

ACS 2022 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Research In-Progress

Augmented Reality Improves Time to Completion of Laparoscopic Peg Transfer by Surgical Residents

Stefan Walter Johnson, MD FACS, Fatima El Jamiy, Ronald Marsh, PhD, Mark Jensen, MD FACS and Sabha Ganai, MD PhD MPH FACS. University of North Dakota, Grand Forks, ND, University of North Dakota, Grand Forks, ND, University of North Dakota, Fargo, ND, University of North Dakota, Fargo, ND

University of North Dakota

Introduction: Augmented reality (AR) integrates computer-generated images into a real environment. Our goal was to determine if AR is feasible for use in surgical education. Our hypothesis was that residents would perform Fundamentals of Laparoscopic Surgery (FLS) tasks quicker with AR technology.

Methods: Research subjects are surgical residents at a university-affiliated community program in a rural state. Residents were asked to perform the laparoscopic peg transfer activity with manipulation of six plastic blocks according to a pattern that was displayed either in the AR glasses, or on a laptop computer screen positioned in a way that required them to turn their heads behind them to view the pattern. Time to completion for Laptop vs. AR, and senior (PGY 4-5) vs junior (PGY 1-3) residents were compared with paired Student's t-tests. Errors including dropped blocks were assessed using the Fisher exact test.

Preliminary Results: Twenty-four residents participated in the study, 16 juniors, and 8 seniors. Mean time to completion for all residents was 104 ± 23 (SD) seconds for the laptop group vs. 90 ± 23 seconds for AR ($p < 0.001$). Four blocks were dropped in the AR group and none in the laptop group ($p = 0.57$). Junior resident mean time was 102 ± 25 seconds for laptop vs 93 ± 26 seconds for AR ($p = 0.06$). Senior residents were significantly faster in the AR group (85 ± 17 seconds) vs laptop (105 ± 19 seconds) ($p < 0.001$).

Next Steps: Overall, resident performance was faster in the AR group, supporting our hypothesis. This finding was significant for senior residents, and there was a trend towards faster times in the junior AR group, suggesting construct validity. This study demonstrates that AR use is feasible in surgical education. This has exciting possibilities for surgery and surgical education, with future directions exploring the use of AR glasses for provision of real-time instruction and feedback.