

Diabetes Management for Under Served Populations: A Mobile Technology Solution

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Abstract

In the Kingdom of Saudi Arabia (“KSA”), geographic isolation, culture, and a unequal distribution of healthcare resources have created severe shortages in healthcare access. A large part of KSA's rural population, including women and children, expatriate workers and those with disabilities lacks access to any institutional care, lack information about healthy behaviors, and lack finances to pay for care. These factors have combined to produce an alarming growth in chronic disease among these populations in the KSA, particularly Type II Diabetes.

In emerging markets like the KSA that have poorly distributed healthcare resources, but DO have widespread mobile connectivity and high mobile device penetration, an immediate solution to this challenge is mobile health. The principal aim of this study is to explore the potential for “mHealth” to impact chronic disease (diabetes) for patients in Saudi Arabia. This paper examines the role of an mHealth diabetes management app in addressing the shortcomings of healthcare access and outcomes for diabetes patients in the KSA. It further examines the optimal configuration of an mHealth app solution for diabetes management in the KSA, from the physician and patient perspectives.

Keywords—mHealth, Saudi Arabia, remote populations, diabetes

I. Introduction

Saudi Arabia (“KSA”), a country with a total population in 2012 of 29 million (1), is like many developing countries experiencing an alarming growth in the incidence of chronic diseases. The growth in these disease conditions can be traced in part to lifestyle issues such as diet and smoking, but they are also due in large measure to inadequate access to healthcare resources. In addition, due to social and cultural backgrounds, a large part of rural populations, including children, women, expatriate workers and those with disabilities are largely disconnected from accessible and efficient healthcare services (Marsh, 2006).

The advent of almost universal ownership of an affordable consumer device - the mobile phone, and widespread wireless network connectivity has provoked much new thinking on the potential for mobile technologies to impact the health characteristics of entire populations in developing countries

like SA. The UN foundation and Vodafone Foundation (3) gives us a very basic definition of mobile health – “the provision of health-related services via mobile communication”. From health education and extension services in developing countries, to sophisticated remote monitoring of chronic disease, mHealth can more efficiently allocate healthcare resources and more actively engage patients in their own health management.

Geography, cost and a strained healthcare infrastructure (there is less than 1 doctor for every 1,000 SA residents) (4) has yielded a healthcare industry in SA whose moving parts are disorganized, clustered around population centers, and unequal to the task of providing convenient, prompt healthcare to rural populations . A clear need exists for a remote consultation facility, connecting patients and centralized medical staff, field based and centralized medical staff or a combination of each. Establishing a traditional bricks and mortar solution to the problem of remote access to care in SA is both costly and time consuming. What is needed for the underserved is a new way to connect providers and patients, and a communication channel that allows patients to become more accountable for their own health. The purpose of this mixed methods study is to explore the views of a selection of Saudi diabetes specialists, Saudi healthcare workers, and Saudi diabetes patients about the extent to which a mobile phone diabetes management application would be an acceptable solution to diabetes management within the Saudi context. We hope that the findings and conclusions will inform the development of a nationwide, efficient mobile health solution in SA, for specific disease indications (in this case diabetes), and for specific healthcare consumers such as expectant mothers, children, and the elderly.

To guide the investigation, a single overarching research question was defined to drive the methodology of the study: What factors influence the potential acceptance of an mHealth desisted for diabetes patients in KSA? The study's objectives are:

- To investigate mobile technological solutions to health issues.
- To investigate the current infrastructure for the medical monitoring and communication processes in Saudi Arabia (KSA)..

- To find out the suitability and applicability of the applications.
- To explore requirements of chronic disease patients who are living in remote areas of Saudi Arabia, women and immigrant workers.
- To explore requirements for medical professionals and organizations
- To explore the feasibility of the proposed solution

II. Context

The healthcare system in SA can be classified as a national system in which the government provides health care services through a number of government agencies. However, there is a growing role and increased participation from the private sector in the provision of health care services. The Ministry of Health (5) is the major government agency entrusted with the provision of health care through a network of health care centers (comprising 4,594 centers) (6) situated throughout the kingdom. It also provides curative care for all members of society from the level of general practitioners at health centers to advanced specialist services through a broad base of general and specialist hospitals (415 hospitals) (6). However SA's healthcare infrastructure (particularly specialty services) tends to be clustered in and around population centers, resulting in issues of access and affordability for those living in remote locations.

As the focus of this study, Diabetes is a disease that is becoming a major problem in SA, due to a diet high in carbohydrate and lack of exercise culture (7). As Khan et al. stated (8), "Approximately 25% of the population in the Kingdom of Saudi Arabia (Saudi Arabia) has been diagnosed with diabetes. Over the last decade, there has been an 8% increase in the prevalence of DM in Saudi Arabia.". This epidemic is most acute among the underserved. A highly connected and ubiquitous healthcare system would definitely assist in interconnecting the most unprivileged groups of Saudi Arabia. For instance, extending mobile healthcare and its benefit to women and children would enable them to seek immediate advice, upload health readings and seek consultations in real time from their homes.

Diabetes is a massive and growing problem in Saudi Arabia and the difficulties of adequately treating diabetes patients, particularly those living beyond metro areas, are well established. Although there have been studies assessing the utility of mobile solutions to address the management of chronic diseases, there have been few specifically aimed at looking at such a solution in Saudi Arabia. The Saudi healthcare service needs to know if an mHealth solution is likely to be accepted as a way of managing diabetes by its own professionals and, above all by diabetes patients.

III. Methodology

A mixed methods study (qualitative and quantitative analysis) was selected for this investigation. The focus of the mixed methods study is an exploration of the views of a selection of Saudi diabetes specialists, Saudi healthcare workers, and Saudi diabetes patients about the extent to which a mobile phone diabetes management application would be an acceptable solution to diabetes management within the Saudi context. Primary data collection in the form of both online surveys and semi-structured interviews was conducted to determine the attitudes of stakeholders and the attributes of a mobile phone diabetes management application. Sample size and sampling frame were consistent with the goals of the study. A prototype mHealth application was constructed to test out design options.

The following four two-tailed hypotheses were tested:

- 1a: A mobile health solution is perceived as likely to will benefit people in Saudi Arabia.
- 1b: A mobile health solution is not perceived as likely to will benefit people in Saudi Arabia.
- 2a: There is an optimal design for a mHealth system for chronic disease.
- 2b: There is no optimal design for a mHealth system for chronic disease.
- 3a: The Saudi Arabia context would influence design
- 3b: The Saudi Arabia context would not influence design
- 4a: Diabetes patients will have a favorable response to using a mobile phone
- 4b: Diabetes patients will not have a favorable response to using a mobile phone application to help manage diabetes.

IV. Ethical Issues

In the UK, US, and other developed countries, patient privacy has been legislated and stiff penalties are assessed to institutions and individuals who violate these rules. Trust is a major issue in deploying any healthcare solution in which patient information will be exchanged, and patients must be given the opportunity to opt-out if they choose not have their information shared by means that they do not trust. The danger of data breaches, security and confidentiality are all related and top of mind issues for both consumers and providers. To gain the trust of participants, and particularly among consumers, the surveys were accompanied by a narrative describing what mHealth is, how it works, and what benefits it delivers to patients. The survey instrument was administered online in an anonymous format. The narrative also clearly explained the protections the research provided regarding patient privacy, and the right of the participant to opt-out of the research at any time, and have any identifiable information removed from the research records at such time.

v. Findings and Conclusions

Results from the Provider Survey

Among the survey sampling, it was revealed that there is limited communication between providers and patients between office visits. The medical communication that currently takes place is conducted infrequently by phone or paper-if at all. Overwhelmingly, respondents reacted favorably to the possibility of employing a mHealth solution in their practices to manage chronic conditions. The main benefits providers expected to receive from an mHealth solution were not financial, but mainly improved patient outcomes and patient satisfaction. These findings reveal a huge opportunity to deploy a disease management app that allows providers to more closely manage patient chronic conditions. However, respondents expressed concerns about technology integration issues like security, reliability, and cost.

Conclusions from the Provider Survey

Providers recognize the value of mHealth as a tool of clinical care that addresses issues of access to care, quality of care, and cost of care. A healthcare app that focuses on chronic disease, which engages patients between visits, and allows providers to more closely monitor the health characteristics of their patients, and removes geography, time and cost as obstacles to care, is seen by providers as of immense value in improving outcomes and improving patient satisfaction.

Results from the Consumer survey

Of those respondents to the consumer survey, approximately half were male, half were female, and 70% were between the ages of 25-44. In the survey, respondents indicated a clear preference to play a more active role in their own healthcare, and being able to communicate their health metrics to their provider. They expressed keen interest in an mHealth tool particularly as it related to chronic disease management, as a solution set to remove time, distance and cost as barriers to more effective healthcare. Over half of respondents own smartphones and would like to receive alerts and reminders from their providers via their phones. However, consumers viewed the premium value of an mHealth app to be its ability to give them a more active role in their health management.

Conclusions from the Consumer Survey

Consumers are very receptive to mHealth as a tactic to address and improve their health issues. They want to measure and monitor their health metrics, and have that data communicated to their provider. However, they view mHealth not just as an extension of their provider relationship, but as a convenient alternative to the office visit and a way to exert greater control of their health. Almost universally, respondents felt that an mHealth solution would make them more responsible and

more compliant with their own health requirements. For them mHealth is a tool of self-care, and providers can supplement that care by providing education, alerts and interventions via their mobile phones.

Implications for the Development of a Diabetes Management Application

The purpose of these surveys has been to identify, among the primary stakeholders, the key features that must define a diabetes management mobile phone app in SA. Key findings include:

1) Patients are more interested in an mHealth app that promotes self-care, rather than an app that simply collects data and sends it to their provider. Patients want control of their health, and they want a tool that allows them to play a more active role in managing their health issues. That said, they do want to communicate their health information to their providers, and want professional advice and intervention as required to address adverse health indications.

2) Providers recognize the value of mHealth as a tool to extend the reach of their practices, and as a means of removing time and distance as barriers to patient care. They are willing to incorporate apps, particularly as a tool of chronic disease management, into their clinical work flow. They are willing to communicate with and treat patients remotely based on the data that is produced by an app, and expect remote patient management via an app to improve clinical outcomes.

Essential Features of a Diabetes Management App for SA

Based on the above findings, an ideal Diabetes Management mHealth App for SA will have the following attributes:

Consumer facing – emphasis on self-care (data monitoring, measuring and interpretation at the point of care).

Ease of Use – patients must be able to operate and input results in a simplified procedure and send to providers seamlessly.

Integratable – the app must be able to communicate with wearable devices and enterprise systems.

Industry compliant- the app must meet industry standards for privacy, security, reliability and interoperability.

Adaptive –provider/patient communication will be limited initially to voice and text, but with proliferation of smartphones this can be expanded to additional media (video, web).

Engaging – the app must serve as a trigger of clinical service – its value derives from its ability to monitor measure and alert in real time, at the point of care, and promotes interventions by the provider or by the app directly to the patient.

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