Usability Study of a Physicians’ User Interfaces for a Computer-Based Patient Record

Viviam L. Murillo Cartagena
Advisors: Néstor Rodríguez, José A. Borges
Center for Computing Research and Development
University of Puerto Rico, Mayagüez Campus
vmc23@hotmail.com

Abstract

In this article we present a usability study of the physician’s user interface of two computer-based patient record systems. One of the systems has a graphical user interface and the other a text-based interface. In the study a group of 19 internal medicine resident physicians were asked to performed typical task with the two systems. The results of the study showed that the physicians were significantly faster performing the task in the graphical system that in the text-based system. The results also indicated that physicians were more satisfied using the graphical system than the text-based system.

1. Introduction

Electronic patient record systems improve health care quality and management. Implementing and maintaining these systems can be a difficult task. The interaction style used in electronic patient record systems and its usability [Nielsen93] can have a significant impact on the acceptance, efficiency and satisfaction of its users.

Recent studies [Bates96, Lovis01, Murff01, Overhage01, ] revealed that the user satisfaction with electronic patient record systems is tightly related to usability issues like: the level of productivity achieved by users, and the ease with they can learn to use the system.

The medical Gopher [Overhage01] is text-based electronic order entry system for direct physician order entry (POE). A recent study of this system revealed that physicians using the Gopher do not spend any more significant time writing orders than physicians using paper-based methods. The study also showed that physicians were satisfied with the system because they believed that the system improved patient care.

In [Lovis01] two order entry interfaces were compare. One of the interfaces was based on a natural language approach and the other was a menu driven interface. The study revealed that physicians found the natural language interface easier to learn and faster to use than the usual menu-driven system.

Another study [Murff01] compare two order entry systems: a commercially available product using a character-based interface, and the Department of Veterans Affairs Computerized Patient Record System (CPRS) with a graphical interface. The study showed that physicians were more satisfied with the graphical system than the character-based system.

Concerned with the need for usable computer-based patient record systems a group of researchers have been working on the development of a computer-based patient record system applying the principles of usability engineering [Borges97, Gonzalez97, Rodriguez97]. In this article we present a prototype of the physician’s user interface and describe a usability study in which the prototype was compared with a text-based system.

2. The Graphical Interface Prototype

Our prototype is a computer-based medical record system for physicians. The system provides a graphical user interface with separate windows for viewing the patient record and for order entry. Both windows can be displayed at the same time.

The View Record interface (figure 1) presents, a top bar always visible to the user, with information about: the age, sex, weight, height, the name of the primary care physician, the insurance company of the patient, allergies, and a photo of the patient. The interface also provides ten tabs of information: Profile, History, Complaints, Physical exam, Medication, Results, Nursing, Problems, Notes, and Lookups. In the Profile tab a summary of relevant information about the last visit of the patient is displayed, such as: notes,
Figure 1. The View Record Window

Figure 2: The Order Entry Window
medications, problems and, consultations. The History tab contains information about allergies of the patient, family conditions, social conditions, hospitalizations, and surgeries. The Complaints tab has the subjective information provided by the patient on each patient-physician interaction. The Physical Exam has the objective information gathered by physician. The Problems and Notes tabs correspond to the physician’s assessment of the patient. In the previously mentioned tabs the information can be listed by date and by the name of the physician that entered the information. In the Medication tab a history of the patient’s prescriptions is displayed. The physician has the capability to discontinue any prescription. The Results tab provides a history of studies and labs results, arranged by date. Finally, the Lookup tab provides a detailed summary of each patient’s visit.

The Order Entry interface (figure 2) provides a top bar without a photo but with basically the same information as the View Record’s top bar, including a diagnosis. The interface also provides six tabs of information: Medications, Laboratories, Exams, Consults, Misc, and Summary. In the first four tabs, medicines, laboratories, exams and consults can be selected from lists or can be typed in. In the Misc tab, the physician can order an I/O, diet or make any other recommendation. The Summary tab allows the physician to review all the order before submitting it.

3. The Text-Based System

The text-based system is an in-house computer-based patient record system used at the outpatient clinics of the Beth Israel Deacones Hospital in Boston. The system provides patient lookups and physician orders functions. Physicians can lookup patient demographic information, medication and studies results history, primary care problems lists, and notes. Physicians can also add new problems and notes, order medication and studies, and discontinue medication. The ordering system provides checks for drug-to-drug interaction and suggests medicine dosages.

The system features an option driven user interface. The user accesses the different functions of the system by selecting an option from a list presented on the screens. Each option has a number associated to it and keywords that describes its function. The user selects an option by entering its corresponding number. In some screens an additional set of options are provided at the bottom of the screen. Each of these options is identified with a keyword and the option is selected by entering the first letter of the keyword. Navigation through the system is thus achieved through a sequence of options selection.

3. The Experiment

The main objective of the experiment was to compare our graphical user interface with a text-based user interface in order to identify usability problems and the advantages and disadvantages of the two interaction styles.

Nineteen internal medicine resident physicians of the Beth Israel Deacones Hospital participated in the study. All the participants had experience using the hospital character-based patient record system. None of them had experience in the graphical-based patient record system.

Each of the 19 participants performed eleven tasks on both the character-based system and the graphical-based system. Ten of the participants performed the tasks first on the graphical-based system and then on the character-based system. The other nine participants performed the tasks first on the character-based system and then on the graphical-based system. All the participants were given a short tutorial session on the graphical system before they performed the tasks on this system. The tasks consisted on finding patients’ information in each system, entering medical information and making orders. After performing the tasks the users were asked to fill out a subjective user satisfaction questionnaire and to rate and comment on the elements of both interfaces.

4. The Results

The results were analyzed in terms of time to complete the tasks, number of task completed, and the subjective user satisfaction.

All the tasks were completed by the participants in both systems. The test revealed that the participants completed all the tasks in statistically significant less time in the graphical-based system than in the character-based system. The participants were 35.1% faster in the graphical-based system than in the text-based system. In completing individual tasks, the participants were between 19.1% and 86.8% faster in the graphical-based system than in the text-based system.

A Wilcoxon test revealed that the participants were significantly more satisfied with the graphical-based system than with the character-based system.
5. Conclusions

A graphical-based interfaced can significantly reduce the time it takes physicians to complete typical tasks in comparison with a text-based interface. Physicians can get more satisfaction from interacting with a graphical-based electronic patient record system than with a text-based system.

Even though none of the participants have used the graphical-based system before they were able to complete all the tasks and it took them significantly less average time on this system than on the text-based system. Thus, it can be concluded that the graphical-based interface features a high degree of learnability and efficiency. The fact that the participants have never used the graphical-based system suggests that once they gain experience with the system their efficiency and user satisfaction can be improved. A graphical-based user interface with good usability could improve the acceptance of an electronic patient record system and ease the transition from a text-based system.

References


[Rodríguez 97] Rodríguez, Néstor J., José A. Borges, Domingo Rodríguez, Emily Angarita, Rafael Muñoz, “A Computer-Based Patient Record for Improving Nursing Care”, Journal of Informatica Medica, June, 1997.