Combined Intubation Training (Simulated and Human) for 4th Year Medical Students: The Center for Advanced Technology and Telemedicine Airway Training Program

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Abstract. The video laryngoscope is a useful tool in intubation training as it allows both the trainer and the student to share the same view of the airway during the intubation process. In this study, the Center for Advanced Technology and Telemedicine’s airway training program employed videolaryngoscopy (VL) in teaching both simulated (manikin) and human intubation. The videolaryngoscope statistically improved the glottic view in both the standard and difficult manikin airways when compared to that with standard (direct) laryngoscopy. The success rate in simulated difficult airway intubation was significantly improved using VL. With human intubation training, there was statistically significant improvement in airway views using VL and a 97.5% intubation success rate. The enhanced view of the videolaryngoscope in airway intubation facilitates the learning process in performing both simulated and human intubation, making it a powerful tool in intubation training.

Keywords. Intubation, video laryngoscopy, direct laryngoscopy

Background

Prior studies have shown that video laryngoscopy (VL) is ideal for teaching orotracheal intubation, allowing the trainer and student to share the same airway view [1-2]. In our study (CATT airway training program), we attempted to demonstrate improved learning with a VL system in manikins as well as in humans.

Tools and Methods

Following IRB approval, fourth year medical students (University of Nebraska School of Medicine) participated in basic intubation training - both simulated (n=56) and

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human (n=40). Students completed an online intubation course and test plus a pre-training questionnaire prior to the manikin and human intubation training.

**Manikin Intubation Training** - A Laerdal Difficult Airway Trainer™ was intubated using the Storz Medi Pack Mobile Imaging System™ with a number 3 video MacIntosh blade. Students attempted 4 intubations: (1) on a standard airway with direct view (DV) of the glottis (direct laryngoscopy); (2) on a standard airway with an indirect view (videolaryngoscopy (VL); (3) on a difficult airway with DV; and (4) on a difficult airway with VL. The glottic view on a modified Cormack-Lehane (CL) [3] scoring system and time of intubation were recorded.

**Human Intubation Training** - Under direct supervision, the students performed endotracheal intubation using VL. The CL view at the time of insertion of the endotracheal tube was noted by the student. Before removal of the laryngoscope and with no movement from its position, after insertion of the endotracheal tube, the CL direct view was also recorded. Nonparametric data (e.g. the classification of the view of the vocal cords and success/failure of the intubation) was analyzed with a two-tailed Fisher’s Exact Test (p < 0.05 was considered significant).

**Results**

**Manikin Intubation Training Performance Data** - The average airway view grade recorded for the standard airway using DV was 2.62 ± 0.7 (Mean ± SD; n=56). Trainees performing VL on the standard airway manikin reported a mean CL score of 1.30 ± 0.6 (n=56). The indirect view gave a significantly greater proportion of Grade I & II views than the direct view in the standard airway model (P < 0.0001; comparison of grades 1& 2 vs. 3&4). The average CL grade for the difficult airway model with DV was 3.94 ± 0.2 which was significantly higher (worse view) (p < 0.0001) than the indirect view on the difficult airway model (average CL visual airway score 2.82 ± 0.610), leading to a significantly (p < 0.001) greater proportion (28.8 %) of Grade 1 & 2 views (VL) compared to the proportion of direct Grade 1 & 2 views in the difficult airway model (0 %).

![Figure 1. Manikin intubation training: comparison of airway view scores in standard and difficult manikin airways using direct and video laryngoscopy](image-url)
Human Intubation Performance Data—Trainees performed video laryngoscopy on patients with a 97.5% (39/40) success rate. The average CL view grade using VL was significantly lower (1.58 ± 0.68; n=40) than using DV (2.63 ± 0.75; n=38) (p < 0.0001).

Figure 2. Human intubation training: comparison of airway view scores in a human with direct and indirect visualization

Discussion and Conclusion

The VL glottic views of a standard and difficult manikin airway were statistically improved as compared to direct laryngoscopy. A markedly improved intubation success rate of 67.8% was achieved in the difficult manikin airway with VL versus 12.7% with direct laryngoscopy. In the human intubation training, improvement in the glottic views with VL from the direct view was statistically significant (Figure 1). Most importantly, we identified an intubation success rate of 97.5% (39/40) with the video laryngoscope. We recommend videolaryngoscopy be used as the preferred method of teaching intubation.

References


