Usability Testing A Redesigned Display Interface For An Electronic Preoperative Anesthesia Record

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Abstract
Preoperative anesthetic evaluations, used to assess the risk of surgery and anesthesia, are documented in a preoperative anesthesia note. If the computer display of the note is difficult to read, it can lead to decreased efficiency and errors. The readability of electronic notes is affected by several factors. We redesigned the preoperative anesthesia note according to accepted human factors (HF) principles of display design. Usability tests of the original and revised notes were conducted to assess readability and usability. To date, 3 subjects have been tested. These preliminary results show a preference for the redesigned note. The optimal design remains to be determined.

Introduction
The notes that document anesthesia preoperative evaluations are important sources of information for anesthesia providers. Their readability is affected by HF design considerations that include font characteristics, spacing, formatting and layout, as well as the software translation of structured input elements (e.g., checkboxes) to output text. A well-designed note can be easier to read and comprehend, and better facilitate complete and accurate transfer of patient information.

Methods
A set of three notes were created using the Epic electronic record¹ for the original design, as well as a revised design based on HF design guidelines.² Also, portions of each revised note were written using more natural language. Usability testing of the displayed notes was performed using OHSU anesthesia providers. Each subject read the notes of a given design at an initial session, and 2 weeks later the notes of the other design. Which design was read first was randomized. Eye tracking was used to record where visual attention was focused while reading the notes. After reading each note, they wrote a complete summary of the patient’s history and exam to the best of their recall. The time it took to read each note, and the number of correctly recalled elements, missed elements, and errors in recall were recorded. After reading all three notes of a given type, they filled out a questionnaire regarding their subjective impressions of the notes they had read, using a 5-point Likert scale.

Results
Preliminary results have been obtained from three attending anesthesiologists. Reading times for the notes ranged from 101-169 seconds. Reading times do not appear to correlate with old vs. new design. There were 98-112 separate elements in the notes. Subjects recorded (recalled) 12-36% of elements. Errors in recall were few, from 0-3 per note. Recall does not appear to correlate with old vs. new design. All 3 subjects preferred the new design. They felt they were better designed and easier to read; matched their expectations; would help decrease workload, prevent harmful mistakes, and help deliver higher quality care; had more complete H&P info; and took less time to read. Overall, they were more satisfied with the redesigned version of the notes.

Conclusions
These preliminary results show that the use of HF guidelines can improve the design of an anesthesia preoperative note. Users prefer the redesigned version, although reading times and recall of information may not be any different. Additional work is needed to determine the optimal design, however.

References
1. Epic Systems Corporation, Verona WI