Virtual ACS 2021 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Research

Lessons Learned from Eight Years of Robotic Surgical Simulation and Directions for the Future

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Introduction: This study was done to evaluate trends in Robotic Surgery VR simulation from 2011 to 2019 to determine which categories of exercises are most utilized by students with a view towards predicting the next generation of Robotic Surgery VR training simulation.

Methods: Data from 455,300 VR robotic surgery exercises sessions, 416,000 sessions on the Mimic dV-Trainer®, 33,000 sessions on the Intuitive Surgical DVSS®, and 6,300 sessions on the newer portable Mimic Flex-VR® trainer from 2011 - 2019, were analyzed. Simulation exercises were broken down into four major categories: 1. "Basic" Robotic Controls (typically hand only activities), 2. Exercises focusing on "Foot Controls" (Clutching and camera movement), 3. Exercises focusing on "Fine Controls" (Sewing and knot tying), and 4. "Other" advanced exercises (Procedure Specific Simulation, Team Training and Games).

Results: On all simulators, "Basic Control" exercises were initially the most frequently performed exercises over the entire study period. But with all simulators, this utilization decreased steadily over time. "Foot Control" exercises remained either steady or decreased slightly. "Fine Control" exercises increased steadily over time. With all simulators, there was an increase initially in procedure specific exercises, but then this utilization stabilized and eventually even declined.

Conclusions: Over time, students consistently chose exercises that focused on the core psychomotor skills necessary to become proficient at robotic surgery (&gt 85%). The recent availability of procedure specific VR simulation showed some initial interest, but then utilization stabilized or declined over time. This shows that there is a continued need for core skill training in robotic surgery simulation. Partial procedure steps tied to specific core surgical skills training may be useful. These findings should help guide the development of future robotic surgery simulation training modules.