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MedWISE, a Highly User-configurable Web 2.0-based Electronic Health Record

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Abstract. Health information systems have extremely complex, variable and changeable information requirements. Current development practices have sometimes resulted in systems that frequently neither reflect clinical users' domain knowledge nor meet their needs. 'Web 2.0' participatory approaches have transformed the commercial/public internet world. Consequently we created MedWISE, a 'web 2.0' EHR interface which allows users to create, select, configure, and share information, displays and tools, via simple drag/drop interfaces, without programmers. Possible advantages include greater suitability to user needs, incorporation of multiple information sources, interoperability, agile reconfiguration, capture of user tacit knowledge, efficiencies due to workflow and Human-Computer Interaction (HCI) improvements, and greater user acceptance. Modular composable systems may also better meet the needs for rapid change presented by emergent public health conditions and T2 translation.

Keywords. User configuration, web 2.0 EHR, human-computer interaction, clinician design. user-configurable EHR, user-configurable EMR.

1. Introduction

MOTIVATION

In recent years increasing attention has been paid to the expansion of electronic records in healthcare. However despite years of research and deployment, the development and adoption of an ideal medical record remains elusive. Problems range from profound user dissatisfaction and lack of task-technology fit to inability to integrate public health elements or configure systems for response to emergency conditions. Information varies with patient, provider, practice system, and many other variables. The practitioner must aggregate and integrate snippets of information from multiple information sources (e.g. a laboratory test result, x-ray, paper, patient preference). Increasingly, complex multiplayer care of chronic conditions is involved. Healthcare is also a social, collaborative, and high-stakes activity in which constant change exists at all levels from individual cognition to societal and technological change. It includes the possibility of emergent high-stakes problems (such as new epidemics or treatments, or economic change) which must be accommodated.

However, current systems are designed and built by programmers, and consequently may prioritize their concepts, not the complex domain knowledge and

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mental models of the healthcare professional. In addition, the system complexity uses cognitive resources (perception, attention, and memory) which are then unavailable for the main diagnostic and treatment tasks. Rigidity and lack of expressivity are some of the reasons for user dissatisfaction, underutilization, or failed adoption with current systems. Further, changing current EHR systems usually involves the vendor, time, consensus, and often, further cost. Users must view different parts of the medical record in sequence, taking different paths through the system. These may differ by specialty, role, and institution(6-7). This also often means in clinical work there is considerable repetitious navigation and information viewing during a session.

To address these problems we created MedWISE, a 'web 2.0'-based EHR platform, which gives the user far greater control, using drag/drop techniques which allow users to select and arrange information and interfaces without programmers. Innovative features include the facility for users to create, save and share custom widgets and tabs with colleagues and to a central repository; assemble information from multiple internal and external sources on the same page; and create mashups of clinical data as well as custom sophisticated visualization and display types. This includes timelines for data overview and drill-down, user-determined plotting of test results with other data, and creation of widgets for calculation and creation of new entities. The greater flexibility can facilitate the capture of user medical domain knowledge, and tacit knowledge (e.g. of institutional procedures) to eventually form a library of user-created and practice-based innovations and tools adapted to changing conditions. The architecture eases incorporation of new technologies, data, and workflows, and allows independent scripting for each widget.

Findings from cognitive studies with clinicians show sharply decreased repetitious navigation, great user enthusiasm and engagement in using the system to solve problems in different clinical contexts, and user-described 'easing' of their cognitive process, putatively due to reduced cognitive load and reduced need to use short-term and working memory when any information can be gathered on the same screen, selectively externalized and prioritized according to the needs of the individual case.

DEMO SCENARIO

We will present findings regarding user cognitive and interaction behaviors, including apparent reduction of cognitive load. After a short introductory presentation about the system motivation and architecture, we will demonstrate the system live (over the internet). There would also be short de-identified videos of how clinicians use the system to solve real patient cases, and implications for future EHR design. In addition, we describe the possible uses of the system in different clinical, translational, and public health contexts.

References

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