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## Call for Increased Patient Support Focus: Review and Evaluation of Mobile Apps for Tuberculosis Prevention and Treatment

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### Abstract

Tuberculosis (TB) remains a major global public health problem and is a leading killer due to an infectious disease. Mobile applications (apps) could support TB prevention and treatment. App stores were searched and of the 1332 reviewed 24 met our inclusion criteria. For each app 11 functionalities were assessed. The majority were targeted towards clinicians (n=17), few patient focused (n=4). Most had fewer than 4 functions out of 11, *inform* and *record* being the highest. Peer reviewed publications were identified for 2 of the apps and 3 apps in testing stage were found in the grey literature. Apps for TB prevention and treatment had minimal functionality, primarily targeted clinicians, and focused on information or data collection. None were for patient self-management of care and treatment or to improve patient-provider interactions. Identifying TB patient needs and involving them in the design phase is recommended.

### Keywords

mHealth; mobile applications; review; treatment support

## 1. Introduction

The World Health Organization recently reported Tuberculosis (TB) as now rivaling HIV/AIDS as a leading cause of death.[1] In 2014, TB killed 1.5 million people while the estimated death toll of HIV was 1.2 million people which included 0.4 million TB deaths among HIV positive people.[1] Given that most deaths from TB are preventable and nearly all cases can be cured, this death toll is recognized as unacceptably high. Mobile health (mHealth)-based tools, such as smartphone applications (apps), are reported to be an ideal platform for improving health outcomes because of their popularity, connectivity, and increased sophistication.[2] Apps have the potential to support TB prevention and treatment efforts by, for example, supporting healthcare providers in diagnosing TB, and monitoring patient progress as well as providing support to patients to successfully complete treatment. [3]

## 2. Methods

We conducted searches in 3 mobile app stores from within the US during June 2015: Apple iTunes Store, Android Google play Store, and Amazon Appstore. We used the search terms tuberculosis, TB, phthisis, and tuberculose in each of the app stores. Apps were eligible for inclusion if they focused on TB control efforts and excluded if they focused on other

infectious diseases, were games, or unrelated, and not in English, Spanish or Portuguese. For each app 11 functionalities were assessed by two reviewers. Searches were conducted in peer review publications for TB app evaluations and in the grey literature for apps in development or testing.

### 3. Results

1332 potentially relevant apps were identified, with 24 meeting our inclusion criteria. All were free to download, 7 required login/password and were developed for specific clinics or research studies. Targeted users were mainly clinicians (n = 17); few (n = 4) were patient focused. Most apps (n=17) had a total of 4 or fewer functions out of 11 (range 1–6). The most common functionalities were *inform* and *record* (n=15). Some had issues, such as incorrect spelling and grammar, inconsistent responses to data entry, problems with crashing, or links to features that had no data. Eight apps had not been updated for more than a year. Peer reviewed publications were identified for two of the included apps and 3 in the grey literature (not found in the app stores) as in progress, being launched, or tested.

### 4. Discussion

Even though the app market is huge, apps as a potential solution to support TB prevention and treatment are limited in scope and functionality. Almost all of the identified apps targeted healthcare providers as end users, and the majority provided access to a broad spectrum of TB information or to tools aimed to support frontline healthcare workers in monitoring, detecting, and documenting visits. Few TB related apps targeted patients as end-users which limits the potential of these apps to facilitate patient-centered care. None were developed to support TB patients' involvement and management in their care (e.g., follow-up alerts/reminders, side effects monitoring) or to improve interaction with their healthcare providers. Our evaluation shows that more refined work needs to be done in the area of apps for TB. Involving TB patients in treatment in the design of these apps is recommended.

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