

Controlled Software Evaluation Methodology: Case Simulation and Cognitive User Analysis

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Abstract: *Software for use with patient records is challenging to design and difficult to evaluate because of the tremendous variability of patient circumstances. A method was devised by the authors to overcome a number of difficulties. The method evaluates and compares objectively various software products for use in emergency departments and compares software to conventional methods like dictation and templated chart forms. The technique utilizes oral case simulation and video recording for analysis. The methodology and experiences of executing a study using this case simulation are discussed in this presentation.*

Background: Interest in software for charting and other functions in the emergency department has long been demonstrated by the hundreds of voice-based systems purchased in the early nineties. The importance of selecting the right system is demonstrated by the number of those systems turned into doorstops. Opinions vary and few individuals have experience with more than one system of the dozen or so products currently available (1).

Efficiency and the quality of the chart produced are key performance measures. The time to produce a chart, however, varies widely from patient to patient.

Case simulation is a well-described process in the context of testing all emergency physicians for specialty board certification. After a written test, all are tested with an oral board test. The examiner presents a case orally to the candidate and they simulate the visit including talking with, examining and treating the patient. The process works well for the important task of testing emergency physicians' professional skills.

This paradigm also fits well for evaluating software. It allows the experimental control of comparing software performance on the same, standard patients. No real patients are involved so sticky issues of confidentiality and consent are avoided.

Methodology: Each experimental case is formulated as a typical emergency room patient visit. Facts of the case are spelled out and the simulator memorizes them to be able to respond quickly to the candidate physician's questions.

In the software evaluation paradigm, the computer screen is recorded by a video converter inserted

between the PC and the CRT cable. A second camera records the physician at the keyboard and mouse and use of auxiliary materials like notes and clipboard or other parts of the chart that may be on paper still. This camera captures the audio stream as well.

Because the physical exam is verbally simulated, the transcript of the audio contains all the facts of the case including those things normally observed by the physician. This comprises the control on the accuracy of the information recorded in the chart.

Prospective, objective measures of efficiency and quality are performed for each case. Timing and efficiency are measured from the video.

Additional user analysis and cognitive analysis techniques (2) are available from the rich video data collected.

Results: Seven datasets of five cases each have been collected to date. Interesting particular behaviors have been observed by the nature of the paradigm. One is the prevalence of paper notes taken during the patient encounter used for recall of facts to be entered. Positional constancy seems important consistent with Poon's experiments in software design performance (3)

Future goals: The first series will compare several more vendors and the use of dictation and templated, hand-written forms. A second series will expand upon the breadth of the simulation by including nurse charting and the collaboration in charting accomplished by some systems. Improvements in video processing and format of capture should improve efficiency of analysis and allow more extensive studies and more extensive analysis of the rich data produced.

References

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