

ASSISTIVE TECHNOLOGIES FOR DIALYSIS PATIENTS

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1. ABSTRACT

Dialysis patients can only consume 1 liter of fluid and a few milligrams 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, reduce the stigma of disease as a medium for recording dietary information, 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.

2. THE PROBLEM

Imagine a liter of water and a few milligrams of salt. Can you picture it? Now try to figure out how much water and salt you consume in one day. How much water does the apple you had for lunch contain? If you pass on the potato chips during lunch, could you have cheese on your dinner? If I have a cup of coffee in the morning, a soft drink with lunch, can I afford to have a drink with dinner? These are just some of the questions dialysis patients think of every 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[4]. If patients miscalculate their fluid intake they run the risk of hypertension [2], pulmonary edema [3], and death [1].

3. THE SOLUTION

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. The application will allow patients with reduced cognitive skills to easily record dietary information and get immediate feedback on fluid and sodium intake. PDA computers could help reduce the stigma of disease because the general population is accustomed to seeing people tap on PDA computers instead of recording information in food diaries. The application would assist researchers gain information about patient fluid and sodium compliance for future studies. Monitoring fluid and sodium levels could help clinicians teach patients about the relationship between fluid consumption and their ideal “dry weight.”

4. THE APPROACH AND PRELIMINARY WORK

We are developing our application in four stages. First, we evaluated our users needs and decided on what hardware to use. Once we selected our hardware, we let dialysis patients use the technology to ensure they could use the PDA and scanning hardware we selected. We compared how novice PDA users in various age groups could complete traditional (pressing buttons, viewing icons, voice recording, etc.) and non-traditional (scanning barcodes) tasks. We found that there were no major differences in performance among age groups. Currently, we are working on our third and fourth stages. In the third stage, we are developing the backend for our application. The backend is responsible for connecting a UPC database with a nutritional database and saving information about food items the users consumes. We are designing the interface in our fourth stage. The graphical user shows food items, nutritional and fluid intake levels, and other pertinent information.

5. 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. The nurses will assist us in recruiting and training dialysis patients. We will consult with the nephrologist to ensure our application can assist in collecting patient compliance data for future studies. The dietician will ensure our application accurately monitors fluid and sodium intake and gives patients enough feedback. Our biostatistician will evaluate how much of an impact our application has on the health of dialysis patients.

6. 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.

7. EXPECTATION FOR PHD FORUM

The PhD Forum will allow us to present our first prototype and gain valuable feedback from professionals in the field. The dialysis application should be finished by the summer of 2005. We will usability test the dialysis application in the field during the Fall of 2005. Katie anticipates graduating in May of 2006.

References

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