Chapter I
Evaluation of Two Mobile Nutrition Tracking Applications for Chronically Ill Populations with Low Literacy Skills

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ABSTRACT

In this chapter, the authors discuss two case studies that compare and contrast the use of barcode scanning, voice recording, and patient self reporting as a means to monitor the nutritional intake of a chronically ill population. In the first study, they found that participants preferred unstructured voice recordings rather than barcode scanning. Since unstructured voice recordings require costly transcription and analysis, they conducted a second case study where participants used barcode scanning or an integrated voice response system to record nutritional intake. The authors found that although the latter input method provided participants with a faster method to input food items, participants had difficulty using the system despite training.
INTRODUCTION

Chronic diseases, such as chronic kidney disease (CKD) and heart disease, are among the leading causes of death and disability in the world. At least half of the chronic disease related deaths could be prevented by adopting a healthy lifestyle, such as good nutrition, increased physical activity, and cessation of tobacco use. Researchers believe that the world must put a higher priority on interventions to help prevent and successfully manage chronic illness (Preventing Chronic Diseases: A Vital Investment, 2005).

Current interventions to help chronically ill populations improve their nutritional health and self-manage therapeutic diets include paper-based food diaries, 24 hour recalls, and food frequency questionnaires (Dwyer, Picciano, & Raiten, 2003; Resnicow et al., 2000). Patients who use these interventions must have high literacy and memory recall skills. Unfortunately, over a quarter of the United States population do not have the necessary literacy or numeracy skills needed to successfully self-monitor themselves (Kirsch et al., 1993). If people cannot self-monitor themselves, they cannot manage their chronic conditions (HRSA Literacy) and may lead them to worse health outcomes (Schillinger et al., 2002). In addition, to administer current interventions medical professionals must spend a significant amount of time evaluating the data from paper-based forms.

We are currently developing a mobile handheld application to assist CKD patients on hemodialysis monitor and maintain their nutritional intake. Initially, we thought a personal digital assistant (PDA) would be the best solution for health professionals and patients (Connelly, Faber, Rogers, Siek, & Toscos, 2006). Participants could scan barcodes on food items for their primary input or select items from an interface as a secondary input. These input mechanisms are ideal for low literacy populations because there is no reading required – participants only have to identify a barcode or select a picture. Health professionals could easily administer the intervention and evaluate data without intermediate steps of electronic transcription. The low literacy chronically ill participants benefit from using the application because they can use the application anytime they consumed a food item, receive immediate visual feedback on their nutritional intake, and make decisions on a prospective basis. In addition, the interface and content could be customized for populations with varying literacy and computing skills.

In this chapter, as part of a larger study, we will compare and contrast the use of barcode scanning, integrated voice response system (IVRS), and patient self reporting as a means to monitor their nutritional intake relative to their dietary prescription of CKD patients. In the first case study we found that participants preferred unstructured voice recordings rather than barcode scanning. Unstructured voice recordings are difficult to automatically parse and require transcription. We had to find out if patients would use a menu-based structured voice input system, such as IVRSs for automated recognition. In the second case study, we explored participant use of an IVRS and found although the system provided participants with a quicker way to input food items, participants had difficulty using the system and some could not use the system despite training. We will discuss the methodology and findings from these two case studies. We will conclude the chapter with lessons learned during the user study and provide considerations for future areas of research.

RELATED WORK

PDAs with scanner input and mobile phones used for IVRS input gather information in many domains. PDAs and scanners have been used to show clinicians videos about specific unit appliances (Brandt, Björgvinsson, Hillgren, Bergqvist, & Emilson, 2002), save and search for information about food products, music, and
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