INTERNATIONAL JOURNAL OF MEDICAL INFORMATICS 82 (2013) e251–e268

journal homepage: www.ijmijournal.com

User profiles and personas in the design and development of consumer health technologies

Cynthia LeRouge[a,1], *Jiao Ma*[b,2], *Sweta Sneha*[c,*], *Kristin Tolle*[d]

[a] *Decision Sciences/IT Management Department - John Cook School of Business, Joint Appointment Health Care Management and Policy - School of Public Health, Saint Louis University, 3674 Lindell Avenue, DS 459, Saint Louis, MO 63108, United States*
[b] *Parks College of Engineering, Aviation and Technology, Saint Louis University, 3450 Lindell Blvd., St. Louis, MO 63103, United States*
[c] *Department of Information Systems, Kennesaw State University, 1000 Chastain Road, Kennesaw, GA 30144, United States*
[d] *Health and Wellbeing, Microsoft Research, One Microsoft Way, Redmond, WA 98052, United States*

ARTICLE INFO

Article history:
Received 8 March 2010
Received in revised form
17 August 2010
Accepted 10 March 2011

Keywords:
Aged
Health care
Information technology
Medical informatics
Consumer health technologies
User profile
Persona
Methodology
China
Diabetes

ABSTRACT

Background: "The graying of the globe" has resulted in exponential rise in health care expenses, over-worked health care professionals and a growing patient base suffering from multiple chronic diseases, one of which is diabetes. Consumer health technologies (CHT) are considered important catalysts for empowering health care consumers to take a proactive role in managing their health and related costs. Adoption rate and usability of such devices among the aging is far from being satisfactory. Past studies noted the motivation for adoption by the aging is dependent on the suitability/relevance, perceived usability and anticipated benefits associated with usage of technological innovation. Traditional information technology (IT) development adopts a systematic approach without necessarily using a specific user model that personalizes the system to the aging user groups. The aging patient population has unique needs arising from progressive deterioration in both physiological and psychological abilities. These needs are often ignored in the design, development, trial and adoption of consumer health products resulting in low adoption and usage.
Objectives: The main objective of this research is to investigate the user-centered design (UCD), specifically user profiles and personas, as methodological tools to inform the design and development of CHT devices for an aging population. The adoption of user profile and persona has not received much attention in health care informatics research and, in particular, research involving CHT. Our work begins to fill this void in three ways. We (1) illuminate the process of developing CHT user profiles and personas for a Chinese elder population with a demanding health care needs, i.e., self-management of chronic diabetes, with the hope that the resulting profiles and personas may be used as foundational material for informing the design, development and evaluation of CHT in other similar contexts; (2) call attention to how to further enhance and complement traditional user profile and persona techniques for CHT design by integrating cognitive structures and present behavior that drive

* *Corresponding author*. Tel.: +1 770 853 0661; fax: +1 770 992 9609.
E-mail addresses: lerougec@slu.edu (C. LeRouge), jma3@slu.edu (J. Ma), ssneha@kennesaw.edu, swetasneha@yahoo.com (S. Sneha), Kristin.Tolle@microsoft.com (K. Tolle).
[1] Tel.: +1 314 977 3852/588 7887; fax +1 314 314 584 5006.
[2] Tel.: +1 314 977 8408; fax: +1 314 977 8384.
1386-5056/$ – see front matter
doi:10.1016/j.ijmedinf.2011.03.006

health care thinking, future behavior and demand; (3) show how the profiles and personas can be used to inform requirements, design and implementation decisions for a technology aimed at facilitating CHT adoption and diffusion for the elderly.

Methodology: To exemplify process and application, we use an action-research methodology, where user profiles and personas of an aging patient population were developed. The resultant profiles and personas were leveraged to improve the design, development and implementation plans of a smart phone application to assist chronically ill aging Chinese diabetic population capable of disease self-management.

Results: The results from the study show that user profile and persona can be a valuable methodological approach in capturing the conceptual model of the aging and informing the design and development decisions of CHT. The demonstration of techniques used in this study can serve as a guideline to CHT developers in bringing conceptual user modeling into the design of software interfaces targeted for users with specific health care needs. Specifically, the study provides guidance on the creation and use of profiles and personas to tap into the conceptual models of the targeted elderly population reflecting their preferences, capabilities and attitudes towards using technology in self-management care in general and the smart phone diabetes management application in particular. Insight into the mental model of the aging group has been shown to inform later stages of UCD development (e.g., the creation of prototypes and usability testing) as well as implementation and adoption strategies. The World Health Organization (WHO) predicts that by 2025, 80% of all new cases of diabetes are expected to appear in the developing countries. In fact, the number of diabetic patients in China is estimated to rise to 42.3 million in 2030 from 20.8 million in 2000. Thus, we investigate the Chinese aging population in order to demonstrate the process of developing and using user profile and persona. We hope that the resultant conceptual model of the Chinese aging diabetic population can be used in future research to guide CHT designers interested in designing health care devices for this vulnerable user group.

1. Introduction

In the wake of the 21st century, health care systems around the globe are faced with exponential rise in expenses, heavy utilization of services and limited financial as well as human resources [see [1] for an example of when this is not the case]. Another trend observed parallel to the rising health care costs is the "graying of the globe." The worldwide population of adults over 65 years of age is on the rise and expected to reach 761 million by 2025 [2]. Several studies in the past have noted the prevalence of multiple chronic diseases and co-morbidities in the aged population [1]. In the US, high-risk aged patients account for approximately 78% of all health care spending—well over a trillion dollars per year and/or over two-thirds of Medicare's annual spending [3]. A critical inference drawn from epidemiological data is that preventing occurrences of acute episodes and managing health care needs of the aging patient population holds the key to providing quality health care and reducing unnecessary health care expenses. In order to reduce preventable acute episodes from occurring it is critical to focus on preclusion of complications, proactive management of illnesses and timely detection of anomalies such that aging patients can actively participate in the management of their health care and lead a normal, healthy lifestyle outside of the hospitals [1,4].

Consumer health technologies (CHT) have the potential of empowering aging consumers to take a proactive role in managing their health and related costs. In the recent past, there has been an influx of technological tools and devices that attempt to educate and engage patients in their health care process. However, successful usage and adoption of these technological devices is fairly poor in the *aging patients*—which accounts for a large proportion of customer base for innovative health care devices.

Aging involves progressive deterioration in both physiological and psychological abilities, creating special needs among the aging population segment. In addition to age-related issues, a large proportion of the aging populace suffers from multiple chronic diseases and co-morbidities [1]. These needs are often ignored in the design, development, trial and adoption of consumer health products resulting in low adoption and usage among the aging adults [5]. This population segment not only requires more time, practice and technical assistance to acquire computer skills, they are also more error-prone than the younger generation as a result of detriments in visual, perceptual, psychomotor and cognitive abilities [6,7].

Information technology (IT) and age-related challenges in the aging population can, in part, be compensated by designing senior-friendly applications. In order to design and develop health care products that meet the unique requirements of the aging patient segment there exists the need to (1) analyze/understand the challenges and requirements of the elders; (2) study and implement methods of making information communication technologies (ICT) accessible to elder user group; (3) model and integrate preferences of the elder population segment into health technologies; and (4) evaluate outcomes. Involvement of the elder population in each