

Virtual Simulated Patients for Bioterrorism Preparedness Training

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Abstract: Prior to the incidents of 2001, the Institute of Medicine suggested that better training of medical, emergency-response, and public health personnel is needed to respond to potential terrorist incidents. Notably, 75% of family physicians surveyed said they were not prepared to respond to a bioterrorism event. To meet this need, we developed and evaluated a virtual patient simulator for training clinicians in identifying and treating bioterrorism or other diseases.

Methods: The simulator, called VirtualClinic, follows a Subjective, Objective, Assessment, and Plan (SOAP) model for primary care. The user interface comprises a menu bar, a 3D graphical presentation of the virtual patient, frames for accumulation of medical records and presentation of public health alerts, and a command and navigational frame to direct patient behaviors and provide alternative patient views.



Child with cutaneous anthrax in VirtualClinic.

Subjective: The clinician can query the patient about present illness, past medical history, social and family history, lifestyle and medical risks, and symptoms according to body systems. The patient verbalizes his response (using a text-to-speech processor) and may show a related expressive behavior. A definitive textual response is then recorded in the medical record.

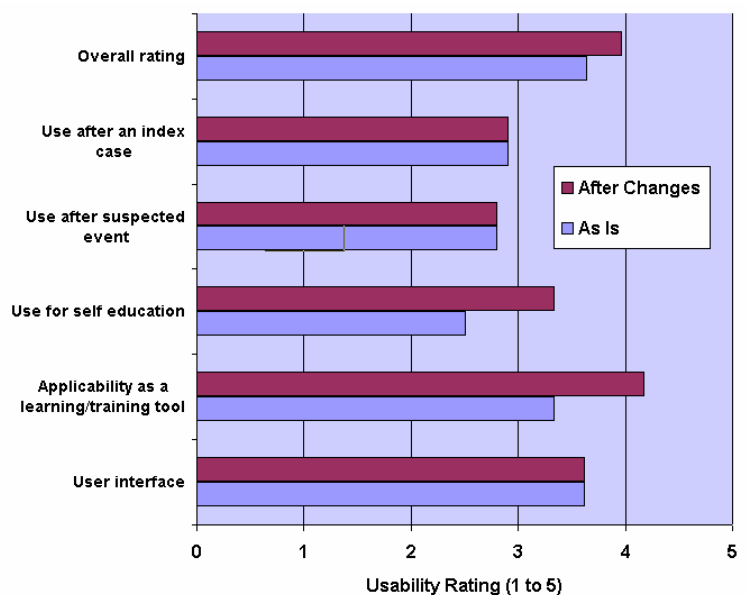
Objective: Physical exams are conducted according to body systems. Diagnostic tests (e.g., chest x-ray) and clinical laboratory tests (e.g., blood chemistries) may also be ordered. Test results, such as Gram stains and radiographs are displayed. For each query, a textual response is recorded in the medical record, and lab results that are outside normal limits are highlighted.

Assessment: Diagnostic hypotheses are made using a disease table comprising over 1,500 expected diseases in primary care, augmented with bioterrorism and emerging diseases. Multiple disease hypotheses can be specified, and each is recorded in the medical record. Whenever a definitive diagnosis is available, the clinician can update the differential diagnosis and a revision is noted in the medical record.

Plan: The clinician prescribes medications, provides patient education, schedules follow-up visits, makes referrals, and ultimately disposes of the patient. All actions are recorded in the medical record. Referrals can be ordered to any of 16 medical specialists

Results: Evaluation included scripted scenarios, pre- and post-test questionnaires, data logs, user commentary, and test monitor observations. Six physicians evaluated the software: five internal medicine or infectious disease specialists, and one recent medical school graduate. The physicians were asked to rate various quality measures on a scale ranging from 1 (lowest) to 5 (highest). They were also asked to suggest improvements, and to give a second rating assuming these were made to assess the relative value of potential improvements. The results (means) indicated that such software is most useful as a training and evaluation tool, but less likely to be used as a refresher immediately after a disease outbreak.

Conclusions: A virtual reality-based simulator has been developed for clinicians to practice interacting with bioterrorism patients. Users testing the software rated it moderately high to very high, with the caveat that certain improvements are made. By providing such training to primary care clinicians nationwide, front line clinicians may be better prepared to respond to bioterrorism events.



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