Use of Mobile Learning by Resident Physicians in Botswana

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Abstract

*With the growth of mobile health in recent years, learning through
the use of mobile devices (mobile learning [mLearning]) has gained
recognition as a potential method for increasing healthcare provid-
ers' access to medical information and resources in resource-limited
settings. In partnership with the University of Botswana School of
Medicine (SOM), we have been exploring the role of smartphone-
based mLearning with resident (physicians in specialty training)
education. The SOM, which admitted its first class of medical stu-
dents and residents in 2009, is committed to providing high-level
on-site educational resources for resident physicians, even when
practicing in remote locations. Seven residents were trained to use an
Android-based myTouch 3G smartphone equipped with data-
enabled subscriber identity module (SIM) cards and built-in camera.
Phones contained locally loaded point-of-care and drug information
applications, a telemedicine application that allows for the sub-
mission of cases to local mentors, and e-mail/Web access. Surveys
were administered at 4 weeks and 8 weeks following distribution of
phones. We found that smartphones loaded with point-of-care tools
are effectively utilized by resident physicians in resource-limited
settings, both for accessing point-of-care medical information at the
bedside and engaging in self-directed learning at home.*

Introduction

In parallel with the growth of mobile health (mHealth), mobile
learning (mLearning) has emerged as a tool that leverages mobile
technology to increase healthcare providers' access to medical
information and resources, especially in resource-limited set-
tings.[1–5] Across Africa, information needs of healthcare providers are
not being met, and this has been associated with suboptimal delivery
of healthcare to a substantial portion of the world's population.[6]

Mobile devices and wireless networks allow resource-limited coun-
tries to implement information and communication technology
systems by circumventing low bandwidth and substandard computer
resources.[3,7–9]

Botswana has a national public health system made up of health
posts, clinics, primary hospitals, district hospitals, and referral hos-
pitals. There are approximately 40 physicians per 100,000 people in
the country,[10] and access to physicians, especially specialists, re-
mains a challenge outside the major city centers. The health system is
burdened by the second highest prevalence of human immunodefi-
ciency virus (HIV)/acquired immunodeficiency syndrome (AIDS) in
the world, estimated at 24.6% of adults aged 15–49.[11] mHealth and
mLearning efforts in Botswana benefit from a significant mobile
device ownership[12] and an existing network of multiple competing
telecommunication companies.

In response to the HIV/AIDS epidemic, the Government of Bots-
wana, the University of Botswana, and the University of Pennsyl-
vania (UPenn) formed the Botswana-UPenn Partnership to build
capacity in Botswana. Since 2001, UPenn has been helping to train
healthcare providers in the prevention and treatment of HIV/AIDS, to
develop postgraduate training programs at the University of Bots-
wana, to build joint research programs, and to offer global health
experiences to UPenn trainees.

In 2009, the University of Botswana School of Medicine (SOM)
admitted its first class of students and residents, physicians in spe-
cialty training. Residents rotate throughout the health system, and
access to information technology resources at all training sites is
crucial. In the capital city of Gaborone, however, access at the referral
hospital is limited by poor Internet connection and availability of
functioning computers. In remote areas, gaining access is even more
challenging, and specialist mentors are not readily available.

Incentivizing physicians to continue practicing in Botswana and
in remote clinics is the major goal of the SOM. A smartphone-based
mLearning tool was implemented to help residents train and care for
patients by providing access to medical resources and remote men-
toring. We will discuss our experiences to date with this ongoing
program.

Methods

Seven residents in Medicine and Pediatrics residency programs,
based at a public referral hospital in Gaborone, were provided with
myTouch 3G smartphones, equipped with Android-based medical
information applications, built-in camera, and data-enabled sub-
scriber identity module (SIM) card (*Fig. 1*). The phones contained
locally loaded point-of-care applications, including UCentral, Sky-
scape, and ePocrates Rx. UCentral and Skyscape are medical software
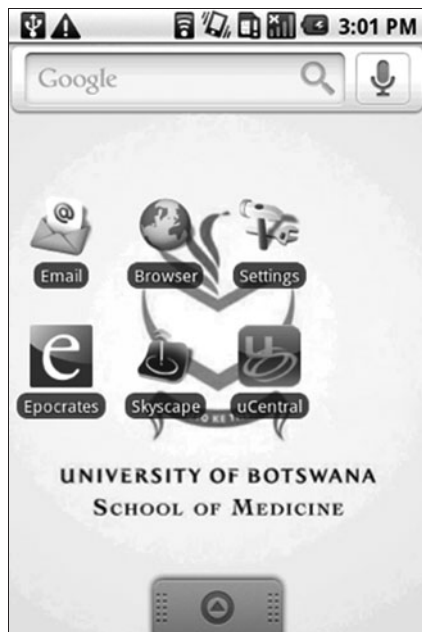that each contain multiple applications, including drug references

Fig. 1. Screenshot of the phone's home page.

(e.g., A-Z Drug Facts, RxDrugs) and clinical decision-making resources (e.g., 5-Minute Clinical Consult, DynaMed). ePocrates Rx is a stand-alone drug reference application. The phones also had e-mail/Web access and a telemedicine application that allows for the submission of cases to local mentors. Calling and texting capabilities were not activated.

Study coordinators conducted an initial training session, which covered use of the smartphone and its applications. Prior to phone distribution, residents completed an initial written survey with multiple-choice questions, which assessed familiarity with smartphone technology. At 4 and 8 weeks following phone distribution, residents completed a follow-up written survey with multiple-choice and free response questions, which assessed comfort level, frequency of use, and applications used. One resident did not complete follow-up surveys due to scheduling conflicts.

Results

Between follow-up at 4 and 8 weeks, residents increased their usage of the phone, which they primarily attributed to increased opportunity for use and growing familiarity. Residents reported gaining familiarity through the initial training session, help from other residents, and spending time alone with the phone. While six out of seven residents initially surveyed were unfamiliar with smartphones, these six felt comfortable with the phone after 8 weeks of use.

Residents listed use of the following medical information applications: five out of six used UCentral, of which four used 5-Minute Clinical Consult and one used A-Z Drug Facts; two out of six used Skyscape; three out of six used ePocrates Rx. Five out of six residents

used the phone not only for access to point-of-care applications in the medical setting, but also for supplementary reading outside of the hospital. When asked to provide suggestions for other types of information, four out of six residents requested increased access to journals.

Discussion

We have found that smartphones loaded with point-of-care tools are effectively utilized by resident physicians in resource-limited settings, both for accessing point-of-care medical information at the bedside and for self-directed learning at home. As reported elsewhere, we found that users required only a short period of time to learn how to use the smartphone and search for information.[2]

Ongoing plans include scaling up the use of the phone to remote clinic sites and residents in other specialties, such as Family Medicine and Emergency Medicine. We are currently implementing the telemedicine case consultation program. As data collection efforts increase, mentors will be able to identify medical topics that residents find challenging by evaluating the types of cases being submitted for consultation.

In 2000, citizens of developing countries owned one-fourth of the world's 700 million mobile devices. By the beginning of 2009, their share had grown to three-quarters of the four billion total mobile devices in the world, and this exponential growth is expected to continue in the coming years.[13] Competition among different mobile phone companies has driven improvement in the number and quality of smartphone applications available, as well as enhancement of phone features. By 2015, an estimated 500 million people will access mHealth applications on smartphones.[14]

Use of mobile devices to access information leverages an existing, robust network of mobile connectivity. As smartphones become more affordable worldwide, mLearning will likely play an integral role in providing education to people in remote and resource-limited areas of the world.[1,15] Within medicine, mLearning is poised to be an invaluable resource for addressing the medical information needs of healthcare providers in resource-limited settings.

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No competing financial interests exist.

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