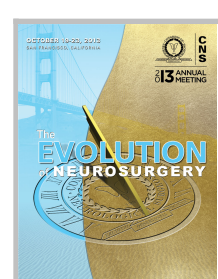


Developing an Anterior Cervical Discectomy and Fusion Simulator for Neurosurgical Resident Training

Wilson Zachary Ray MD; Aruna Ganju MD; James S. Harrop MD, FACS; Daniel J. Hoh MD
Washington University St. Louis, Northwestern, Thomas Jefferson University, University of Florida



Introduction

Surgical simulators have proven useful in many surgical disciplines to augment residency training. Duty hour restrictions combined with increasing emphasis on patient safety measures and senior surgeon oversight have fundamentally changed neurosurgical education from the traditional operating room apprenticeship model. As a result, the Congress of Neurological Surgeons (CNS) Simulation committee has been actively working towards developing comprehensive neurosurgical simulators and training modules for the purpose of enhancing resident education and for assessing proficiency.

Methods

The first CNS Simulation committee ACDF training module was implemented at the 2012 Annual Meeting. The 90 minute curriculum included: written pre-test, didactics, practical pre-test on simulator, hands-on training, written post-test, practical post-test evaluation, and post-course feedback. Didactic material covered clinical indications for ACDF, comparison with other cervical decompression and/ or fusion procedures, surgical anatomy and approach, principles of arthrodesis and spinal fixation, and complication management. A written Pre and Post-test were administered to assess baseline fund of knowledge and for evidence of improvement post-module. Qualitative evaluation of individual performance on the practical portion (simulator) of the module was included.

Results

Three neurosurgery residents, two senior medical students, and one attending neurosurgeon (program director for residency training program) participated in the course. The pre-test scores were an average 9.2 (70.5% of maximum score, range 6 – 13). Post-test scores improved to an average 11.0 (84.6% of maximum score, range 9 – 13) ($p=0.03$).

Conclusions

Our initial experience with the ACDF simulator suggests it may represent a meaningful training module for neurosurgical residents. Simulation will likely become an increasingly important modality for residents to practice surgical technique and to demonstrate proficiency necessary for advancement. Further development of an ACDF simulator and didactic curriculum will require additional verification of simulator validity and reliability.

Learning Objectives

By the conclusion of this session, participants should be able to discuss: 1) issues related to current neurosurgical resident education; 2) characteristics of an effective ACDF surgical simulator; 3) methods for improvement of neurosurgical simulators and training modules.

References

Alaraj, A. et al. Virtual reality training in neurosurgery: Review of current status and future applications. *Surgical neurology international* 2, 52, doi:10.4103/2152-7806.80117 (2011).
Schmitt, P. J., Agarwal, N. & Prestigiacomo, C. J. From planes to brains: parallels between military development of virtual reality environments and virtual neurological surgery. *World neurosurgery* 78, 214-219, doi:10.1016/j.wneu.2012.06.014 (2012).
Seymour, N. E. et al. Virtual reality training improves operating room performance: results of a randomized, double-blinded study. *Ann Surg* 236, 458-463; discussion 463-454, doi:10.1097/01.SLA.0000028969.51489.B4 (2002).
Schlickum, M. K., Hedman, L., Enochsson, L., Kjellin, A. & Fellander-Tsai, L. Systematic video game training in surgical novices improves performance in virtual reality endoscopic surgical simulators: a prospective randomized study. *World journal of surgery* 33, 2360-2367, doi:10.1007/s00268-009-0151-y (2009).