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ABSTRACT

The implementation of the Electronic Health Record to substantially improve the practice of medicine has not fully reached its projected potential partly due to many barriers to its adoption. There is growing evidence that one of the reasons for the delay in the adoption of EHR has been due to the negative impact of current EHRs on the clinician-patient interaction, clinician workflow and communications. This research studies the usability of the Electronic Health Record for clinicians involved in cardiac care by evaluating various clinician-patient interaction workflows. The aim of the study is to identify inefficiencies by examining the similarities and differences among various clinician-patient interaction workflows. This research is presented as "work in progress".

Keywords

Electronic Health Record, instructions, length, conference publications.

INTRODUCTION

Electronic Health Records (EHRs) are intended to enhance patient care efficiency, increase patient safety and improve patient outcomes (`Bodenheimer, T., & Grumbach, K. (2003)`). Availability of evidence-based and technology-enabled data at the point of care improves the outcomes for patients (`Frankovichet, et al. (2011)`). However, if the Electronic Health Record is if poorly aligned with the clinical workflow, it can produce unexpected consequences and problems (`Ash, et al. (2007)`). The adoption of Electronic Health Records often introduces radical changes to clinical workflows and these changes could have an undesirable impact on user satisfaction, time efficiency and quality of care (`Niazkhani, et al. (2009)`). The investigation by American Medical Informatics Association's Task Force on usability recommended human factors research to improve EHR usability (`Middleton, et al.(2013)`).

A clinical workflow has been defined as 'the flow of care-related tasks as seen in the management of a patient trajectory: the allocation of multiple tasks of a provider or of co-working providers in the processes of care and the way they collaborate' (`Niazkhani, et al. (2009)`). In order to identify and measure the inefficiencies in the clinician-patient interaction workflows when using an EHR system, this study intends to observe various clinician-patient encounter workflows. In particular, this study uses cardiovascular clinical scenarios and trained simulated patients to evaluate and analyze the clinician-patient interactions. For each patient encounter, the tasks to be measured are defined and diagrammed in a workflow template. Each clinician-patient interaction has an overall pattern of work processes that are summarized graphically using workflow diagrams. Each workflow diagram shows sequences and patterns of tasks of the patient clinical encounter.

Many prior studies have tested the usability of a single EHR vendor system in a particular organization (`Edwards, P. J., Moloney, K. P., Jacko, J. A., & Sainfort, F. (2008)`). The intention of this work-in-progress study is to compare and evaluate the clinician-patient interactions in different hospital settings across the US and comparing various vendors. This will allow us to have a more comprehensive view on the current provider's barriers to effectively and efficiently use EHR systems. By including a diverse group of EHR users (e.g., physicians, fellows, nurse practitioners and medical assistants), we are able to record how the clinicians approach information retrieval, documentation and communication. Then we will analyze differences in the workflow patterns. We believe these differences will help us identify the gaps and inefficiencies.   In sum, the specific research questions we aim to address in our study are:

- What are the similarities among various workflows during the clinician – patient encounters?
- What are the differences among various workflows during the clinician – patient encounters?
- What are the inefficiencies and ineffectiveness, in the clinician-patient interaction workflow due to the misalignment of EHR in the workflow?

In the next section, we present a brief literature review in the workflow analysis and EHR areas.

LITERATURE REVIEW

Health Information Technology is identified as a key component when an organization is transitioning to a healthcare system that is safe, effective and efficient (Unertl, K. M., Novak, L. L., Johnson, K. B., & Lorenzi, N. M. (2010)). One of the areas that HIT impacts the most during the transition is the clinical workflow. In some cases it has been found that the implementation of HIT has negatively affected clinician productivity due to misalignment to the current workflow (Unertl, K. M., Novak, L. L., Johnson, K. B., & Lorenzi, N. M. (2010)).

As healthcare organizations increase information technology investments, in-depth analyses of workflows are needed to inform effective design and implementation of HIT to help avoid failures (Unertl, K. M., Novak, L. L., Johnson, K. B., & Lorenzi, N. M. (2010)).

Past research has identified several areas that need improvement in EHRs such as reducing clinician cognitive load, increasing speed and ease of use (Zhang, J. (2005), Pizziferri et al. (2005)). It is our intention to contribute to improving the workflow alignment and the design of the EHR interface. In the next section, we describe our study design and progress to date.

STUDY DESIGN

We have selected the cognitive walkthrough method to observe the clinician/EHR workflow. Cognitive Walkthroughs is "a method which applies principles from the study of cognitive psychology to simulate the cognitive processes and user actions needed to carry out specific tasks using a computer system" (Polson, P. G., Lewis, C., Rieman, J., & Wharton, C. (1992)). The cognitive walkthrough method is a good choice in this case because it is a robust and flexible usability evaluation method to study complex interactions between healthcare providers and EHR systems ((Wharton, C., Rieman, J., Lewis, C., & Polson, P. (1994, June)). The cognitive walkthrough method was selected because this method can be used to assess human interactions with one another and with systems, in detail (Kushniruk, A. W., & Patel, V. L. (2004)). To help us revisit our data for further analysis, we incorporated a portable usability lab that connects the subject's workstation to capture audio and screen data. We also captured corresponding videos for additional review.

In our study the cognitive walkthrough includes several steps. The cognitive walkthrough began by having the moderator explain the purpose of the study and describe cognitive walkthrough to the participant. The moderator then distributes the case scenario to the participant and the participant completes the tasks defined by case scenario. For each cognitive walkthrough several researchers observed the user and then diagramed the patient clinician-EHR workflow.

For this study, we conducted the clinician/patient encounter in a simulation lab, which is a training center for the medical center students. The clinical scenarios were developed by, medical professionals. A trained patient simulator was pseudo patient. The creation of clinical scenarios followed a well-established method to evaluate EHR functionality (Belden, J. L., Grayson, R., & Barnes, J. (2009)). The specific clinical scenario used in this study is an outpatient clinic visit for patient follow-up of hypertension, coronary artery disease (CAD), and heart failure atrial fibrillation.

The participants in our study include a diverse group of clinicians including physicians, fellows, nurse practitioners and medical assistants from different hospital settings.

As the research progresses, different clinician-patient interaction workflows will be analyzed primarily by identifying and comparing the workflows where the clinician's dependency on the EHR to accomplish various tasks is more versus the workflows where the clinician's dependency on the EHR is less and the clinician uses paper notes instead. An example of a workflow that shows the clinician relying mainly on the EHR is shown in Appendix A. An example of a workflow that uses more paper notes is shown in Appendix B. The analysis comparison of these two workflows is still in progress.

To help us identify the similarities and differences in the workflows, we will color code similar tasks across different workflows. We will use time sequencing to help us analyze the order of the tasks across different workflows.

For further analysis and comparison of the workflows, the tasks in the clinician – patient interaction workflow will be categorized as: Review, Interview, Documentation, and Reflect. The time taken for each of these categories in different type of workflows will be measured, compared, and analyzed.

To date we have completed 10 cognitive walkthrough observations. We are in the process of diagramming the remaining 8 workflows and doing our analysis. Preliminary results show that the type of clinician using the EHR has quite different

workflows. We have also observed many inefficiencies, where improved usability design of the EHR interface would benefit.

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REFERENCES

1. Ash, J. S., Sittig, D. F., Poon, E. G., Guappone, K., Campbell, E., & Dykstra, R. H. (2007). The extent and importance of unintended consequences related to computerized provider order entry. *Journal of the American Medical Informatics Association*, *14*(4), 415-423.

2. Belden, J. L., Grayson, R., & Barnes, J. Defining and Testing EMR Usability: Principles and Proposed Methods of EMR Usability Evaluation and Rating [Online]. 2009 [cited 2009 Jun 30].

3. Bodenheimer, T., & Grumbach, K. (2003). Electronic technology: a spark to revitalize primary care?. *Jama*, *290*(2), 259-264.

4. Edwards, P. J., Moloney, K. P., Jacko, J. A., & Sainfort, F. (2008). Evaluating usability of a commercial electronic health record: A case study. *International Journal of Human-Computer Studies*, *66*(10), 718-728

5. Frankovich, J., Longhurst, C. A., & Sutherland, S. M. (2011). Evidence-based medicine in the EMR era. *N Engl J Med*, *365*(19), 1758-1759.

6. Kushniruk, A. W., & Patel, V. L. (2004). Cognitive and usability engineering methods for the evaluation of clinical information systems. *Journal of biomedical informatics*, *37*(1), 56-76.

7. Middleton, B., Bloomrosen, M., Dente, M. A., Hashmat, B., Koppel, R., Overhage, J. M., ... & Zhang, J. (2013). Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA. *Journal of the American Medical Informatics Association*, amiajnl-2012.

8. Niazkhani, Z., Pirnejad, H., Berg, M., & Aarts, J. (2009). The impact of computerized provider order entry systems on inpatient clinical workflow: a literature review. *Journal of the American Medical Informatics Association*, *16*(4), 539-549.

9. Pizziferri, L., Kittler, A. F., Volk, L. A., Honour, M. M., Gupta, S., Wang, S., ... & Bates, D. W. (2005). Primary care physician time utilization before and after implementation of an electronic health record: a time-motion study. *Journal of biomedical informatics*, *38*(3), 176-188.

10. Polson, P. G., Lewis, C., Rieman, J., & Wharton, C. (1992). Cognitive walkthroughs: a method for theory-based evaluation of user interfaces.*International Journal of man-machine studies*, *36*(5), 741-773.

11. Unertl, K. M., Novak, L. L., Johnson, K. B., & Lorenzi, N. M. (2010). Traversing the many paths of workflow research: developing a conceptual framework of workflow terminology through a systematic literature review. *Journal of the American Medical Informatics Association*, *17*(3), 265-273.

12. Zhang, J. (2005). Human-centered computing in health information systems Part 1: Analysis and design. *Journal of Biomedical Informatics*, *38*(1), 1-3.

APPENDIX A

Workflow that shows the clinician relying on the EHR:
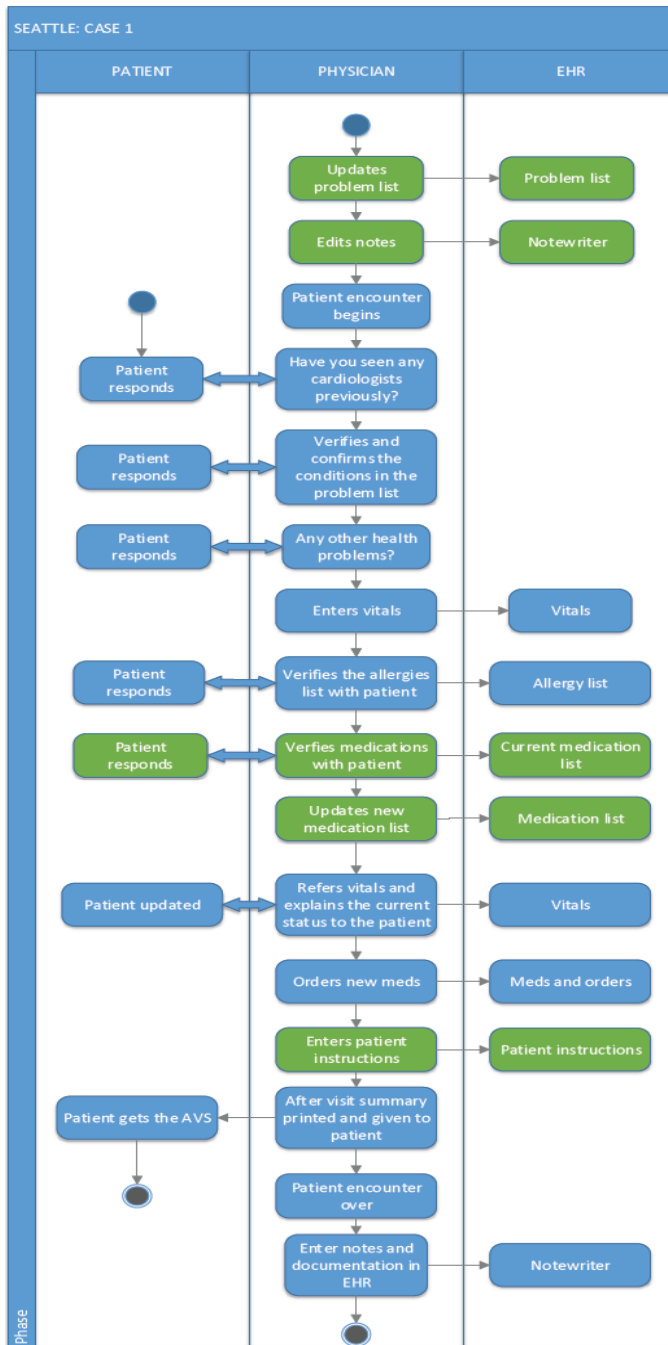
APPENDIX B

Workflow that uses more paper notes.