VIRTUAL REALITY SIMULATIONS AND INTERVENTIONAL RADIOLOGY

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Avhandlingen baseras på följande delarbeten:

I. Berry M, Lystig T, Reznick RK and Lönn L. **Assessment of a Virtual Interventional Simulation Trainer.** Journal of Endovascular Therapy, Apr 2006; 13(2), 237-43.

II. Berry M, Lystig T, Beard J, Klingenstierna H, Reznick RK and Lönn L. **Porcine Transfer Study: Virtual reality simulator training compared to porcine training in endovascular novices.** Cardiovascular and Interventional Radiology, May-June 2007; 30(3), In press.

III. Berry M, Hellström M, Göthlin J, Reznick RK and Lönn L. **Endovascular Training using Animals or Virtual Reality Systems: An Economic Analysis**. Submitted.

IV. Berry M, Lystig T, Reznick RK and Lönn L. **The Use of Virtual Reality for Training Carotid Artery Stenting: A Construct Validation Study**. Submitted.

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Aim: The general aim of this dissertation was to conduct validation studies to elucidate the potential for skills acquisition and assessment outside of the catheterization laboratory using VR simulation. Endovascular skill transfer from VR-Lab to the porcine laboratory (P-Lab) was also investigated. An economic analysis was performed to assist in the establishment of a realistic VR implementation strategy.

Methods: Simulator validations were conducted by comparing performance metrics collected from novices and experienced physicians using Student's t-test. Performance metrics were recorded by the simulator while participants treated simulated patients suffering from renal artery stenosis (RAS) and carotid artery stenosis (CAS). Endovascular skills transfer was tested using the P-Lab as an approximation of the human catheterization laboratory. A group of endovascular trainees were evaluated in the P-Lab and the VR-Lab using an objective skills assessment of technical skills (OSATS), yielding a Total Score. Participants were then randomized into different training groups, put through their assigned training schema and subsequently re-evaluated in both laboratories. ANCOVA analysis was conducted to compare the cumulative effect each type of training had on Total Score. Consumable and rental fees from the skills transfer study were used as the substrate for the economical comparison.

RESULTS: Face validity was demonstrated for both the renal and carotid artery stenosis modules. Neither construct validity study produced results which differentiated between the expert and novice performance metrics except for fluoroscopic and procedural times. VR-Lab training sessions generated skills which improved P-Lab performances. VR-Lab training cost less than the P-Lab using our economical analysis.

CONCLUSIONS: Despite demonstrating face validity, VR-Lab simulations should not be used alone for skills assessment outside of the catheterization laboratory in its present form. Skills learned in virtual reality transfer favorably to the P-Lab and simulation training seems to offer a viable alternative of non-clinical training. The VR-Lab affords a more economical method to teach and practice endovascular skills compared to the P-lab. Further research is needed to elucidate the relative efficacies of both training methods.

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