EMR-sim: a computer-based simulation for enhancing residents' competence in computerized primary care settings

Samer Elamrousy, BPharm1, Sharon Domb, MD, CCFP2, Elizabeth Borycki, RN, PhD3, Shmuel Reis, MD, MHPE4, Andre Kushniruk, PhD3, Amitai Ziv, MD, MHA5, Aviv Shachak, PhD1,6

1Institute of Health Policy, Management and Evaluation, University of Toronto, Toronto, Canada; 2Department of Family and Community Medicine, Sunnybrook Health Sciences Centre, Toronto, Canada; 3School of Health Information Science, University of Victoria, Victoria, Canada; 4Bar-Ilan University Faculty of Medicine in the Galilee, Safed, Israel; 5MSR- Israel Center for Medical Simulation, Sheba Medical Center, Tel-Hashomer, Israel; 6Faculty of Information, University of Toronto, Toronto, Canada

Abstract

Patient-clinician communication has been associated with patient satisfaction, compliance/adherence and better health outcomes. Although electronic medical records (EMRs) have many benefits, one concern that remains is their impact on communication and especially on psychological and emotional exchange, establishing rapport and maintaining eye contact with the patient. In this project, we are developing a set of computer game-like simulations for enhancing family medicine residents’ competence in computerized settings, based on previous research findings and modeled after a simulation-based intervention that we previously developed and tested. First, we selected an authoring tool (Adobe Captivate 7) suitable for the project. Next, we defined the design process of building computer-based simulations to include four iterative phases that we employed in developing 3 prototype scenarios. We will illustrate this process and discuss our future plans for usability evaluation and pilot testing of the simulation.

Introduction

Interpersonal communication skills have long been acknowledged as an important competence of health care providers. Patient-clinician communication has been associated with patient satisfaction, compliance and adherence to therapeutic regimen, conflict resolution, and better health outcomes that range from improved physical and emotional health status, and better performance in activities of daily living, to enhancements in disease markers and states. With advancements in health information technology (HIT) and growing acceptance, the traditional dyadic patient-clinician interaction has transformed into triadic relationships. In particular, the implementation of electronic medical records (EMRs) has both positive and negative impacts on the clinical consultation: while it positively affects information exchange, EMR use often interferes with psychological and emotional exchange, establishing rapport and maintaining eye contact with the patient. Several studies identified strategies, best practices, and skills that enhance clinicians’ communication in computerized settings and can be learned. However, educational interventions that go beyond technical aspects of using HIT are rare. Therefore, we developed and tested a simulation with standardized patients (actors) for enhancing family medicine residents’ competence in computerized settings. However, cost and scalability compromise widespread implementation of this simulation. An alternative is point and click computer simulations, which can be widely distributed and implemented. Here we report on the design of such computer-based simulation that we call EMR-sim. Implications for the interdisciplinary community and plans for future research and evaluation are discussed.

Methods

We reviewed several simulation authoring tools to select one that: 1) Allows for insertion of photos and EMR screen shots into the simulation; 2) Instantly converts the storyboard into computer simulation that is compatible with various technological platforms; 3) does not require extensive knowledge of programming or graphic design; 4) Supports the creation of complex branching storyboards; and 6) Contains a mechanism for performance assessment and feedback. Based on these criteria we selected Adobe Captivate® 7 as our authoring tool. Next, we selected case scenarios from the standardized patients’ intervention developed in Israel. We met with the Medical Director of Family Medicine at Sunnybrook Health Sciences Centre, Toronto to adapt the scenarios to the Canadian context and the specific requirements of the clinic including cultural issues, workflow, and the EMR system used. We then
followed the process of building simulations suggested by McGee with modifications. Our final process involves four main phases:

1. Defining the learning objectives and drafting a case synopsis (a brief narrative of the case).
2. Mapping the story by creating a flow chart of the case events with a detailed description of the actors’ actions, conversations, decisions that would be made by trainees, results of these decisions and visual elements.
3. Designing the storyboard by creating sketches of the simulation slides based on the story maps. The storyboard will also include a) the feedback that will be provided to the trainees based on their decisions, and b) the technical infrastructure details of developing the simulation in Adobe Captivate, such as the use of variables, standard actions, conditional actions and navigation objects.
4. Developing the prototype, by using Adobe Captivate. The prototypes are fully functional simulation modules but do not yet include all of the visual elements that will be added later.

**Results**

We used the previous four-phased process to build simulation prototypes for three case scenarios, in which residents interact with virtual patient characters and their EMRs, make decisions that lead to different paths, and then get feedback on their choices. The main challenge that emerged was converting narrative scenarios, which allow flexibility and improvisation when used with standardized patients, into structured storyboards with predefined decision points. The complete scenarios would be uploaded to a learning management system or a website from which they could be accessed by residents. As a research in progress, we have not yet conducted evaluation research of the computer-based simulation. Our plans for future interdisciplinary research are described below.

**Implications for the interdisciplinary community and directions for future research**

The project opens multiple directions for future research that can be addressed from various perspectives. From a human-computer interaction (HCI) perspective, we plan to evaluate the usability of EMR-sim using a combination of heuristic evaluation, cognitive walkthrough and testing using ‘think aloud’ observations. As the project progresses, questions related to the design of the simulation emerge; for example, our goal was to design a low-cost product using simple graphics that does not require extensive knowledge in programming or graphic design. The question remains as to whether this type of design would be as effective as rich media such as animation or video that may better capture nuances of patient and clinician behaviors. Another question that arose is whether to embed instant feedback within the scenarios or capture the user’s decision and provide feedback at the end. Evaluation of these alternative designs and of EMR-sim’s impact on patient-physician communication in general, requires more work. As training interventions can be assessed at different levels, we are planning to conduct a multi-level evaluation using mixed methods that include self-reported measures of knowledge, attitudes, and impact on practice as well as quantitative and qualitative assessments of patient-physician communication in video observations. These evaluations require expertise in various relevant areas such as family medicine, medical communication, cognitive science and education.

**References**