Perioperative Patient Anxiety and Satisfaction following Orthopaedic Ambulatory Procedures using Augmented Reality as an Education Tool: A Randomized Controlled Trial

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INTRODUCTION:

Augmented reality (AR) and virtual reality (VR) have recently gained much interest in the public sector with applications in video gaming, sports, home layout, navigation, and many others. Both AR and VR have recently had increasing applications in medicine including medical training, psychology, physical medicine and rehabilitation, and surgical specialties such as neurosurgery and orthopaedic surgery. These surgical applications rely largely on supplementing a surgeon's visual field to assist in surgical technique or hardware placement, but little work has been done with applying AR/VR systems to patient experience and satisfaction. To our knowledge, no studies have been performed that examine AR's ability to impact patient education and experience. Prior studies have shown that increased education and visual aids such as handouts and videos can serve to decrease perioperative patient anxiety. We hypothesize that by applying the AR to perioperative patient education and experience, we can decrease perioperative patient anxiety and improve patient experience.

METHODS:

Patients scheduled to have outpatient orthopaedic procedures with one of our IRB-approved providers were randomly selected to either be provided standard instructions for their procedure or receive an AR training experience. The interactive AR experience is a custom application developed in-house in collaboration with our institution's Center for Computational Science which visually walks patients through their trip to the OR with narration from their surgeon. Prior to instruction, patients were administered a screening questionnaire to gauge their baseline levels of anxiety. We used the State-trait anxiety inventory (STAI), a validated anxiety index where greater scores correspond with higher levels of anxiety. Patients then underwent appropriate education based on their randomized group (i.e., either standard education via existing preoperative materials or AR-based education in addition to the standard materials). The day before the procedure and at their first postoperative appointment, patients were again administered the questionnaire to determine differences in levels of anxiety.

RESULTS:

Beginning in May 2021 to May 2022, a total of 90 patients were enrolled—50 in the AR group, and 40 in the standard instruction group. Six patients were excluded because they either did not receive surgery or did not complete the required surveys or did not wish to continue. At the time of composition, 36 patients had completed the screening and preoperative surveys (19 in the AR group, and 17 in the standard group). The AR study group saw an overall decrease in anxiety from screening to preoperative, while the standard group saw an increase (mean score -3.8 vs. 1.5, $p = 0.022$, respectively). All patients who completed the postoperative survey (AR group n = 16, standard group n = 16) saw a mean decrease in anxiety compared with both the screening survey (AR mean score -9.3 vs. standard -6.9, $p = 0.29$) and preoperative survey (AR mean score -5.8 vs. standard -8.6, $p = 0.16$). Of the patients in the AR group who completed the postoperative satisfaction survey (n = 18), 14 agreed or strongly agreed that they enjoyed the experience, and 14 patients agreed or strongly agreed that they would recommend the experience and do it again.

DISCUSSION AND CONCLUSION:

Our custom AR application may lead to decreased perioperative anxiety compared with traditional perioperative education and handouts. AR may serve as an effective and enjoyable patient education tool.