



University at Buffalo
The State University of New York

Health Care Research in a Virtual World

SUNY at Buffalo (UB)/ Erie County Medical Center (ECMC) Study Group on Extreme Events: Mitigation and Response*

Presenter: Robert C. Sugarman, PhD, University at Buffalo, School of Dental Medicine

*The Team

Project Leader, Steven Dubovsky, MD, SMBS, Chairman, Psychiatry
Project Manager, Renee Volpe, MSW, SSW**
Medical Director, David Ellis, MD, SMBS, Emergency Medicine
Human Factors Director, Robert Sugarman, PhD, SDM, I/UCB***
Project Administrator, Sevie Kandefer, SMBS, Psychiatry
Principal Investigator, Natalie Simpson, PhD, MGT, Operations Management and Strategy

Elsa Dauregnac, PhD, SMBS, Psychiatry
Daniel Antonius, PhD, SMBS, Psychiatry
Werner Ceusters, MD, SMBS, Psychiatry
Jessica Castner, PhD, RN, NUR
Charles Syms, MSW, SSW
Lisa Butler, PhD, SSW
Joann Sands, DNP, NUR
Robert Baier, PhD, SDM, I/UCB
Jim Phillips, Full Circle Studios

Key:
School of Medicine and Biomedical Sciences (SMBS)
School of Dental Medicine (SDM), Industry/
University Center for Biosurfaces (I/UCB)
School of Nursing (NUR)
School of Social Work (SSW)
School of Management (MGT)
** and Intuitive Virtual Solutions
*** and RCS Performance Systems, Inc.

The Challenge

The research team has built a virtual environment replica of the Emergency Department (ED) to conducting research that could otherwise not be performed in the real world. Virtual reality simulation has significant advantages by allowing real nurses, physicians, and first responders to perform their roles by controlling avatars in responses to emergencies ranging from infectious disease outbreaks to mass-casualty incidents (MCI) with chemical, biological, radioactive, nuclear, or explosives (CBRNE)-exposed patients. Medical personnel move about the area, talk and listen to patients, manipulate instruments, charts, and equipment, and make critical decisions.

The potential of virtual ED environments is immense. It will allow creation of real-time scenarios on a large scale in familiar environments without shutting down or impacting the real world counterparts. A virtual environment can track data such as staff movements, use equipment and identify questions asked in a way that is not possible in real world large scale disaster and medical training. The Virtual ED can easily and cost-effectively be retooled to meet multiple scenarios.

Key research interests include:

- Creating a valid laboratory for studying decision making in emergency medical treatment
- Exploring the impact of stress on that decision making process
- Developing evidence-based data that can lead to new protocols
- Evaluating group decision making and teamwork
- Identifying variables that will lead to optimize ED performance
- Developing criteria for evaluation of research and training in virtual environments

Triage Scenario



Goals

The aim of early studies is to assess the virtual environment as a valid proxy for a research environment. Many excellent virtual medical environments are currently being used and developed for training of medical personnel. Generally, those simulations are part-task trainers in that many behaviors or feedback are represented by automatic actions, inferred actions, written messages, and other means of "short cutting" unnecessary fidelity. Among our goals is to determine the fidelity levels that may affect behavior and research validity. For example:

- Should subjects be told to control their avatar in the manner that they would personally perform the tasks, or as they believe a typical professional does the job, the latter allowing them to be more anonymous?
- Is there a detrimental effect of perspective distortions?
- Should the subject see the environment from the eyes of the avatar ("mouse view") or from behind or above the avatar?
- What is a necessary field of view?
- Can subjects judge when they are close enough to an object to touch it without trial-and-error?
- What are the pros and cons of adding 3-D viewing systems and haptic feedback?
- What are appropriate means for measuring stress?
- How should time delays be introduced to simulate the actions of interactive objects or avatars that are not under the direct control of the subject?

As preliminary studies are accomplished, the virtual environment will be expanded to become a multiplayer simulation facility that encompasses more areas of the hospital, the user community, and the supporting players. We expect to be able to evaluate group behavior in response to threats of personal danger to medical staff and their families during a SARS epidemic, behavioral impact of new medical procedures and equipment, effect of public service announcements on the community response to an epidemic or terrorism disaster – the list is unimaginably long, but the availability of experts from across the UB faculty will allow the development of meaningful and timely programs of research that could not otherwise be accomplished.

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If you know of human factors research and development performed in a virtual environment with similar goals, please let us know. Contact Bob Sugarman at rcs7@buffalo.edu or 716-634-8016.