Medical Diagnosis: A Functional Model and Diagnostic Aid

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Abstract

Improving the quality of the medical system has always been of great importance but has not always made the largest advances. A significant percentage of medical errors are due to wrong, missed, or delayed medical diagnosis. Diagnostic errors are among the most preventable categories of medical errors, but when an error is made it is harder to overcome the harmful effects on a patient, in contrast to other types of medical errors. Through this research the flaws of the clinical diagnostic process were explored and addressed by designing a means to present medical information. Cognitive biases are a major cue in diagnostic errors, and the challenge of finding their potential countermeasures were also addressed. A systems engineering approach consisting of problem analysis, modeling, requirements development, design, and testing was followed to find a solution. Being aware of the changing state of healthcare, one understands that little effort is currently devoted to designing appropriate visualization and navigation techniques for presenting medical history records, in contrast to developing standards for gathering medical records, which receives substantial funding. This lack of effort worked as a motivation to develop a solution to the problem.

The Diagnostic Aid was developed according to a formal IDEF0 model of the diagnostic process, requirements derived from the model, and information visualization principals. The effectiveness of the Diagnostic Aid in presenting medical information, preventing cognitive errors, and matching physicians’ need was tested. A quantitative questionnaire and a qualitative interview were used to evaluate the subjects’ perceptions about the system and to verify requirements. The users’ overall perceptions of the system were positive and they found the system potentially helpful. The system did not interfere with their decision making process, at least in the context that was tested. The Diagnostic Aid was found to be as efficient as the paper format in presenting medical information, yet it could be improved. Most of the requirements were evaluated positively and new requirements developed for the next generation of the Diagnostic Aid.

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