Assessment of Fiberoptic Bronchoscopy Dexterity Retention by Novice Personnel Using Accutouch Bronchoscopy Simulator

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Learner Audience: Medical Students on Fiberoptic Intubation using Virtual Reality Simulators

Background: The importance of fiberoptic intubation (FOI) is well established in the management of difficult airway. [1] Acquisition of fiberoptic dexterity skill is the first step to become an expert in manipulation of fiberoptic bronchoscope (FOB). Previous investigators have demonstrated that virtual reality (VR) AccuTouch Bronchoscopy Simulator (Immersion Medical, Gaithersburg, MD) is an effective tool in teaching FOB dexterity [2] [3]but the decay of the skill among novices over time is under investigated. This study represents a follow-up to our study of acquisition of FOI skills by novices. We have recently demonstrated that novices can be trained equal to the expert with regard to FOB skills. We wished to determine the degree to which these skills are retained by novices after a 2-month period.

Hypothesis: Fiberoptic dexterity skills decay overtime if the operators do not have exposures to the procedure.

Method Designs: This study involved two phases. In phase 1, we established the "expert level" of FOB skill on VR simulator by collecting data from 8 attending anesthesiologists. Fifteen novices who had no prior FOB experience participated in the study and underwent training on VR simulator under direct feedback supervision of an expert until they have achieved the pre-set "Expert Level". For the second phase, the assessment process was repeated two months later. No didactic training or practice attempts were provided on this latter occasion. Data included the time required to pass the fiber-optic scope from the nose through the cords until the carina was visualized, number of tip collisions with the mucosa and time spent viewing the mucosa. After testing, the novices were re-trained and the number of attempts required to achieve "expert level" on VR Simulators was recorded. Two consecutive performances equal or better than the expert level were considered an appropriate level of skill. The initial post training data, 2nd month follow-up pre-training data and the number of attempts that required for them to attain their previous "expert level" were recorded and compared by Wilcoxon Signed Ranks Test. Data are expressed as meant ± SD.

Outcome: Twelve novices (with a drop-out rate of 20%) joined the Phase II two months after initial training. A comparison of their initial performance post-training and after 2 months interval showed a significant decay in dexterity with regard to total time of FOB (initial post-training ,24.89 ± 4.79 vs. 2 month follow-up, 68.33± 30.66, $p<0.01$), total number of airway collisions (0 ± 0 vs 3.50± 4.12, $p<0.01$), time spent in hypopharynx (9.72 ± 3.65 vs. 27.42 ± 21.97, $p<0.01$), nasal passage (6.48 ± 2.19 vs. 18.92 ± 8.79, $p<0.01$), nasopharynx (0.68 ± 0.45 vs. 3.08 ± 2.1, $p<0.01$), and trachea (5.09 ± 2,58 vs. 9.50 ± 3.63, $p<0.01$) after the second month.

The average attempts required for retraining to achieve the expert level after 2 months was less than phase one but not statistically different (8.08 ± 4.58 vs 10 ± 5.69, $p = 0.48$).

Our findings indicate that the substantial deterioration in FOB skills among novices over time emphasizes the need for continued reinforcement of this complex skill. The use of VR simulator plays an invaluable role for the reinforcement of FOB skills.