



Simulation and education

Emergency preparedness in the 21st century: Training and preparation modules in virtual environments[☆]Daniel Cohen^{a,*}, Nick Sevdalis^a, David Taylor^a, Karen Kerr^a, Mick Heys^b, Keith Willett^c, Nicola Batrick^d, Ara Darzi^a^a Division of Surgery, Department of Surgery and Cancer, St. Mary's Campus, Imperial College London, Praed Street, London W2 1NY, United Kingdom^b Ambulance HART, Defence CBRN Centre, Winterbourne Gunner, Salisbury, Wiltshire SP4 0ES, United Kingdom^c NHS Medical Directorate, Wellington House, London SE1 8UG, United Kingdom^d Department of Emergency Medicine, St. Mary's Hospital, Imperial College London Healthcare Trust, London W2 1NY, United Kingdom

ARTICLE INFO

Article history:

Received 18 April 2012

Received in revised form 10 May 2012

Accepted 16 May 2012

Keywords:

Simulation

Education

Emergency preparedness

Trauma

Resuscitation

Virtual worlds

ABSTRACT

Objectives: To determine the feasibility of evidence-based design and use of low-cost virtual world environments for preparation and training in multi-agency, multi-site, major incident response.**Methods:** A prospective cohort feasibility study was carried out. One pre-hospital, and two in-hospital major incident scenarios, were created in an accessible virtual world environment. 23 pre-hospital and hospital-based clinicians each took part in one of three linked major incident scenarios: a pre-hospital bomb blast site, focusing on the roles of the team leader and triage person; a blast casualty in a resuscitation room, focusing on the role of the trauma team leader; a hospital command and control scenario focusing on the role of the clinical major incident co-ordinator/silver commander. Participants supplied both quantitative and qualitative feedback.**Results:** Using a systematic, evidence-based approach, three scenarios were successfully developed and tested using low-cost virtual worlds (Second Life and OpenSimulator). All scenarios were run to completion. 95% of participants expressed a desire to use virtual environments for future training and preparation. Pre-hospital responders felt that the immersive virtual environment enabled training in surroundings that would be inaccessible in real-life.**Conclusions:** The feasibility and face/content validity of using low-cost virtual worlds for multi-agency major incident simulation has been established. Major incident planners and trainers should explore utilising this technology as an adjunct to existing methodologies. Future work will involve development of robust assessment metrics.

© 2012 Elsevier Ireland Ltd. All rights reserved.

1. Introduction

1.1. Background

The globally elevated terrorist threat, especially the London bombings of July 7th, 2005, has brought major incident preparedness into focus in the United Kingdom (UK). In the UK, legislation is in place to enable emergency services and acute hospitals to prepare for such major incidents, defined as “any event whose impact cannot be handled within routine service arrangements.”^{1,2} Effective response requires a co-ordinated

multidisciplinary approach which may involve local, regional and national healthcare institutions.³

1.2. Importance

In the UK, acute hospitals are required to prepare for major incidents by undertaking a live exercise every three years, a tabletop exercise yearly and a test of communications every six months.¹ Live exercises are the accepted “gold standard” for both pre-hospital and hospital response, but they are costly and time-consuming to organise, and may be disruptive to local services. The inherent difficulties in organising live exercises has been acknowledged by the UK Department of Health, who have stated that an enhanced tabletop exercise (Emergo) can substitute for live training if necessary.^{4,5} Moreover, despite the cost and disruption of organising and running major incident exercises, there is little evidence of their effectiveness in improving the preparedness of an organisation, or the quality of major incident response, although

[☆] A Spanish translated version of the summary of this article appears as Appendix in the final online version at <http://dx.doi.org/10.1016/j.resuscitation.2012.05.014>.

* Corresponding author.

E-mail address: daniel.cohen@imperial.ac.uk (D. Cohen).

this is difficult to measure.^{6–8} The relatively low frequency of exercises and limited accessibility for the large number of potential responders, together with a lack of standardised, accepted skill competencies, make it challenging to train individuals or teams.^{9–12} Furthermore, current exercises focus primarily on the ability of organisations to follow a pre-defined incident plan, rather than improve the skills of individuals or teams involved in incident response, and there is therefore a corresponding lack of structured feedback to individual participants.^{6,13}

Failure of appropriate response in a major incident, especially those involving hazardous environments or materials, may have adverse consequences for both casualties and emergency responders, as demonstrated by the Tokyo Sarin attacks (1995) and terrorist attacks in New York (2001).^{14,15} In addition, high-profile reports and analyses of responses to major incidents around the globe have been critical of emergency response and expressed the need for improved, scalable training provision.^{16–19} Particular focus has been placed on suboptimal communications between different agencies and the poor accessibility of multi-disciplinary training.^{16,20} Deficiencies in communications, response planning, knowledge of roles and responsibilities and the ability of organisations to learn from previous emergency response have all been consistently reported.^{13,21–25} Indeed, at a pre-Olympics security exercise in London, a senior member of the emergency services commented that mistakes were being made similar to those from the London bombings of 2005.²⁶

1.3. Goals of this investigation

There is therefore a pressing need to explore and develop new modalities of training and preparation for major incident response. Here we report the design, development and evaluation of a novel approach to major incident response planning and training based on cutting edge virtual technologies.

2. Methods

2.1. Virtual worlds

Virtual worlds are live, online, interactive 3-dimensional environments in which users interact using speech or text via a personalised avatar. Access requires a modern computer and Internet connection. Healthcare practitioners are increasingly utilising virtual worlds and other web-based technologies for educational purposes, including resuscitation training, conferences, surgical education and team-working for multidisciplinary healthcare providers.^{27–33} Second Life (www.secondlife.com), and the open source equivalent OpenSimulator (www.opensimulator.org), are low-cost, easily accessible virtual worlds. Second Life typically has over one million unique users per month worldwide.³⁴

2.2. Design and development of training scenarios

This project gained ethical approval from the North West London Research Ethics Committee (Reference 11/LO/0850). All participants gave written consent to participate.

An evidence-based, user-driven approach was adopted to ensure that the scenarios created would not only be face and content valid, but also relevant to the current training needs of emergency responders in the pre- and within-hospital setting. The design, development and evaluation of the scenarios were carried out in 3 phases:

Phase 1: scenario specification: A 13-member expert advisory group was convened, with the purpose to identify training priorities for which virtual environments could be appropriately utilised.

Participants all held prominent local or national roles in the emergency services, emergency or trauma medicine, and in the military within the UK. There was also representation from the security services and organisers of the 2012 London Olympic Games.

Phase 2: scenario design: Three scenarios were created to illustrate the capability of running a continuous, fully reproducible, recordable, multi-agency major incident exercise in real time across multiple sites. Scenarios were created on Second Life and OpenSimulator virtual platforms, utilising externally located modelling software to manage virtual patient physiology where required.

Phase 3: scenario evaluation with expert users: All three scenarios were tested at Imperial College London using HP Probook 4530s Notebooks containing a dedicated AMD Radeon Graphics Card. Scenarios were observed live by Ambulance Hazardous Area Response Team (HART), trauma and emergency planning trainers as appropriate, as well as a patient safety and human factors expert (NS). In all three scenarios, participants were sat in isolation, in order that all audio and visual communication took place within the simulated environment. Participants had a short familiarisation session with the software immediately prior to testing; the scenario did not start until participants stated that they were comfortable with the software. After the testing, participants were asked to provide feedback. 5 point Likert scales were used to determine level of agreement with written statements on the participant experience (1 = strong disagreement and 5 = strong agreement). Participants provided verbal feedback on their experience via a semi-structured interview which asked for their views on the potential of the virtual environment for feedback, debriefing and future scenario development.

3. Results

3.1. Phase 1: scenario specification

The expert advisory group came to a consensus that there was a need to examine the feasibility of virtual worlds in both pre-hospital and within-hospital major incident response, specifically focusing on triage, acute clinical response and acute hospital response. The views of the group were corroborated with the findings of two user-needs analysis studies, existing training syllabuses and published academic and grey literature.^{35–37}

3.2. Phase 2: scenario design

3.2.1. Scenario 1: the pre-hospital response

The pre-hospital response scenario was tested by twelve invited members of the Ambulance HART recruited from around the UK (H1–12). Established in 2007, Ambulance HART units ordinarily consist of six to eight pre-hospital clinicians with extended skills and equipment that enable them to access casualties and support other emergency services within unsafe environments.³⁸ HART trainers and UK Army medical staff with experience of blast injuries were closely involved in scenario development to ensure face validity of the scene and casualties.

The scenario was created using OpenSimulator and run on a secure server hosted by Imperial College London. Skype (www.skype.com) was utilised for all verbal communication, using radio call signs. The scenario incorporated a 3D soundscape with realistic sounds emanating from traffic, equipment and casualties. The casualty noises gradually reduced as they were progressively discovered, treated and moved to the casualty collection point. The scenario begins with the aftermath of a suspected dirty bomb explosion outside a sports stadium (Fig. 1). An emergency cordon has been put in place, and walking wounded casualties have been

Download English Version:

<https://daneshyari.com/en/article/3008287>

Download Persian Version:

<https://daneshyari.com/article/3008287>

[Daneshyari.com](https://daneshyari.com)