The goal of this study was to develop and validate the effectiveness of a new virtual reality and force haptic based simulation platform for CVC of the right internal jugular vein” Pepley et al (2017).

Abstract:

OBJECTIVE: Ultrasound guided central venous catheterization (CVC) is a common surgical procedure with complication rates ranging from 5 to 21 percent. Training is typically performed using manikins that do not simulate anatomical variations such as obesity and abnormal vessel positioning. The goal of this study was to develop and validate the effectiveness of a new virtual reality and force haptic based simulation platform for CVC of the right internal jugular vein.

DESIGN: A CVC simulation platform was developed using a haptic robotic arm, 3D position tracker, and computer visualization. The haptic robotic arm simulated needle insertion force that was based on cadaver experiments. The 3D position tracker was used as a mock ultrasound device with realistic visualization on a computer screen. Upon completion of a practice simulation, performance feedback is given to the user through a graphical user interface including scoring factors based on good CVC practice. The effectiveness of the system was evaluated by training 13 first year surgical residents using the virtual reality haptic based training system over a 3 month period.

RESULTS: The participants’ performance increased from 52% to 96% on the baseline training scenario, approaching the average score of an expert surgeon: 98%. This also resulted in improvement in positive CVC practices including a 61% decrease between final needle tip position and vein center, a decrease in mean insertion attempts from 1.92 to 1.23, and a 12% increase in time spent aspirating the syringe throughout the procedure.

CONCLUSIONS: A virtual reality haptic robotic simulator for CVC was successfully developed. Surgical residents training on the simulation improved to near expert levels after
three robotic training sessions. This suggests that this system could act as an effective training device for CVC.

Reference:


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