

Assistive Technologies for Dialysis Patients *

Katie A. Siek

Computer Science
Indiana University
Bloomington, Indiana
ksiek@cs.indiana.edu

Kay H. Connelly

Computer Science
Indiana University
Bloomington, Indiana
connelly@cs.indiana.edu

Abstract

Dialysis patients can only consume 1 liter of fluid and two grams of sodium each day. Currently, patients try to remember or write down in a food diary their fluid and sodium consumption. However, these techniques are insufficient because 80% of patients are unable to restrict their fluid intake. If patients miscalculate their fluid intake they run the risk of hypertension, pulmonary edema, and death. Our research focuses on creating a personal digital assistant application to assist dialysis patients accurately monitor their fluid and sodium intake. Our application will allow patients with reduced cognitive skills to easily record dietary information, allow all patients to get immediate feedback on their fluid and sodium intake, and assist researchers gain information about patient fluid and sodium compliance for future studies. We will present what steps we are taking to create a personal digital assistant application for dialysis patients.

1 Introduction

How much water have you consumed today? How much sodium? These are just some of the questions dialysis patients ask themselves everyday. Dialysis patients can only have 1 liter of water and 2 grams of sodium each day. Currently patients keep track of their fluid and sodium intake by remembering or writing what they eat in a food diary. Welch et al. has shown that these techniques are insufficient since 80% of patients are unable to restrict their fluid intake[1]. Research has shown 1/3 of dialysis patients have difficulty performing simple calculations [2]. If patients miscalculate their fluid intake they run the risk of hypertension, pulmonary edema, and death.

We are creating a proof-of-concept personal digital assistant (PDA) application for dialysis patients to monitor fluid and sodium intake. Patients can select food icons on the PDA screen or scan food UPCs to easily input food. Monitoring fluid and sodium levels could help clinicians teach patients about the relationship between fluid consumption and their ideal “dry weight.”

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2 The Approach and Preliminary Work

We are developing our application in four stages. We completed the first two stages and are currently working on the third and fourth stage.

1. **Match users needs to technology.** We decided to use a Socket SDIO In-Hand Scanner and Tungsten T3. The T3 has a larger screen, voice recording feature, and SDIO slot.
2. **Initial user study.** We compared how healthy and chronically ill novice PDA users in various age groups could complete tasks (pressing buttons, viewing icons, voice recording, scanning barcodes, etc.). We found that there were no major differences in performance among user groups.
3. **Application backend.** The backend is responsible for connecting a UPC database with a nutritional USDA database and saving information about food items the users consume.
4. **User interface.** We are designing the interface with participatory design methods. Patients and clinicians will be involved at every design step. The graphical user interface shows food items, nutritional and fluid intake levels, and other pertinent information.

3 Interdisciplinary Ties

We are closely working with two nurses, a nephrologist, a dietician, and a biostatistician at Indiana University-Purdue University's School of Medicine in Indianapolis, Indiana. Our contacts at IUPUI's School of Medicine will assist us in recruiting and training dialysis patients; ensure the application is accurate and can assist clinicians with compliance data; and evaluate the impact our application has on the health of dialysis patients.

4 Impact and Importance

The advantages of our application are (1) dietary and fluid intake will be automatically computed; (2) patients will not need to read labels, make mathematical conversions, or do mathematical computations to effectively use the application; (3) accurate diet and fluid intake can be recorded and monitored; (4) ongoing feedback can be provided to help patients make improved decisions about diet or fluid intake on a prospective basis; and (5) patients will not worry about the stigma of disease.

References

- [1] J. Welch, S. Perkins, J. Evans, and S. Bajpai. Differences in beliefs by stage of fluid adherence. *Journal of Renal Nutrition*, 2003.
- [2] J. Evans, C. Wagner, J. Welch. Cognitive Status in Hemodialysis Patients. *Renal Failure*, In review.