Summary of Discussion for
The significance of cognitive modeling in building healthcare interfaces
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In this article the authors support a cognitive modeling approach to creating electronic medical record (EMR) interfaces for clinical settings. The hypothesis is that physicians and nurses, while both integral components of the health care system, do not read and process patient information in the same way. The authors point out the "cure versus care" paradigm as a possible explanation for the differences in perception.

A study was conducted on 48 clinicians, 50% doctors, 50% nurses. Each was given the same data in the same format and asked to use the "Think Aloud" technique (i.e. speaking their thoughts) to work through the problem and diagnose the patient. The investigators then translated these monologues into sentences, then ideas, then units. They grouped these units into seven categories: recall, inference, assumption, conditional, intervention, and error (or uncoded). After creating these categories they quantified the monologues and made comparisons between MDs and RNs.

The data of the study showed that doctors made many more inferences and interventions than did nurses, who were more focused on recalls. The investigators noted that there was some shared terminology between doctors and nurses but more often than not they did not share the same concepts. As a result of these observations they note that information can be lost and thought processes can be retarded if a single interface is required for both groups.

While the class thought that the concept of paper was solid and the results accurate, we found the ambition of the paper disappointing. The paper does not offer any practical suggestions for the alternative interfaces that might apply to these groups. After the study and argument confirmed the theory that two interfaces were indeed necessary, we hoped to see what these two interfaces might look like. In fact, re-testing these groups with the modified interfaces would have helped to confirm the observations of the study. As it is, the conclusions of this study are anticlimactic at best.

Also, the authors' statement that "electronic medical records need to be designed to achieve their goals and the goals of the users" is dubious. The EMR itself is a *data structure* and as such should contain as much of pertinent information about the patient as possible, no matter how many audiences might be looking at it.

What the authors might have intended to emphasize is that we should select different ways to *display* an EMR. As a result, they miss the opportunity to discuss a necessary and topical distinction between content and display, as is the case with XML data and XSLT stylesheets. Arguing that the data of the EMR itself should be adjusted for multiple audiences is not efficient and is sure to create issues reconciling these data later on.

Also, the class discussed the lack of scientific controls and iterations applied to this study. We questioned the experience level of the nurses versus the relative inexperience of the doctors, as well as the particular field studied and how that might have affected the outcome of the study. We also would have liked to have seen the investigators test their seven-category ontology to see if it properly describes what's going on. That is, the only two people for whom these concepts are surely applicable are the investigators. At minimum these classifications might be shared with colleagues in order to validate their applicability to the field. And in fact we would have hoped that the investigators would have conducted a second round of studies with the doctors and nurses actively engaging them, seeing if the terms stand up for the expert field. This might have allowed the investigators to tweak the test and learn more about the different cognitive models of the groups and then propose some differences that might be useful in the distinct interfaces.

As an exercise, we brainstormed how we might complete such a study and test the different interfaces on our different actors. The following list constitutes some of our better possibilities and suggestions:

- Simulate a more realistic usage environment, by placing a time limit on the interactions and increase the noise and activity levels.
- Include the current record-keeping system in the tests so that there is a control or baseline measurement against which we can say the clinicians' interactions are "better" or "worse" with the new interface(s).
- Iterate through interfaces with modifications based on clinicians' experience and feedback to develop optimal RN and MD interfaces. Are they different? This would support/confirm the cognitive theory.
- Perhaps MDs need a more inference-facilitated test, whereas RNs are more focused on recall.
- Break down the test into specific groups (experienced vs inexperienced MDs, etc), environments and tasks and allow the clinician to treat a mock patient.
- Give the clinicians a card-sorting exercise where they rank the importance of the various fields that might appear in the EMR, given different tasks. If this exercise is successful, one can validate (or revise) the structural scheme developed in the original experiment.
- Include interviews, observations, and modeling of workflow in the process, as well as controlled, more "known" variables (e.g., testing clinicians on the current interface alongside the new ones).