



## Commentary

# More Than a Game: Extended Reality in Critical Care Nursing

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## ABSTRACT

The need for innovation in hospital education is significant. Extended reality presents a unique opportunity to provide education on the unit during working hours with a minimal cost. The variety of extended reality hardware and software is rapidly evolving. This commentary addresses the options for critical care education in extended reality.

**Keywords:** Extended reality, virtual reality, nursing education, burnout

## INTRODUCTION

Critical care nursing employs approximately 10% of all hospital nurses (HRSA, 2018). This population of nurses face high levels of work-related stress, with a turnover rate of 18.2% (Bloomer, 2020). The stressors for critical care nurses are constant and emotionally draining. Stressors include ethical issues, dealing with family members, steep learning curves, new technology, the severity of patient illness, irregular work hours, and staffing issues (Woo et al., 2020). Burnout rates in nursing are the highest in critical care nurses. The World Health Organization (WHO) describes burnout as a syndrome that results from inadequately managed chronic workplace stressors (WHO, 2019). High levels of turnover have added to workplace stressors, requiring creative methodologies for continuing education, and annual competency testing.

With increased rates of turnover and the overall need for more nurses, there is an extreme need for innovation in the workplace educational setting. Much of the focus of recent literature is on innovation in classroom education. This commentary seeks to look at educational innovation beyond the classroom setting. Extended reality (XR) has the potential to aid in continuing education for established nursing professionals.

## REVIEW OF THE LITERATURE

This review of the literature focused on XR in nursing education, specifically virtual reality (VR) and augmented reality. More explicitly, the review of the literature targeted the impact of VR in nursing education and the development of VR in the hospital

environment to support continuing education and stress relief. Articles discussing the use of VR in the clinical setting demonstrated a continued need for further research.

### **Definitions**

Extended reality (XR) is a broad term encompassing all types of reality experiences. It aims to blend the real world with virtual objects to support realistic, intelligent, personalised experiences. Augmented reality (AR) overlays information into the real world by superimposing digital objects into the physical space without spatial awareness (Ulrich et al., 2021). The most familiar example of AR is the Pokémon Go! phone app. Mixed reality (MR) mixes digital content with the physical space using a headset and keeps the user in the real world (Ulrich et al., 2021).

One example of MR is the use of an AR headset that overlays a wound or a face on a human patient simulator allowing the learner to see facial expressions or a bleeding wound. Virtual reality (VR) creates a 3-dimensional world that is interactive based on the actions of the learner and provides a feeling of presence in this world that is fully immersive (Abersold et al., 2020). Computer-based simulation is also known as screen-based simulation. This type of simulation may be animated, contain videos, images and/or text (Lioce et al., 2020).

### **Extended Reality in Education**

As the need for continuing education in nursing continues to evolve, technologically supporting gaming is an up-and-coming resource that can increase engagement in the learning process (Dahlke et al., 2020). The importance of continuing education in a flexible format to keep up with the ever-changing needs of the healthcare environment is imperative (Dahlke et al., 2020). Multiple authors performed a review of the literature and found several themes related to VR in nursing education. In a recent meta-analysis on the use of VR in nursing education (Chen et al, 2020), the following themes were analyzed: knowledge, skills satisfaction, confidence, and performance time. The primary finding was increased knowledge with the suggestion to study the additional benefits further. Shorey & Ng (2021) found similar findings with a positive gain in theoretical knowledge, suggesting future research within the context of improving clinical skills. Each of these larger reviews found positive gains in nursing knowledge while discussing the need for continued research.

Fewer articles exist discussing the use of VR in the hospital setting, however, those who have instituted the process have found positive results. Both Dahlke and Wood did a ROL with specific VR interventions focusing on nursing skills in the hospital setting. Dahlke et al., (2020) focused on acute care and Wood et al., (2022) focused on VR use for the performance of CPR. Both authors found VR potential with a call for more research. Independent studies focusing on patient safety (Schumacher et al., 2019), as well as the development of OR skills (San Martin-

Rodriguez et al., 2019 and Sen et al., 2022), have demonstrated positive findings at the introductory level with a call for further research. VR has the potential to provide education that is flexible and meaningful and has been found to improve nursing satisfaction regarding continuing education (Schumacher et al., 2019). Both Sen and Wood discuss the potential for VR to improve nursing confidence, while decreasing perceived stress, with a call for further studies.

The consistent theme is the promise VR holds in enhancing continuing education with a call for further research. Yoder Wise (2021) concurs that the future of VR holds value in development of personalized education for nurses overall. VR holds the innovative potential of meeting the needs of the nursing profession, both in the educational and clinical setting.

## **DISCUSSION**

With current staffing shortages and high levels of burnout for critical care nurses, XR can provide novel ways to change continuing education, annual competency assessments, simulation of high-risk/low-frequency cases, and alleviation of stress in the workplace. VR could be used to address these situations in individual critical care units. In Australia, 150 nurses and midwives participated in headset-based VR to evaluate the use of this technology for nurses who have difficulty leaving the unit for training (Betcher & Wainright, 2021). Screen-based simulations are virtual simulations; however, the discussion are limited to the more immersive modalities of XR.

In a VR headset, nursing staff can complete self-contained simulations at any time, allowing nurses to train when there is time in their shift. With the high acuity of patients, it may be necessary to have additional nurses to cover the patient assignments, but this would be more cost-effective than paying nurses for several hours of education when not working. Most VR nursing simulations last 15-20 minutes and can be repeated. Annual competency simulations could be completed in the same manner as these educational simulations if the content matched the desired competencies. Facilitated simulations could be completed on the unit or in a dedicated area. Facilitated simulations require additional staff to operate and facilitate the simulation but these may be customized or changed in real time as the learner makes decisions for the VR patient. The use of VR decreases the amount of time needed to set up and re-set simulations which are necessary for traditional simulation experiences.

Consistent in the literature is the importance of analysis of cost, as well as the variety of XR technologies available. The cost of VR headsets varies greatly. Prices begin around \$400 per headset and can be significantly more expensive depending on the type of headset selected. An analysis of the return on investment is one area that should be considered before purchasing headsets. The number of headsets

required will vary based on the number of staff, the amount and frequency of VR training, and if the headsets will be used for stress reduction. To allow for training during a scheduled shift, a plan would need to be created to allow for coverage of patients while the nurse is using the headset for training. If each nurse was allowed 30 minutes to complete a simulation, 16 simulations could be completed in an 8-hour shift. Depending on the size of the unit, it could be possible to run every nurse through the required training in a few days with a minimal cost for additional staff to cover patient assignments during the VR training for each nurse.

Simulation software is available for the VR headset from various vendors with a wide range of pricing plans. Some companies charge a flat fee per headset structure, while others charge for each user for a set number of simulations. Another consideration for software purchases is based on the type of simulations desired for the learner. Many companies have pre-built simulations that do not allow customization. These simulations may be self-contained, meaning there is no need for a facilitator. One drawback of many self-contained simulations is the use of drop-down menus for conversation with the patient in the simulation. Facilitated simulations require an educator to run the simulation while the learner is in the headset as the nurse. These simulations require more staffing which may lead to a higher cost for the simulations. Other simulation options include the ability to create custom simulations using no code simulation building software or some companies will custom create simulations for a cost. There is no one size fits all VR simulation program, and each hospital will need to determine which is the best fit for their needs.

Augmented reality (AR) simulations are available from various vendors with the option for AR simulations in an actual patient room using a hologram patient. AR goggles may have a limited field of view, and items in the scenario may require resizing to fit into the physical room. Mixed reality simulations are not as common. Mixed reality simulations use AR headsets with a simulator or patient actor in a hospital bed. This technology is rapidly evolving and has the potential to create emotions on the simulator's face or wounds that appear to be bleeding without the difficult clean-up and resetting of traditional simulations. The benefit of MR simulations would be the combination of increased realism in the appearance of the simulator along with the hands-on tactile experience of traditional in-person simulation.

While the advantages of XR technology are evident and clearly hold promise for enhancing the job satisfaction of critical care nursing, units must create a plan for implementation to determine which products and programs work best for their nursing population. Cost, staffing, and return on investment are key factors to consider when evaluating XR technologies for nursing education. Finding the product that meets the needs of the nursing staff with a solid return on investment

can be challenging but identifying the key issues to be addressed will help narrow the field when purchasing hardware and software.

## CONCLUSION

As an emerging technology, XR can be leveraged to improve continuing education and annual competency evaluation. Headset technology is evolving quickly as is the variety of simulation software. Libraries of available simulations are anticipated to expand over time, allowing units to find a product that meets their specific needs. There are also different mindfulness programs to choose from with preprogrammed experiences or the ability to create a customized experience. XR offers innovative solutions for critical care nurses without relying on a one size fits all program. Further research is necessary to demonstrate the efficacy of XR as a means of improving the work environment for critical care nurses.

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