patient knowledge regarding skin cancer related apps was quite low, in spite of high interest.[22] Dermatologists need to play an active role in educating patients about the diseases as well as apps related to the same. For this to happen the dermatologist needs to be aware of the apps themselves and the pros and cons of the same.

As far as decision-making tools are concerned, a study on a tool for psoriasis, MDi-Psoriasis showed that it could generate recommendations comparable to those of experts in psoriasis.[23]

A recent study regarding the effectiveness of eczema self-management apps evaluated 98 apps and concluded that 34% of the apps provided misleading information. None of the included apps complied well with the three criteria, which were mainly studied- educational information, tracking functions and health information principles.

The “ItchApp®” is like an e-Diary for the assessment of pruritus and has been validated in English, Polish, and German.[24]

There are quite a few apps, which aim at improving adherence to treatment. A single blind, randomized control trial for an app which gave pop-up reminders to patients on topical treatment for psoriasis concluded that adherence to treatment was improved. The app was also linked to an electronic monitor, which recorded the amount of medicine applied and frequency of application.[25] An app providing personalized advice of sun protection was found to be associated with improved sun protection.[26]

For some patient directed apps (like sunscreen use reminder), it has been suggested that while the apps may indeed improve adherence or compliance, it is often not very easy to really quantify this behavioral change.[27]

Medicine dispensing apps are also being increasingly used in dermatology. “DernaComp” is an app available on iOS, which helps dermatologists in designing specialized, personalized topical medications. A pilot study assessing the utility of the app concluded that the app scored high on content, navigation, design, and usefulness.[28]

As far as use in dermatology teaching was concerned, a smartphone-based wallpaper learning module was found to be effective in helping medical students and residents learn about fungal morphology.[29]

The future
Artificial intelligence and computational neural networks for the diagnosis of skin diseases is an exciting new field. Artificial intelligence has been explored effectively in the diagnosis of conditions like melanomas, non-melanoma cancers, as well as other inflammatory and infectious dermatoses.[30-33] A study from Sanford reported that the ability of neural network based technology to diagnose skin cancer was comparable to board certified dermatologists.[34]

The big thing in the future of mobile applications is likely to be the more effective incorporation of artificial intelligence (AI) into apps. At present, there are AI-based apps for diagnosis of skin conditions targeting both physicians and patients. For patients there are apps which claim to be useful in triage and follow-up of conditions ranging from eczemas and moles/melanomas to cosmetic conditions. Some examples are tibot (eczemas), DermIA (mole/melanomas), SkinVision (mole/melanomas), My SkinCoach (cosmetic). Scientific validity, especially for patient targeted apps is still a major concern and most of these apps do put up a disclaimer to that effect. One app, recently developed by Nurithm labs and All India Institute of Medical Sciences (AIIMS), Delhi, is DermaAld. DermaAld is a decision support tool for non-specialist dermatologist available on both Android and iOS. It uses a combination of patient images and other input in the form of patient symptoms. Over the last year the app has had more than 5,000 download on Play store. Another recent app, for generating differential diagnosis for dermatologists, is Dermion. Entering one line of descriptive text related to the presentation (e.g., “black, itchy plaque”) will generate a list of possible differential diagnosis to consider. The app has more than 500 downloads as of now.

However, it should be mentioned that one of the keys to developing successful apps in dermatology would be the active involvement of dermatologists in the development phase. As of now most apps do not have clear disclosure statements regarding involvement of professionals in the development phase. This would be especially important for apps involving patient diagnosis.[35] The development of more evidence based, personalized and dynamic apps is the need of the hour.[36]

Conclusions
Smartphone and apps have become ubiquitous. Dermatologists need to be aware of the variety of apps available to improve their practice. Apps are likely
to become more versatile and effective in future. At present, key concerns regarding apps are scientific validity—especially for patient related apps and the need for more involvement of dermatologists in the development phase. AI-based apps and apps with more personalization options could be the future of dermatology apps.

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**Conflicts of interest**

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