# Persian mHealth Apps: A Cross Sectional Study Based on Use Case Classification

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**Abstract.** Mobile health apps play an important role in healthcare processes and health promotion. In recent years many Persian mhealth apps were developed and are available in various national app markets. Cafebazaar is the largest Persian app store that contains more than 3500 android apps in medical and health & fitness categories. In this study some characteristics of 200 top Persian medical apps of Cafebazaar were investigated and then categorized by their use cases. Results showed that only 6% of apps declare the involvement of at least one health professional in the conception or development of the apps. In 35% of studied apps, no contact information was provided for the users and 10.5% applied reliable sources for their content. 13 distinct use cases were found in all 200 apps of which two were new to an already published use-case model. This study shows that Persian mHealth apps, like other existing apps in the world, have a long way to improve and reach some basic standards. Lack of regulatory agencies and absence of a dynamic evaluation system for mHealth apps might be the main reason of these defects. This study also shows that 20 use cases existing in international health related apps are not yet used in Persian apps and therefore there is a reach potential of creating new apps in mHealth field.

**Keywords.** m-health apps, use case, classification, Persian apps

## 1. Introduction

Rapid development in the field of mobile health (mHealth) devices such as smartphones and tablet computers has caused increasing employ of these applications to collect or deliver health care information and data. The potential advantages of these applications are patients and providers' active involvement and health outcomes improvement [1]. Therefore, mHealth applications have great potential to advance health care quality and reduce related costs [2].

By the fourth quarter of 2015, the total number of mHealth apps downloads worldwide had reached 3 billion regarded to 165,000 apps on the market; this has made the mHealth industry worth $10.2bn [3].

Google play and Apple's app store are at the first marketplaces for Android and iOS systems respectively in terms of usage volume and number of apps availability [4, 5]. However, Iranian users mainly prefer to download their needed apps from national app markets. Cafebazaar is the largest Persian app store and includes more than 3500

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android apps in medical and health & fitness categories (about 1600 apps in medical category and more than 1900 apps in health&fitness category). Similar to Google play and Apple's app store, Cafebazaar has been classified based on two main categories: medical and health & fitness. There is no other classification or directory to facilitate access to the apps [6].

The application stores would be utilized more effectively if a use case based classification of these apps were developed to facilitate access to the right application [5].

The main aim of this study was to investigate the characteristics of Persian medical apps and to discover the various use cases provided by these apps.

## 2. Materials and Method

A cross sectional descriptive study was conducted from November 2015 to February 2016. The top 200 Persian medical apps in Cafebazaar (of 1600 medical apps) were installed and analyzed. These applications were divided into two major categories according to their target users: apps that address the health professionals and apps that address the general public. The use cases and some other characteristics including the participation of a healthcare professional expert in app development process, existence of contact information for the users, usage of reliable and valid bibliographic references, existence of general terms and condition of use, and existence of a data privacy policy were investigated.

For each app, the information including the provided use cases and the above mentioned characteristics were extracted by three experts in medical informatics and health information management field. We then mapped the uses cases with a model proposed by Yasini&Marchand [5]. If we could not find an already existing use case in the model to map our use cases, a new use case was added.

## 3. Results

Of 200 reviewed apps, 111 (55.5%) were free, 50 (25%) were paid apps and 39 (19.5%) had In-app payments. Table1 illustrates the studied characteristics and their frequency in the top 200 mHealth apps.

**Table 1.** Studied characteristics and their frequency in analyzed apps

| Characteristics | Number of apps (%) |
|---|---|
| Clinical expert involvement in the app development process | 12 (6%) |
| Ability to Contact the developers | 130 (65%) |
| General terms and conditions of use | 25 (12.5%) |
| Existence of reliable content | 160 (10.5%) |
| Existence of privacy policy for the collected data | 0 (0%) |

Eleven use cases were found in all 200 analyzed apps. We could map nine use cases with the model proposed by Yasini and Marchand [5]. Two new use cases were added to this model: "Presenting and/or advertising a health institution" targeted to the general public and "Medical dictionaries" targeted to health professionals.

For all discovered use cases, nine (82%) were related to the general public including patients and healthy individual users and only two use cases (18%) were related to health professionals. The most frequent use case in Persian mHealth apps

was "consulting medical information" and was present in 180 apps (90%). "Drug database" and "using mobile device as a diagnostic/measurement tool" were the second most frequent use case discovered in the analyzed apps. Table2 illustrates the various use cases and their frequency in the studied apps. Some of these apps were multi-functional and we had to assign more than one use case to them. That's why the total frequency percentage is more than 100%.

**Table 2.** Frequency of Persian mobile health apps by use case

| Mobile health app use case | Frequency (%) |
|---|---|
| Consulting medical information | 180 (90) |
| Drug database | 10 (5) |
| Using mobile device as a diagnostic/measurement tool | 10 (5) |
| Calculate or interpret data | 6 (3) |
| Presenting and/or advertising a health institution ✶ | 4 (2) |
| Communicate/Sharing information among the general public and health professionals | 4 (2) |
| Looking for information about on health professionals/institutions | 3 (1.5) |
| Medical dictionaries ✶ | 2 (1) |
| Health news | 2 (1) |
| Treatment reminders | 1 (0.5) |
| Communicate/Sharing information among the general public | 1 (0.5) |

✶ Added use cases to Yasini and Marchand classification model

## 4. Discussion

In this study we analyzed 200 top Persian mHealth apps in the largest local app market and described some of their characteristics including their various use cases, providing a contact information, the involvement of a health professional in the conception or development of the app, giving reliable content sources and defining the general terms and conditions of use.

In mHealth industry, a wide range of embedded technologies is applied in order to collect and store personal data in a safe way [7]; the collected data includes contacts and calendars and personal patient-reported health data. The data could be entered directly by the user or collected with cameras and other sensors available in smart devices (accelerometer, gyroscope, etc.). This variation may raise the security and privacy risks related to multiple sources including networks, carriers, operating systems and mHealth apps application [8]. Furthermore, the data confidentiality is crucial due to permanent data collection capacity by mobile apps. Therefore, user privacy and confidentiality need to be protected in mHealth apps [9].

None of reviewed applications, reported a privacy policy. The situation seems to be better comparing with western countries, however, Sunyaevet al. reported that only 30.5% of their studied apps, selected from common apps in the Google Play Store and Apple's iOS app Store, provide privacy policies [7]. Another study on thirty-five apps of NHS Health Apps Library reports that 80% had a privacy policy [10].

Clinical expert involvement in the mHealth app development processes is another important criterion that ensures the reliability of health information [11]. This study showed that very small proportions of reviewed apps have been produced with cooperation of clinical expert. This lack of professional involvement in the conception or development of mHealth apps was also reported in other studies in the literature [12-17]. These studies report that the expert involvement in app development process varies

between 12.8% and 48%. Our findings in Persian mHealth apps (6%) is even less 12.8% reported in western studies.

Users' feedback validates the efficiency and usefulness of the app [18]. Among 200 Persian mHealth apps studied, 70 (35%) apps didn't have contact information. This means that developers are deprived of users' suggestions and comments.

In spite the high potential of mHealth for healthcare improving, misuse or misinterpretation happens when using mHealth apps can lead to invalid diagnosis and put the user at risk [15]. Therefore, the general terms and conditions of use that are clearly described may reduce potential risks. A few percent (12.5%) of analyzed apps had addressed this issue.

Since patients and health care providers may make critical decisions based on information provided by an app, it is vital that medical apps be precise and reliable [16]. Therefore, the mHealth apps must be developed based on reliable information resources and references. This study showed that the most of Persian mHealth apps (89.5%) did not mention to have valid references. This may warn Iran's health system to dispense invalid medical and health information in the society with serious consequences. However, our founding is in line with other studies [12, 13, 15, 16, 19] that report the non-adherence of the apps to established guidelines.

Persian mHealth studied apps have two new use cases that we added to our reference model [5]. Twenty-two use cases of the reference model were not provided in our studied apps. This indicates that diversity in western mHealth apps is much more than Persian mHealth apps. This gap may be an opportunity for local app developers and health professionals to plan to enter new areas of app development and providing new functionalities in their apps.

One of the limitation of this study is the number and source of analyzed apps. The top rated apps in the local app store are based on user evaluations with a five star ratings. However, a five-star rating system do not seem to be a reliable evaluation system [20, 21]. Further research with a more important sample and from various sources have to be made to validate these results.

## 5. Conclusion

This study showed that Persian mHealth apps are not in a satisfying situation. Lack of regulatory agencies and absence of dynamic evaluation system for Persian mHealth apps might be the main reasons. Therefore, there is a need to create guidelines for the editors of mHealth apps. The guidelines should include various axes (medical content validity, legal consistency, ethical issues, usability, etc.). The criteria of the guidelines could then be used to set up an evaluation system for mHealth apps.

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