Chapter 8.8
Pulse!!: Designing Medical Learning in Virtual Reality

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ABSTRACT

Pulse!! The Virtual Clinical Learning Lab is designed to transfer and further develop state-of-the-art game design and technology to create subject matter for teaching critical thinking skills in experiential medical learning in virtual reality. The underlying design principles of Pulse!! include real-time feedback, repetitive practice, controlled environment, individualized learning, defined outcomes and educational validity. Pulse!! development incorporated evaluation issues early in the design cycle. The Pulse!! evaluation process ensures that the learning platform meets standards as rigorous as that required by military simulation systems and educational accrediting bodies. The Pulse!! method of case and technology development indicates that virtual-world educational platforms must be not only user-friendly, visually effective, interactively immersive and fluid but also procedurally rooted in curriculum, rich in readily-accessible information and cognizant of actual practice in the real world.

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INTRODUCTION

Pulse!! The Virtual Clinical Learning Lab is a research project designed to transfer and further develop state-of-the-art game design and technology to create subject matter for clinical medical learning in virtual reality. Pulse!! is a high-tech response to a coalescing host of adverse factors compelling innovative means to provide clinical experience and practical knowledge rooted in critical thinking, not only for degree-based education but also continuing education for medical practitioners. Pulse!! problem-based case scenarios are designed for degree-based education and post-degree certification, as well as continuing

education and training for health-care professionals that is pedagogically structured for deep and rapid experience-based learning.

The underlying design principles of Pulse!! include immediate feedback, repetitive practice, controlled environment, individualized learning, defined outcomes and educational validity. An important feature of the Pulse!! development strategy incorporates evaluation issues early in the design cycle. This iterative approach begins with usability analyses and proceeds to incorporate learner reactions, cognitive change, behavior and transfer of knowledge. To this end, Pulse!! field research began with beta testing of the learning platform in medical-education institutions to establish the system's functionality and usability. This chapter focuses on whether the apparatus and conventions of this new paradigm in medical education can be made into an effective tool that is generally acceptable to those who undergo medical training.

BACKGROUND

Pulse!! originated as a research project to determine whether sophisticated medical learning could be achieved in virtual space created by cutting-edge videogame technologies. The platform must prove itself valid and reliable according to the highest academic standards; otherwise, the medical profession will justifiably bypass virtual-world technologies as viable media for experiential learning in critical thinking and differential diagnosis.

The Crises and the Research

The need for low-cost, portable educational media for medical education is driven by a host of contemporary factors, including but not limited to:

- Deaths due to medical error estimated between 44,000 and 98,000 annually with related costs estimated at $17 billion to $29 billion, according to the Institute of Medicine (Kohn, Corrigan & Donaldson, 1999, pp. 1-2);
- Baby-boom retirements from academic faculties and other demographic factors, which are creating looming shortages of medical personnel, especially physicians and nurses (Rasch, 2006, pp. 29-35);
- Shorter hospital stays and medical residents' workweeks, which are reducing clinical training opportunities and expertise development (e.g., Verrier, 2004, p. 1237);
- Continuously changing warfare and terrorist technology and methods, which drive a need for rapid deployment of training for continuously evolving medical treatment (Zimet, 2003, 40);
- Two-thirds of battlefield fatalities from potentially survivable injuries that might have been prevented with through more effective training of U.S. armed forces' Tactical Combat Casualty Care (TCCC) guidelines (Holcombe, et al., 2006, p. 36).

Responding to the Institute of Medicine report, a partnership of the National Academy of Engineering and the Institute of Medicine formed to conduct a study of health-care mistakes and to identify future remedies. The report concludes that the U.S. health-care industry neglected engineering strategies and technologies that have revolutionized quality, productivity, and performance in many other industries and calls for an array of powerful new tools in medicine (Reid et al., 2005, p. 1). Virtual-world simulations are among technologies being explored for use in various formats. The Pulse!! project posits that these technologies are a means of an inevitable paradigm shift in health-care education.

Entertainment has been the main use of virtual reality, but virtual-world training in various formats – the field of "serious games" – also has been explored. In the academy, there has been inci-