Chapter 29

Health Apps by Design:
A Reference Architecture for Mobile Engagement

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ABSTRACT

The mobile health (mhealth) app market continues to grow rapidly. However, with the exception of fitness apps and a few isolated cases, most mhealth apps have not gained traction. The barriers preventing patients and care providers from using these apps include: for patients, information that contradicts health care provider advice, manual data entry procedures and poor fit with their treatment plan; for providers, distrust in unknown apps, lack of congruence with workflow, inability to integrate app data into their medical record system and challenges to analyze and visualize information effectively. In this article, the authors build upon previous work to define design requirements for quality mhealth apps and a framework for patient engagement to propose a new reference architecture for the next generation of healthcare mobile apps that increase the likelihood of being useful for and used by patients and health care providers alike.

INTRODUCTION

The popularity and usage of mobile technology continues to boom (Research2guidance, 2015). Increasingly, people are inclined to seek guidance from smartphones than from other persons (Elias, 2015). Smartphones' ascendance to this level is highly associated to its practicality in communicating, information resourcefulness, portability and flexible costs for most people, regardless of their economic status (Silow-Carroll & Smith, 2013). Mobile health (mhealth) care applications are seeing a similar boom. Of the millions of apps in circulation, about 45,000 are mhealth apps (Research2guidance, 2015). More than half of these mhealth apps are new on the market. Thirteen percent of these apps were introduced in the first quarter of 2015. However, most mhealth apps are not used in healthcare despite their growing popularity (in terms of downloads) and potential medical purposes (Research2guidance, 2015).

Researchers from various backgrounds have proposed ways that consumers can select useful mhealth apps for their health and health information needs (Albrecht, 2013; Boudreaux, 2014; Powell, 2014; Kumar, 2013). Several studies have identified hurdles that challenge wide usage, including poor user interface designs, differing user literacy levels, implementation issues and organizational structures (Bailey, 2014, Boudreaux 2014; Brown 2013; Caburnay, 2015; McMillan, 2015; McCurdie, 2012). These efforts have so far not been successful at wooing patients and care providers to greater use of mhealth apps. Health app developers are caught in a dilemma of not knowing how to overcome these hurdles.

In this paper, we build upon Albrecht et al.'s "synopsis for apps" in health care (Albrecht, 2014) to propose a novel reference architecture for mhealth apps that can overcome current barriers. Albrecht et al provide a comprehensive framework for mhealth app publishers to describe their compliance with a variety of pragmatic and evidence-informed criteria that are worth considering when evaluating apps. We found their framework useful as a scaffold for considering important elements of an app during the design process.

We also build upon the patient engagement framework developed by Balouchi et al. that describes an enabling environment for engagement and communication between patients and providers (Balouchi, 2014). We propose a refined approach for engaged communication between patients and care providers. This approach focuses on the patient and care provider relationship as the starting place to add value that is likely to grow exponentially in ways we can only now imagine. Our approach considers the constraints identified by the studies cited above in order to identify the critical functions that can elevate how apps can deliver added value. Further, we propose an architecture for mhealth apps that arranges the critical functions identified in order to accomplish the following: (a) capture, validate and communicate data about the processes and outcomes of a disease; and (b) enable on-going communication during treatment to enhance the patient-care provider relationship and ensure patients get the support they need to implement the advice and interventions prescribed by their health care provider.

METHODS

We conducted a literature search in PubMed and Google Scholar to identify articles that described methods to evaluate mobile apps. We utilized the related articles feature to find additional articles. We also identified articles on mhealth architecture and patient engagement with apps. We conducted a narrative synthesis of the studies we identified and applied a critical analysis by way of identifying common hurdles that restrict wide usage of mhealth apps. Our process of deliberation comprised distributing the

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