

Accessibility and usability guidelines for mobile devices in home health monitoring

Rita Hubert

Pace University

School of Computer Science and Information Systems

White Plains, New York USA

E-mail: huberr9@yahoo.com

Abstract

The use of tele-medicine, telecommunications, web-based applications and medical monitoring devices can provide a ‘medical life-line’ for the chronically ill, disabled and elderly home-bound persons. This research develops a guideline of accessibility and usability for the multimodal home-based mobile medical monitoring devices used by older adults. Field studies are used to evaluate the quantitative visualization, errors, input and time factors. Additionally, qualitative studies using surveys and interviews focus on customer satisfaction. The findings of the study will form the accessibility and usability guideline. We anticipate that this usability guideline could be used as the foundation for the design and testing of future mobile medical devices used in the home.

Introduction

As the ‘baby boomer’ population ages and the caregiver population shrinks, there is a growing need for mobile and home-based health monitoring of the aged and chronically ill. During the past decade technology has progressed significantly, with advances in web and wireless access in the home, and also with increased use of mobile health monitoring devices having the ability to run applications, store and transmit data.

In the area of healthcare, we have seen advances in the monitoring and measurement of clinical wellness and reductions in the size of the systems required to measure vital signs of basic body functions, such as blood pressure, heart rate, and pulse. Additionally, the skill required to perform these vital sign and clinical measurements has decreased, as seen by the automated blood pressure measurement devices located in many pharmacies and the glucose measurement meters used by most diabetics to monitor their own glucose levels.

Background

In recent years the proliferation of mobile devices in the United States and the world has become almost pervasive. Wireless and cellular telephones, personal digital assistants (PDA) and wireless laptop computers have become a standard part of our daily lives. This trend toward more mobile and wearable devices will continue to increase in the coming years with more mobile devices in the home, in the workplace, in the automobile and on the person. As these devices become a part of our everyday lives, we need to assure that these devices are easy to learn, easy to use and easy to remember. The key to the successful adaptation of these devices is accessibility and usability.

The study of the healthcare domain's mobile device accessibility and usability testing is only beginning. The majority of the mobile device usability studies in healthcare have focused on the use of Personal Digital Assistants (PDA) by nurses and physicians [3, 4]. Studies of older adult mobile device accessibility studies were conducted on the use of mobile telephones. [1] Only one study addressed the usability of a computer-based health monitoring in the patient home. [2] No studies were found in the literature for the testing of mobile device accessibility and usability of home-based medical monitoring systems for the older adults.

The accessibility and usability research community have focused on the web during the past decade. I plan to build on those study methods, standards and guidelines in the development of the mobile home-health device testing guideline.

The study and testing of the accessibility and usability of mobile devices by older adults is important because these devices offer new challenges:

- The smaller size of the mobile devices
- The lighter weight of the devices
- Various input methods
 - Buttons
 - Touch screens
 - Pen based tap
 - Voice
- The smaller screens
 - Smaller buttons
 - Readability
- The form and features of the devices' communication to the user
- The satisfaction of the users

Goal of the research

The goal of this research is the study of usability and accessibility of home health monitoring devices used by older adults and the subsequent development of a guideline for their design and testing. This guideline should provide developers and testers with validated criteria for the assurance that the mobile devices are designed and tested with consideration to the special needs of the older adult.

Current status of research

The literature review of related accessibility and usability research was completed. The research methodology was developed to include a phase 1 – semi structured questionnaire interviews of 21 persons, between the ages of 49 and 88, who have used a home health monitoring device for more than seven days. Results show a high level of satisfaction with the home health monitoring device and auditory instructions. The data entry keys,

blood pressure cuff and temperature probe were areas of difficulty. Phase 2 will include audio and video taping of 7 – 9 older adults between the ages of 50 and 90, with more than 1 week experience using the home health monitoring device in their home. A control group of 5 new users, between the ages of 50 and 76, were audio and video taped using the home health monitoring device in their home. Additional control group users will be also be added. Studies are conducted in the home of each older adult to simulate the conditions under which the device would routinely be used. The research measures qualitative parameters, such as time to completion, time delays at each step, number of errors, number of requests for help, cognitive delays, font size and ability to adjust font, use of colors and contrast, auditory instructions and movement distance on the screen/display between successive entry steps. The qualitative measures focus on such factors as the ease of use, ease of reading, ease of hearing and understanding auditory instructions, ease of learning and remembering, and satisfaction. Additional home health monitoring device companies were contacted in an effort to include 1-2 additional devices in the study.

Preliminary results accomplished

The semi-structured questionnaires indicate that the older adults studied have a high level of satisfaction with the home health monitoring device and auditory interaction. However, the standard instructions and data entry buttons present a usability and accessibility challenge which is being further studied in this dissertation research.

Open issues and expected achievements

The open issues are obtaining approval to video tape 7-9 older adults using the device in their homes and the ability to obtain additional home monitoring devices for testing.

The expected achievements are the development of an accessibility and usability guideline for the testing of mobile home health monitoring devices which can be extended further by others in the research community.

Current stage of doctoral study

All coursework for the doctoral program was completed in May 2005. My dissertation research is progressing with a targeted completion of May-September 2006.

Doctoral consortium feedback

Advice and guidance from members and researchers related to the study idea, methods for mobile device testing, process for conducting testing with the older adult and other suggestions would be valuable feedback for the improvement of this dissertation.

Acknowledgments

I wish to thank Professor Charles C. Tappert, Ph.D., Vicki L. Hanson, Ph.D. and Professor Fred Grossman, Ph.D. for their support, advice and encouragement. My thanks also to Maureen Strachan, RN and the Lake Sunapee Region Visiting Nurse Association for their support of this research project.

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