Can the AAOS/OTA Hip Fracture Skills Simulator Improve Your Surgical Skills? Validation of a Computer-Based Force-Feedback Simulation Platform

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Purpose: Interest in surgical simulation in orthopaedic resident training led to the development of a computer based force feedback simulation platform by the AAOS and OTA designed to use modules to teach motor skills associated with percutaneous, fluoroscopically guided procedures. Our hypothesis was that users who complete these modules would out-perform those who did not.

Methods: With IRB approval, 24 medical students, recruited from our institution, were randomized to the Training or Control group. After a basic introduction to the simulator, the Control group performed the task of placing three guide-wires (inverted triangle construct) in a valgus-impacted femoral neck fracture (OTA 31-B1) using the simulator. The Training group completed nine training modules on the simulator prior to performing the same task. Our primary outcome measures, determined based on previous construct validation studies, included: pin distance to three defined ideals on the femoral neck, distance to the femoral head articular surface, and distance to ideal starting point on lateral cortex. Unpaired t tests were used to compare the groups.

Results: The training group significantly outperformed the control group ($p<0.05$) in 7 of the recorded performance metrics, including guide-wire distances to the posterior ($p=0.04$) and anterior ($p=0.04$) joint surface, inferior guide-wire tip to center difference ($p=0.04$), parallelism of all three wires ($p= 0.01$-0.04), and overall score ($p=0.002$). The training group had a marginally significant improvement ($0.05 < p <0.14$) over the control in four measures including guide-wire distance to medial cortex, inferior guide-wire distance to the joint surface, distance from the correct starting point, and distance to the lateral cortex. No observed difference in distance to posterior and anterior cortex and number of re-tries.

Conclusion: This study demonstrates efficacy of the AAOS/OTA Hip Fracture Simulator training modules to allow users to outperform their peers in 7 of 14 measured parameters, implying that the training modules may effectively teach motor and three-dimensional spatial skills associated with fluoroscopically guided percutaneous pinning of a hip fracture. A valid computer based simulation platform capable of teaching such skills has the potential to improve surgical education in orthopaedic trauma.

See pages 401 - 442 for financial disclosure information.