Using scenarios and personas to enhance the effectiveness of heuristic usability evaluations for older adults and their care team

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ABSTRACT

Objective: Using heuristics to evaluate user experience is a common methodology for human-computer interaction studies. One challenge of this method is the inability to tailor results towards specific end-user needs. This manuscript reports on a method that uses validated scenarios and personas of older adults and care team members to enhance heuristics evaluations of the usability of commercially available personal health records for homebound older adults.

Materials and Methods: Our work extends the Chisnell and Redish heuristic evaluation methodology by using a protocol that relies on multiple expert reviews of each system. It further standardizes the heuristic evaluation process through the incorporation of task-based scenarios.

Results: We were able to use the modified version of the Chisnell and Redish heuristic evaluation methodology to identify potential usability challenges of two commercially available personal health record systems. This allowed us to: (1) identify potential usability challenges for specific types of users, (2) describe improvements that would be valuable to all end-users of the system, and (3) better understand how the interactions of different users may vary within a single personal health record.

Conclusions: The methodology described in this paper may help designers of consumer health information technology tools, such as personal health records, understand the needs of diverse end-user populations. Such methods may be particularly helpful when designing systems for populations that are difficult to recruit for end-user evaluations through traditional methods.

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1. Introduction

As patients are increasingly responsible for managing their own health and wellness, consumer health information technologies (CHIT) are becoming a critical component of health delivery systems. These tools are defined as "computer-based systems…designed to facilitate information access and exchange, enhance decision making, provide social and emotional support, and help behavior changes that promote health and well-being [1]." Older adults (aged 65 and older) who are homebound experience high levels of disease burden [2], which may increase the significance of CHIT as an important tool in supporting their health.

Although there is no universal definition, Medicare defines someone as "homebound" if they are unable to leave their place of residence without significant support from another person or from assistive devices [3]. Homebound older adults (HOAs) generally have more cognitive and functional impairments, and maintain more complex self-care routines than non-homebound individuals. One study found that 98% of HOAs had difficulty regularly performing at least one instrumental activity of daily living and, on average, required 9–12 medical provider visits per year [4].

Due to the complexity of care, homebound individuals who remain in the community receive support from a variety of sources. Such services are often managed outside traditional office-based medical care, and are in most cases poorly coordinated with other medical providers [2,4,5]. The two most common home-based care programs designed to support HOAs are Medicare home health services and informal caregiving [5]. In the United States there are over 3 million individuals that annually receive home-based medical services at home through Medicare [5]. In addition, up to 15 million older adults in the United States receive informal home-based care services provided by family, friends, and volunteers [5]. These informal care services include homemaking, help with activities of daily living, and transportation to medical appointments. Due to the increased number of older adults in

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the United States and the decreased number of older adults who reside in facilities, experts anticipate that the need for Medicare home health and informal caregiver services will increase over the next several decades to support the growing number of HOAs [5].

Though CHIT may serve as an important tool to support health, recent literature unfortunately suggests that the adoption and acceptance of CHIT has been modest among many healthcare consumers including older adults [1,6,7]. There are many potential reasons for why adoption has been modest, and researchers have proposed investigating factors such as access to technology, patient care preferences, and disparities in care among racial and ethnic minority populations [8]. While these problems are important, one recent study suggests that even by providing universal access to the Internet and related online technologies, disparities in CHIT adoption among patient populations may not be eliminated [8]. This study found that technology literacy plays an important role in CHIT adoption regardless of access to the technology and the Internet. The authors suggest that designing CHIT that is easy to use may help people with low technology and/or health literacy adopt these tools in situations when other barriers have been reduced [8]. Therefore, 'usability' should continue to be a focus for designers of CHIT to promote the use of their tools by the intended audience [1,6,9]. Usability describes "the extent to which a system is easy to use or 'user friendly'" [10]. Common usability problems found in CHIT include a mismatch between functionality and end-user requirements, poorly designed user interfaces, and frequent functional errors [11]. Usability is important for all end-user groups; however, it is especially important for CHIT that may be used by older adults. Due to the natural aging process and an increased prevalence of chronic and acute diseases, older adults often have reduced cognitive or physical function that make using technology more difficult than other adult populations [12].

There are many methods that can be used to evaluate the usability of CHIT. Heuristic evaluations are a tool that helps researchers consider user perspectives through expert reviews. Heuristic evaluations can be used to identify potential problematic areas prior to an intervention study or end-user testing. For example, a previous PHR evaluation performed a heuristic evaluation, and recruited adults aged 18–55 for end-user testing and interview. This study found that the heuristic evaluation was more effective at identifying technical usability issues than the end-user testing. Results from the heuristic evaluation were used to understand how technical issues affected end-user experience and overall perspectives of the PHR [13].

2. Objective

This paper describes a study that evaluates the usability of two commercially available CHITs, specifically Internet-based personal health record systems (PHRs). In this study, we use a methodology that combines a heuristic evaluation with personas and scenarios. We chose a heuristic methodology to gain an initial understanding of the perspectives of HOAs and their care team as the first step to understanding potential usability challenges with existing PHRs before conducting a larger PHR evaluation study with end-users. Our methodology extends the methods used by Chisnell and Redish in their usability review of 50 websites for older adults, commissioned by the AARP [14]. We further the work of Chisnell and Redish by using an evaluation protocol that relies on multiple expert reviews of each system, and standardizes the heuristic evaluation process using associated task-based scenarios. This manuscript describes our methodology, discusses the lessons learned from our evaluation, and suggests potential uses of this methodology in future work.

3. Methods

3.1. Identification of the heuristic evaluation measures

We performed a literature review on heuristic evaluations for older adult users in PubMed and Embase, and identified five sets of heuristics that were developed to assess older adult usability of web-based technologies [14–18]. After evaluating these sets we chose the Chisnell and Redish guidelines for older adult web users. This set of guidelines were the most appropriate for our use case because it allowed us to review each system from multiple user perspectives - homebound older adult, family caregiver, and home health - and accounts for the wide variety in characteristics in these user populations. In addition, the designers of the original methodology are experts in both human-computer evaluation and the needs of older adult web-users [14].

The Chisnell and Redish guidelines contain 20 heuristics that fit into four categories: interaction design, information architecture, visual design, and information design. In order to account for users with different levels of skills, motivation, and abilities, personas are incorporated into the evaluation methodology. This heuristic methodology is unique in that it does not seek to gain an exhaustive list of heuristic violations, but focuses on identifying the most important problems that a persona may face when performing tasks within the system. In their report, Chisnell and Redish highlight that their methodology is designed to be different than a traditional expert-led heuristic evaluations to encourage a list of frequent problems that an average target user will face in the system. This methodology first asks the evaluator to record observations using the website as the persona, and then to fit these observations into the heuristic framework [14].

3.2. Creation of personas

Following the above methodology, our first step was to create personas for the end-users. A persona is a fictional characterization of a user that is meant to "capture the user's mental model comprising of their expectations, prior experience, and anticipated behavior" [9]. To meet this goal, we conducted a literature review on HOAs, their caregivers, and nursing staff. We adapted our initial homebound older adult persona ('Alice') from a case study of a homebound older adult published by Leff et al. [2], our family caregiver persona ('Matthew') after a persona published by Chisnell and Redish [14], and our home health nurse persona ('Lisa') from home health nurses known to the authors (LK, HT, GD) from prior research activities.

The original Chisnell and Redish methodology advocates for a persona characteristic comparison to help the reviewers understand the main differences between the personas [14]. Our persona document includes a comparison between the personas on four dimensions: chronological age, degree of physical and cognitive limitations that affect using the Internet, expertise with computers and the Internet, and PHR aptitude- the degree to which the persona feels positive or negative towards incorporating the PHR into home health routines.

3.3. Search for commercially available personal health records

We identified existing PHRs using MyPHR.com [19], a systematic literature review [20], and the webpages on Healthit.gov [21]. These sites were chosen to identify systems developed for both commercial and research purposes. Three authors (LK, SM, YC) assessed the PHRs identified in this search to ensure that the PHRs were active, met the basic functionality criteria, and were available to the reviewers at no cost. The functionality criteria were