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Journal of Biomedical Informatics 38 (2005) 51–60
Journal of Biomedical Informatics
www.elsevier.com/locate/yjbin

Using qualitative studies to improve the usability of an EMR

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Received 4 July 2004
Available online 7 December 2004

Abstract

The adoption of electronic medical records (EMRs) and user satisfaction are closely associated with the system's usability. To improve the usability of a results management module of a widely deployed web-based EMR, we conducted two qualitative studies that included multiple focus group and field study sessions. Qualitative research can help focus attention on user tasks and goals and identify patterns of care that can be visualized through task modeling exercises. Findings from both studies raised issues with the amount and organization of information in the display, interference with workflow patterns of primary care physicians, and the availability of visual cues and feedback. We used the findings of these studies to recommend design changes to the user interface of the results management module.

Keywords: Usability engineering; User experience; Task analysis; Focus groups; Ethnographic studies; Task modeling; Cognition; Sensory perception; Prototyping; Heuristic evaluation

1. Introduction

The potential benefits of information technology (IT) and the Internet to medical care are well recognized. Reminder systems, online prescribing, and telemedicine applications are just a few areas where IT can have a significant impact on the quality and timeliness of health care delivery [1]. However, medical professionals must first adopt and utilize this technology as part of their practices if these benefits are to be realized. One of the largest barriers to EMR adoption is resistance from physicians, who cite computer anxiety, increased time for orders, decreased interaction with patients, and lack of integration with physician workflow among their primary concerns [2]. Usability is thus critical to successful IT implementation and adoption and its subsequent ability to improve health care quality.

As defined by the International Standards Organization [3], *usability* represents the effectiveness, efficiency, and satisfaction with which specific users can achieve specific sets of tasks in a particular environment. A user's experience with a system is also influenced by error frequency, learnability, and memorability [4]. In order to support the healthcare process and reduce medical errors, EMRs must support clinical workflows and have "interfaces that are easy to understand and navigate" [5]. Qualitative research methods, such as ethnographic observations and focus groups, can improve the design and usability of EMRs through interaction with real users. These studies seek to identify and prioritize user tasks in a clinical environment, as well as diagnose areas of existing systems where usable design is not present.

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doi:10.1016/j.jbi.2004.11.006

We describe two separate qualitative studies that attempted to identify user task flows with an existing EMR, to better understand the environment in which these tasks are performed, and to determine how overall usability can be improved. The findings of these studies contain significant overlap with regard to certain user behaviors and expectations. In the following sections, we will define the task analysis and focus group methodologies used for the studies, present an analysis of the data collected with supporting cognitive research, and recommend design solutions to improve the overall usability of the EMR observed.

2. Research methods

Both qualitative studies focused on users of the Longitudinal Medical Record (LMR), a web-based application that facilitates the management of patient information, provides clinical messaging, and standardizes methods of data entry and retrieval. LMR is a well-liked and widely used system, but problems of usability and room for improvement have been informally observed. The test participants who volunteered their time are proponents of health care information technology and recognized our work as an opportunity to help LMR succeed.

There are many different functional components that comprise LMR, but our focus for this particular study is on Results Manager, a component that assists users with follow-up tasks for patient laboratory test results [6]. It collects test results ordered by a physician and presents them from one centralized location. The number of results letters generated using Results Manager has risen from 18 during it's launch in November 2002, to nearly 4500 per month as of December 2003. However, to bring its adoption to universal levels within our organization, we sought to address usability factors in the application.

Our investigations were both formative and summative in nature, conducted to guide the formation of new user interface designs and to summarize the effectiveness of existing designs. IRB approval was requested and received when necessary.

2.1. Task analysis

The first qualitative study combined different forms of task analysis, a methodology that focuses attention on users and on their tasks and goals. Task analysis clarifies the objectives of each task, which tasks are most important to users, and which tasks depend on other tasks [7]. It also identifies the communication needs of users as they exchange information with others while performing tasks [4]. Other issues to consider are task difficulty and the knowledge and skills required by the task. We also incorporated ethnographic observations (or field studies) into our methodology to better analyze the environment and specific work settings in which user tasks were performed. The attention to detail in describing and explaining how work is organized provides a useful resource for system designers, helping them to understand the activities that should be supported in a new design and to identify processes that do not work well and need to be re-designed [8].

Seven test participants from primary care practices associated with Brigham & Women's Hospital (BWH) and Massachusetts General Hospital (MGH), including five physicians and two nurses, were observed individually in their clinical workplace using Results Manager (Fig. 1). One author—an experienced usability engineer—was present at all sessions to record data as each participant worked for 30–40 min with various patient records. Test participants also used the ''think aloud'' method to describe their thought processes and offer feedback while interacting with the system. A microcassette recorder was used to capture and review these comments. Due to the somewhat intrusive nature of the task analysis methodology and the limited availability of our clinical users, our only requirements for these sessions were that each participant had at least some experience using Results Manager and was willing to be observed.

Following the qualitative data collection process, relationships among the various user tasks were established and task modeling exercises [9] were performed using Microsoft Visio to diagram the workflows of each clinician (Fig. 2). Each diagram represents the collective set of actions that were performed by a clinician while he or she worked with the system. This exercise allowed us to visualize the complex processes inherent in outpatient medicine, compare and contrast user interactions, and identify where similarities in workflow occur. The diagrams and supporting test participant comments were then used to suggest possible design solutions.

The data collected in this study required approximately 6 h of analysis, with an additional 14 h devoted to task modeling.

2.2. Focus group

Generally used for market research, focus groups can be an excellent source for collecting usability data and are a reliable instrument for measuring the quality of health care [10]. Focus groups are an informal and relatively unstructured exercise that can help assess user needs and feelings both before and after system design [4]. Moderators can also ask participants to discuss how they perform certain activities, making this methodology an excellent complement to a task analysis study.

Our second qualitative study included five separate focus group sessions that were open to any attending physicians or internal medicine residents who worked