

**LETTER**

# Virtual reality environments for healthcare professional education

Dear Editor,

I refer to the paper by Walsh on the future of e-learning in healthcare professional education [1]. The paper aptly states that the e-learning has moved from simple text based learning to more interactive, multimedia social learning resources. While e-learning has been around ever since the internet was formally established, advanced techniques in e-learning, such as digital game based learning, virtual patients and virtual reality environments have only recently begun to take center stage. Walsh also points to the fact that simulation will be the future of e-learning. Within the simulation schema, I would specifically like to focus on virtual reality environments and their potential role in e-learning for healthcare professionals in the future.

Over the last two decades, there has been a rapid advancement in the field of simulation and healthcare professional education. A simple PubMed search for “simulation education and healthcare” showed a greater than twelvefold increase in the number of publication from 1994 to 2014 and the number of publications are only going to increase with time.

Virtual reality environments (VREs), which provide an immersive experience to the user, is an area which possesses tremendous potential in the field of healthcare professional education. Several systems such as Second Life, VisCube and Oculus Rift provide the users with an opportunity to don the role of a virtual avatar and enable users to respond to different situations and circumstances in a virtual world. This provides an opportunity for the users to gain knowledge and experience specific situations that, under normal circumstances, might not always be possible.

VRE offers several advantages, especially in healthcare professional education. For example, the simulation of a virtual disaster site could help medical trainees experience the intricacies and difficulties faced during a disaster and can help prepare them in a virtual world. Studying anatomy structures in a VRE could help trainees understand and appreciate the structural complexities of certain organs such as the inner ear.

Several studies have quantified the improvement in knowledge for healthcare professionals via VRE based interventions [2-6]. A systematic review on the effectiveness of VRE based interventions for healthcare professional education is underway by our team and this will provide clarity on the true impact of VRE based education on knowledge, skills attitude and satisfaction of healthcare professionals. However, to date, no comprehensive cost analysis for VREs has been performed. Setup cost, sustainability as well as indirect costs like teacher's time for designing the VRE education module need to be evaluated. Cost effectiveness of the VRE based interventions needs to be addressed and standard guidelines pertaining to the incremental cost effectiveness ratio (ICER) threshold should be formulated. This information will help decision makers decide upon appropriate interventions in different settings.

From the healthcare professional education point of view, the features of VREs such as immersion, role playing opportunities and the provision of personal connection to the simulated environment must be evaluated extensively to determine their influence on knowledge gain. Do VREs truly improve the knowledge for a user? If so, what aspects of the VRE influences the users' knowledge gain the most? How impactful is the VRE in cementing the knowledge for a user and how frequently does a user have to re-enter the virtual world to re-learn and re-familiarize himself with the learning objective? How

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adaptable are VRE based interventions in different geographic and socio-economic settings? These are questions that need to be addressed to have a better understanding of the role that VREs are likely to play in the healthcare education space in the future.

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