Immersive Virtual Reality is Superior to Conventional Training for Novice Scrub Nurses Learning Anterior Approach Total Hip Arthroplasty: A Randomized Controlled Trial

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INTRODUCTION: Superior team performance in surgery leads to fewer technical errors, reduced mortality, and improved patient outcomes. Scrub nurses are a pivotal part of this team, however they have very little structured training. This lack of training leads to high levels of stress, low confidence, and concerns that their poor knowledge may cause patient harm. Immersive virtual reality (iVR) simulation is a low cost, easily accessible technology which allows novice scrub nurses to enter a virtual operating theater and repetitively practice these skills in a risk-free environment. It has demonstrated excellent efficacy in training surgeons, however there is a paucity of literature investigating its role in training scrub nurses. This randomized study therefore investigates the impact of an iVR curriculum on training prospective scrub nurses in performing their role in an anterior approach total hip arthroplasty (AA-THA).

METHODS: An *a priori* sample size calculation was performed. To be powered at 90% with an alpha of 0.05 to detect the smallest effect size of 1 (calculated from available literature), the minimum sample size was 46 participants. To account for potential dropouts we planned to recruit 60 participants to this study. Sixty undergraduate nursing students were therefore included in this study and randomized in a 1:1 ratio to learning the scrub nurse role for an AA-THA using either conventional training or iVR. Participants were excluded if they had previously scrubbed for >5 AA-THA operations or had prior iVR surgical simulation experience. The conventional training was derived through expert consensus, consisting of a 1-hour seminar and 2 hours of e-learning where participants were taught the equipment and sequence of steps. The iVR training involved 3 separate hour-long sessions where participants performed the scrub nurse role with an avatar surgeon in a virtual operation. The primary outcome was their performance in a physical world practical assessment with real equipment, where participants were asked a series of questions designed to reflect the knowledge and skills needed to perform their role in the operation. This assessment was developed and validated using a modified Delphi process with a panel of experts consisting expert scrub nurses, surgeons, and industry representatives.

RESULTS:

A total of 53 participants successfully completed the study (26 iVR, 27 conventional) with a mean age of 31 ± 9 years. There were no significant differences in baseline characteristics or baseline knowledge test scores between the two groups ($p>0.05$). The iVR group significantly outperformed the conventionally trained group in the real-world assessment, scoring 66.9 ± 17.9% vs. 41.3 ± 16.7%, $p<0.0001$.

DISCUSSION AND CONCLUSION: Immersive virtual reality training was superior to conventional training in teaching novice scrub nurses to perform their role in AA-THA surgery. This easily accessible, low cost training modality could be integrated into scrub nursing curricula to address the current shortfall in training.