Full length article

Adoption of personal health records by chronic disease patients: A research model and an empirical study

John Laugesen [*,1], Khaled Hassanein

DeGroote School of Business, McMaster University, 1280 Main St West Hamilton, ON, L8S 4L8, Canada

ARTICLE INFO

ABSTRACT

With the increasing prevalence of chronic disease throughout the world, electronic Personal Health Records (ePHRs) have been suggested as a way to improve chronic disease self-management. However, ePHRs are not yet widely used by consumers. Protection Motivation Theory (PMT) has been successfully used to explain health related behaviours among chronic disease patients. In addition, Information Systems (IS) theories such as Task Technology Fit (TTF) have been successfully used to explain information technology adoption. This study leverages these theories along with the health self-management readiness concept of the Patient Activation Measure (PAM) to propose a theoretical model of ePHR adoption by chronic disease patients for the task of self-management. The role of educational interventions on various elements of the proposed model is also examined. A survey-based study of 230 Type 2 Diabetes patients is used to empirically validate the proposed model via structural equation modeling techniques. Results reveal that the PMT, TTF and PAM constructs all have significant direct and indirect effects on the intention to adopt an ePHR. In addition, the educational intervention analysis indicates that the provision of advanced ePHR education positively influences various constructs in the model, while the use of fear appeals does not have an effect.

Crown Copyright © 2016 Published by Elsevier Ltd. All rights reserved.

1. Introduction

Chronic disease is the leading cause of mortality worldwide, accounting for 60% of all deaths. The World Health Organization (WHO) projects chronic disease deaths will increase from 38 million in 2012 to 52 million by 2030 (World Health Organization, 2014). Diabetes is considered to be one of the four major chronic diseases (World Health Organization, 2014), and it is estimated that 347 million people worldwide have Diabetes, with Diabetes projected to be the seventh leading cause of all deaths worldwide by the year 2030 (World Health Organization, 2013). People with Diabetes are estimated to require two to three times the health care resources (compared to people without Diabetes), and Diabetes accounts for up to 15% of some countries' health care budget (Alwan et al., 2010). What is clear from the statistics are the staggering costs in morbidity and mortality as well as the economic costs of chronic disease and specifically Diabetes.

Studies have shown the positive effects of health self-management for chronic disease patients. Two meta-analyses (Chodosh et al., 2005; Warsi, Wang, LaValley, Avorn, & Solomon, 2004) found improvements in Diabetes patient's clinical results for those involved in self-management programs. Self-management of chronic diseases such as Type 2 Diabetes involves a set of complex, time consuming tasks that can overwhelm individuals who suffer from this condition (Russell, Suh, & Safford, 2005). It has been estimated that approximately 2 h per day are required for Type 2 Diabetes self-management, with 17 distinct tasks identified as part of the recommended care for Type 2 Diabetes (Russell et al., 2005). The time commitment is even higher for those individuals who are newly diagnosed (24%–35% more time) and/or those who are elderly or infirm (up to twice as much time) (Russell et al., 2005). Therefore, while Type 2 Diabetes self-management is important and necessary, the time commitment required to perform the multitude of the complex tasks involved may be far too arduous for many people who suffer from this chronic condition.

Health Information Technologies (HIT) have been shown to help patients with self-management, however they can only do so if

* Corresponding author.
  E-mail addresses: john.laugesen@sheridancollege.ca (J. Laugesen), hassank@mcmaster.ca (K. Hassanein).
  [1] Present address: Pilon School of Business, Sheridan College, 4180 Duke of York Blvd., Mississauga, ON, L5B 0G5, Canada.

they are adopted (Or & Karsh, 2009), thus "developers and those who implement the systems should pay attention to the underlying reasons and motives for patient acceptance of the [Health Information] technology" (Or & Karsh, 2009, p. 556). This research examines the underlying reasons and motives for the adoption of Electronic Personal Health Records (ePHRs) for Type 2 Diabetes self-management.

ePHRs are defined as a "record of an individual's health information by which the individual controls access to the information and may have the ability to manage, track, and participate in his or her own health care." (U.S. Department of Health and Human Services Office for Civil Rights, 2008). ePHRs have the ability to draw one's health information from multiple sources while being maintained and controlled by the individual owner. ePHRs are not just a record of information, but rather the combination of the recorded information with functionalities that can be used in conjunction with the record for health self-management activities (e.g. decision support). Benefits of ePHRs include reduced medical errors, better patient quality of care, higher reliability of information provided to health care practitioners, health reminders (Sensmeier, 2010), comprehensive personal health history, means to become one's own health advocate (Randeree, 2009), and improved disease self-management (Assadi & Hassanein, 2009). Gaining those benefits through the use of ePHRs requires individuals to play a more active role in managing their own health. As such, using ePHRs to manage one's health could be considered as a health behavior where the ePHR (an Information System) is used to support the patient in carrying out a specific task (health self-management).

All patients can potentially benefit from the adoption and use of ePHRs, but those patients with chronic conditions can achieve higher benefits due to the greater need to access health related information on a regular basis and the requirement to actively manage their chronic disease in a joint effort with their physicians and other caregivers (Archer, Fevrier-Thomas, Lokker, McKibbon, & Straus, 2011; Logue & Effken, 2012; Pope, Inc., & Nashville, 2006; Whetstone & Goldsmith, 2009). Unfortunately the knowledge of, demand for, and the understanding of the benefits provided by ePHRs are not fully understood by patients, physicians and other stakeholders, and as such adoption of ePHRs has been an issue (Assadi & Hassanein, 2009; Logue & Effken, 2012). An examination of the ePHR adoption and use studies (Archer et al., 2011) revealed a limited number of studies to be theoretical, empirical studies of the drivers/motivations for ePHR adoption. Rather, most studies were noted to be descriptive, qualitative, or observational studies that examined ePHRs from a physician perspective, examined how currently adopted ePHRs were actually being used, and what these ePHRs were being used for.

Protection Motivation Theory (PMT) has been used for decades (Rogers & Prentice-Dunn, 1997; Rogers, 1975) to analyze and predict health related behaviours (Norman, Boer, & Seydel, 2005), with meta-analyses showing PMT variables as good predictors of health related behaviours and behavioural intention in general (Floyd, Prentice-Dunn, & Rogers, 2000; Milne, Sheeran, & Orbell, 2000). PMT is therefore very appropriate to the health behavior (i.e. chronic disease self-management) context of this research study.

Task Technology Fit (TTF) theory has successfully shown the relationships among the variables that can predict consumers' behaviours towards an information technology (Goodhue, 1995), specifically examining the fit between the task and the technology. TTF is well suited for this research, as this study examines the adoption of a technology (i.e., ePHR) for the task of self-management by chronic disease patients.

Given the voluntary nature of ePHR adoption and use for the task of chronic disease self-management, it is necessary to examine not only the fit between the task and technology and the technology and the individual (through the lens of TTF), but also the fit between the task and the individual. Therefore, the theoretical concept of the Patient Activation Measure (PAM), which assesses an individual's (typically a chronic disease sufferer) readiness for the task of health related self-management (Hibbard, Stockard, Mahoney, & Tusler, 2004, 2005) is well-suited to assess the fit between the task and the individual.

Educational interventions have been successfully applied to chronic disease conditions such as Asthma and Diabetes (Guevara, Wolf, Grum, & Clark, 2003; Sigurdardottir, Jonsdottir, & Benediktsson, 2007) to bring about behavioural changes. Improving an individual's understanding of his/her chronic condition and the task of self-management can be accomplished through education. Therefore, this study explores the impact of educational interventions on the various factors that influence ePHR adoption for chronic disease self-management.

Based on the above introduction, the overarching goal of this research is to develop and validate a research model that integrates PMT with TTF and PAM to gain a deeper understanding of ePHR adoption by Type 2 Diabetes patients for the task of chronic disease self-management. In doing so, this research attempts to address the following specific objectives:

1. To develop and empirically validate a theoretical model explaining the factors that influence patients' adoption of ePHRs for the task of chronic disease self-management.
2. To understand how educational interventions focused on Diabetes Complication (DC) and ePHR capabilities would influence relevant factors in the above model.

2. Theoretical background and research model

To address the overarching objective of this research we draw on and integrate several theories. The integration of these theories allows us to bring a unique perspective that recognizes the use of ePHRs (a HIT) for the specific task of chronic disease self-management (a health behavior) by Type 2 Diabetes patients. In this approach, PMT is used to explain the adoption of a health behavior (chronic disease self-management using ePHRs), TTF is used to assess the degree to which ePHR as an information technology fits the tasks associated with chronic disease self-management, and PAM allows us to assess the readiness of the chronic disease patient to engage in the health behavior in question. We explore these theories below along with Intervention Theory to help us explore the effect of educational interventions on the adoption of ePHRs by chronic disease patients.

2.1. Protection Motivation Theory (PMT)

PMT is a widely adopted framework for the prediction of health-related behavior (Milne et al., 2000). The PMT model itself contains two specific appraisals (based on information held by the individual), namely a threat appraisal and a coping appraisal. The threat appraisal focuses on the likelihood of a threat actually materializing (the *vulnerability* of the individual to that threat) and the potential *severity* of that threat if it actually occurs. The coping appraisal, on other hand, focuses on the coping responses that individuals use to deal with the threat. In this stage, individuals assess the effectiveness of specific actions/behaviours that could be invoked to address the threat (*response efficacy*) and their *self-efficacy* to invoke that response successfully. These two appraisals lead to protection motivation (focusing on the individual's intention to perform recommended coping behaviours) (Norman et al., 2005). Modes of