Chapter 31
mHealth in Resource–Constrained Environments

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ABSTRACT

The use of mobile devices in telemedicine contributes to providing more effective and efficient remote healthcare in rural areas improving patients' life style and medical quality of service in this setting. The idea of creating mobile applications for this scenario led the authors to face important sociotechnical challenges in terms of innovation and design for resource-constrained environments. In this paper the authors present the outcomes of MANTRA (Mobile ANticoagulant TheRApy) Project developed for and evaluated in Venezuela. Through the evaluation of this project under those settings the authors developed an approach to mHealth in the remote management of chronic diseases by supporting the communication between doctors.

1. INTRODUCTION

Rural areas are very often resource-constrained environments where direct access to the Internet, through landlines or mobile phones may be challenging. In such settings, also the quality of health services is often affected by these limitations. In such conditions some chronic diseases are hard to be treated anticoagulant therapy management is one of those because it demands a regular monitoring of patients' conditions made by doctors or health professionals.

Anticoagulant therapy prevents the formation of thrombus. People at risk of developing thrombosis have to take anticoagulant treatment (warfarin) once a day in a dosage that needs to be adjusted on the basis of the International Normalised Ratio (INR) test results (Cohen et al., 2007). The INR test measures the prothrombin time (PT) – how long it takes for the blood to clot. The dose of warfarin is increased or decreased with the intention of keeping the INR value within an appropriate range. When the treatment starts the INR value is tested every 2-3 days but once its

level has stabilised it is tested between 7 and 20 days. Since the INR tests are usually performed in surgeries the patients have to make frequent visits to meet doctors to take the test and receive a prescription of warfarin.

In this paper we present MANTRA (Mobile ANticoagulant TheRApy), a project aimed at studying the feasibility and acceptability of the introduction of mobile technology in the management of anticoagulant therapy involving doctors in the design phases. The project was implemented as a proof of concept for a rural setting in Venezuela. We studied the existing literature and state of the art and performed a study on the end users profiles and the context/environment and designed, developed and evaluated two interactive high-fidelity prototypes for mobile devices (iPads) aimed at support the remote communication between doctors who operate in rural areas and doctors who practice in hospitals. This gave us the chance to derive a general approach to mHealth in the remote management of chronic diseases by supporting the communication among healthcare practitioners.

The paper is organized as follows. First, literature review and state of the art of telemedicine in anticoagulant therapy domain is presented and discussed. In Section 3 the MANTRA project is presented and its research context and methodology are illustrated. Section 4 presents the prototypes design and development and Section 5 illustrates the usability evaluations performed and their results. Finally, conclusion and future developments are presented.

2. LITERATURE REVIEW AND STATE OF THE ART

2.1. The Need for ICT Localization Integrating the Tradition and the New

The design and development of interactive systems for rural environments needs to consider the variety of cultures, e.g. different socio-political-econom-

ical contexts, different languages and educational backgrounds. Thinyane et al. (2007) confirm the importance of localisation techniques in design and development and argue that it should be found "a way to make ICT solutions more sensitive to the local context, and therefore more effective" by capitalising on local knowledge and resources. Therefore, the positive impact of many existing ICTs has been attributed to their localisation for specific contexts and cultures. Given the subject handled by this study, the research focuses also on supporting the design and development of localised ICT solutions.

Choi et al. (2005) identified 52 cultural attributes in three different countries in a qualitative cross-national study of cultural influences on mobile data service design, which demonstrate that without any doubt the context and culture affect the way users interact with technology and systems. Research also shows that ICT solutions that simulate as closely as possible traditional local networks guaranteed a greater success in developing (Kolko et al., 2007).

All these findings and studies also suggest the need for a type of ICT localisation that integrates the traditional knowledge and tools from those cultures with new tools. However, when ICT projects are reviewed, or referred to developing countries, the benefits and implications for the targeted users tend to be the focus. One the other hand, others researches also emphasise the fact that the issues are more related with usability and efficiency of systems and processes.

An excellent piece of research by De Angeli et al. (2004) analysed the introduction of ATM machines in India to evaluate the socio-cultural impact. They concluded that "(…) as much as culture can influence technology, the reverse is also possible" (De Angeli A. et al., 2004). Based on these results and from a research perspective, it was necessary to consider the technology for the targeted rural community, "Wonken", before deciding how to design the prototypes.

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