

Mobile Applications for Allergic Rhinitis

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Abstract

Objective: To study and review the currently available mobile applications relating to allergic rhinitis.

Methods: The Apple and Google mobile app stores were queried with search terms relating to allergic rhinitis. Apps were assigned to categories and analyzed based on description and characteristics such as popularity, reviews, cost, platform, and physician involvement in development.

Results: A total of 72 apps related to allergic rhinitis were identified. Fifty-four apps were unique, with 18 apps found on both operating systems. Forty (55.5%) apps were available in the Apple App store, and 32 (44.4%) apps were available in the Google Play app store. They were grouped into the following categories: patient education (18; 25%), journals (15; 20.8%), symptom tracking (14; 19.4%), clinical/private practice (13; 18.1%), pollen forecast (7; 9.7%), medical education (4; 5.6%), and other (1; 1.4%). The majority of apps were free of charge (67; 93.1%), with paid apps ranging from \$1.47 to \$4.99. Apps that were reviewed had an average rating of 3.9 out of 5. Physicians were involved in the development of 37 (51.4%) apps.

Conclusions: The collection of mobile apps developed for allergic rhinitis includes those for both educational and clinical use. Mobile apps may have an increasing role in otolaryngic allergy and rhinology practices in the future. Thus, continued research is warranted to determine the best way to ensure the accuracy and quality of app content as well as the extent mobile apps can benefit allergic rhinitis patients.

Keywords

mobile applications, allergic rhinitis, apps, smartphones

Introduction

With the extremely rapid rise in ownership and use of smartphones in the US, the use of mobile health (mHealth), which is defined as medical and public health practice supported by mobile devices, has also expanded.^{1,2} In 2017, 77% of adults in the US reported owning a smartphone, up from 35% in 2011.³ Mobile health applications (apps) are increasingly being used by health care professionals and patients.^{4,5} They have already had a profound effect on the field of medicine, with mobile apps being used as diagnostic tools in clinics, educational resources in classrooms, and health guides in patients' homes.

Over the past decade, with the development and refinement of the iOS and Android mobile operating systems, the number of mobile apps related to health conditions has increased significantly. A recent review of 247 papers identified over 3672 apps on health conditions, with the most popular conditions being diabetes, asthma, and

depression.² Previous studies have also examined mobile apps useful to otolaryngologists in their daily practice,⁶ the collection of mobile apps in otolaryngology-head and neck surgery as a whole,⁷ as well as the readability of mobile apps for specific diseases such as gastroesophageal reflux disease (GERD).⁸

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Table 1. Total Applications.

Category	Android	iOS	Total, No (%)
Patient education	12	6	18 (25)
Journal	7	8	15 (20.8)
Symptom tracking	7	7	14 (19.4)
Clinical/private practice	7	6	13 (18.1)
Pollen forecast	5	2	7 (9.7)
Education	2	2	4 (5.6)
Other	0	1	1 (1.4)
Total applications, No (%)	40 (55.6)	32 (44.4)	72 (100)

Although analyses of specific apps created to track allergic rhinitis symptoms exist in the literature,^{9,10} there has been limited research conducted on the expanding collection of apps related to allergic rhinitis. Allergic rhinitis affects an estimated 15% to 30% of the US population and has been associated with decreased quality of life as well as decreased performance at school and work.^{11,12} Many mobile apps have been developed for individuals with allergic rhinitis, including those designed for users to learn about the disease, track their symptoms, and obtain allergy forecasts. The purpose of this study was to identify, categorize, and review the current selection of mobile apps related to allergic rhinitis.

Materials and Methods

Mobile apps were queried in March 2018 within the US Apple iOS app store and the US Google Play Android app store. These 2 mobile platforms were chosen on the basis of their popularity, with US market share of Google's Android mobile operating system at 63.2% and Apple's iOS mobile operating system at 35%.¹³ The iOS apps were queried using the app store application on an iPhone 7 (iOS 11.0.3), and Android apps were queried on the Google Play store website.¹⁴

The following search terms were used: *allergy, allergic rhinitis, rhinology, seasonal allergies*. Apps that were related to allergic rhinitis were selected based on descriptions from the app stores. Exclusion criteria included apps that were developed for food allergies, weather, general medicine, and advertisement or were non-English. Apps were then categorized into the following groups: patient education, journal, symptom tracking, clinical/private practice, pollen forecast, medical education, and other. For apps that were found on both platforms, reviews were totaled and averaged. Other data collected for each selected app included app name, cost, and physician involvement with development, which was determined from app description.

Results

A total of 72 apps related to allergic rhinitis were identified. Fifty-four apps were unique, with 18 apps developed for

both operating systems. Forty (55.5%) apps were available in the Apple App store, and 32 (44.4%) apps were available in the Google Play app store. The majority of apps were free of charge (67; 93.1%), with 5 (6.9%) paid apps ranging in price from \$1.47 to \$4.99. Overall, 51.4% of the apps identified stated that there was physician involvement in development, and 48.6% of the apps had no clear description of physician involvement.

Categories

Apps were grouped into the following categories (Table 1): patient education (18; 25%), journals (15; 20.8%), symptom tracking (14; 19.4%), clinical/private practice (9; 18.1%), pollen forecast (7; 9.7%), medical education (4; 5.6%), and other (1; 1.4%). Apps categorized into the patient education category included apps designed to teach patients about allergic rhinitis. The journal category included apps containing abstracts and articles for journals and apps designed for conferences and meetings. Symptom-tracking apps allowed patients to track symptoms in a log or diary, with several apps also including pollen forecasts. Clinical/private practice apps were those that were created for patient use in clinical settings with physicians, with several specific to private practice groups. Medical education included apps created with the goal of educating health care professionals such as medical students, residents, and practicing physicians.

User Ratings

Thirty-two apps (44.4%) had no user ratings. Among the apps with user ratings, 3 apps had greater than 1000 reviews, 4 apps had 100 to 1000 reviews, 13 apps had 10 to 100 reviews, and 11 apps had less than 10 reviews. Apps that were reviewed had an average rating of 3.9 out of 5. The most reviewed apps are shown in Table 2, based on the total number of reviews for each app.

WebMD Allergy was the most reviewed app and provides a personalized allergy and weather forecast, allows users to track symptoms and treatments and add notes to an allergy tracker, and shows doctor-approved tips. Zyrtec Allergycast provides pollen counts and forecasts, symptom tracking, and an Allergy Impact score to determine how users might feel. Pollen.com's Allergy Alert shows pollen and allergy forecasts and allergen information and allows users to keep an allergy diary to track symptoms. Austin Allergy provides pollen and mold counts as well as allergy forecasts for central Texas. Allergy Pollen Count reports pollen and mold counts and provides short educational videos created by an allergist. Pollen allergy warning Sweden sends notifications to users in Sweden when pollen levels rise. Hayfever Pollen Forecast provides daily pollen forecasts specific to the UK. AllergyMonitor allows users to

Table 2. Most Reviewed Applications.

Application	No. of Reviews	Average Rating	Category	Platform	Cost	Physician Involvement in Development
WebMD Allergy	6656	4.35	Symptom tracking	iOS/Android	Free	Y
Zyrtec Allergycast	5282	3.00	Symptom tracking	iOS/Android	Free	Y
Pollen.com's Allergy Alert	1583	3.26	Symptom tracking	iOS/Android	Free	N
Austin Allergy	373	4.21	Pollen Forecast	iOS/Android	Free	N
Allergy Pollen Count	223	4.12	Pollen forecast	iOS/Android	Free	Y
Pollen allergy warning Sweden	211	3.60	Pollen forecast	Android	Free	N
Hayfever Pollen Forecast UK	114	3.70	Pollen forecast	Android	Free	N
AllergyMonitor	91	4.40	Symptom tracking	iOS/Android	Free	N
Allergy Acupressure Treatment	87	4.09	Patient education	iOS/Android	Free	Y
drawMD	87	4.40	Patient education	iOS/Android	Free	Y

record daily allergic rhinitis and asthma symptoms. Allergy Acupressure Treatment is an app that teaches patients how to use massage techniques to relieve allergic rhinitis symptoms. drawMD provides patients with medical illustrations to help them understand common ENT conditions. Among the most reviewed apps, the highest rated apps in descending order were AllergyMonitor, drawMD, and WebMD Allergy.

Discussion

The rise in use of smartphones and increased use of mobile apps in the US has been meteoric, with 77% of Americans now owning smartphones.³ Despite the ubiquitous use of smartphones and mobile apps, there has been limited research on the current selection of apps for allergic rhinitis. The present study seeks to identify, categorize, and analyze the currently available mobile apps for allergic rhinitis for patients and health care professionals.

In our study, 54 unique apps related to allergic rhinitis were identified. The popularity of apps for allergic rhinitis is evidenced by the total number of reviews—the 2 most reviewed apps related to allergic rhinitis have together, been reviewed 10 000 times, with most reviews created by users of the Google Play app store. Although more users reviewed apps from the Google Play app store, there were more apps related to allergic rhinitis from the Apple app store (55.5%). Most reviews were positive for these apps, with an average rating of 3.90 out of 5, indicating that users were generally satisfied. Many criticisms of these apps involved software bugs such as apps crashing, not opening, or freezing, but some users also complained about inaccurate information in the apps. However, a large portion of apps did not have user ratings (44.4%), which could prove problematic for users trying to determine the quality of apps.

Several studies have explored the use of mobile apps in the field of otolaryngology, including the use of apps by physicians and patients.^{6-8,15} A few studies have also

described the development of mobile apps by physicians specifically for patients with allergic rhinitis such as m.Carat (15 reviews, Android, free, 3.60 out of 5) and Allergy Diary (54 reviews, iOS/Android, free, 4.00 out of 5).^{10,16} Based off the Control of Allergic Rhinitis and Asthma Test (CARAT),⁹ which was the first questionnaire developed to assess control of both asthma and allergic rhinitis concurrently, m.Carat is a mobile app developed with physicians where allergic rhinitis and asthma patients record their exacerbations, triggers, symptoms, medications, lung function tests, and visits to the doctor or hospital. Using the app patients can also receive information and news about asthma and allergic rhinitis as well as create medication and task notifications and synchronize records with an online database.¹⁶ Similarly, Allergy Diary is another app developed in conjunction with physicians for the MASK-rhinitis (MACVIA-ARIA Sentinel Network for allergic rhinitis) study,¹⁷ with the goal of assessing allergic rhinitis symptoms and identifying phenotypic differences between allergic rhinitis patients. With this app, patients input a daily visual analog scale score–based assessment of allergic rhinitis control.¹⁰ The Allergy Diary app has also been utilized to assess the impact of uncontrolled rhinitis on work productivity.¹⁸ Unfortunately, Allergy Diary is not yet available in the Apple or Google US app store. These 2 apps were both developed with significant physician involvement and are already being integrated into clinical use by health care professionals and researchers to further improve the diagnosis, treatment, and long-term management of patients with allergic rhinitis.

There were several other popular apps that were also developed with physician involvement, including WebMD Allergy, Zyrtec Allergycast, Allergy Pollen Count, and drawMD, detailed in Table 2. Overall, physicians were only involved in the development of 51.4% of the apps identified, with this number being inflated by the sizeable percentage (18.1%) of apps developed specifically for private practices. More concerning was that among the patient

education category of apps, physicians were only involved in development of 20% of these apps. This low level of physician involvement poses many challenges and raises questions about the clinical validity of app content. Numerous studies have questioned the quality and safety of health care apps, and one issue often reported is the low physician involvement (12%-35%) in the development of these apps.¹⁹⁻²³ One study investigating the current selection of mobile apps relating to otolaryngology-head and neck surgery found that only 52% of apps involved physicians in their development.⁷

Regulatory oversight of mobile health apps has also been very limited, with the latest FDA guidance from February 2015 indicating that the agency will only regulate a small subset of mobile apps that are intended to be used as an accessory to a regulated medical device or transform a mobile device into a regulated medical device.²⁴ Without physician involvement or any regulatory oversight, apps can misinform and in the worst case, cause harm to patients. Thus, a risk framework where increased regulation is required for apps that pose higher risk to patients should possibly be considered; namely, low-risk apps may be assessed by a clinician, medium-risk apps may undergo peer review, and high-risk apps may undergo regulation by a government agency.²⁵

There were a few limitations to our study. In the selection process, many general medical apps that could be valuable resources for both health care professionals and patients were omitted because they were not specific to allergic rhinitis. Furthermore, our search was limited the US Apple and Google app stores, which may have limited the total number of apps identified. Another limitation was the lack of data on the number of times each app was downloaded in the app stores: The Apple app store does not show the number of total app downloads, and the Google app store provides a range instead of a number of total app downloads. Finally, app information was limited by information provided by app stores. Despite these limitations, this study provides a thorough overview of the apps currently available for allergic rhinitis.

Ultimately, understanding the currently available apps related to allergic rhinitis will lead to future development of better apps. With the categorization and review of apps related to allergic rhinitis, we found that there were many apps designed for patient use, including those for patient education, symptom tracking, and clinical use. These categories of apps made up almost two-thirds of the currently available apps. However, there was a lack of apps that focused on medical education (5.6%). Future app development should focus more on creating apps that are designed to educate practicing physicians and residents. Furthermore, physicians may need to be involved in the development of all apps created for patient use and patient education.

Conclusion

The large collection of mobile apps developed for allergic rhinitis information demonstrates the great potential of these apps for both educational and clinical use. Mobile apps are likely to play an important role in otolaryngic allergy and rhinology practice and should be considered a powerful tool for health care professionals. Continued research is warranted to determine the best way to ensure the accuracy and quality of app content as well as determine the extent mobile apps can benefit allergic rhinitis patients.

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