# Functional Validity of Airway Techniques in Whole Task Human Simulation Using the Laerdal SimMan

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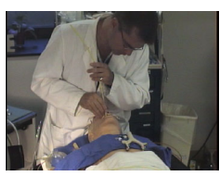
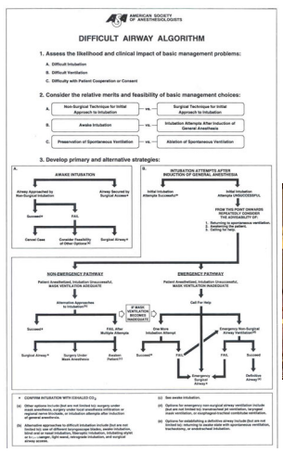
## INTRODUCTION

**Introduction**: Whole task human simulation holds great promise as a evaluation and training tool in areas such as difficult airway management. However, one of the prerequisites for proving whole task simulation to be a reliable educational instrument in difficult airway management is to demonstrate that airway techniques are performed in a functionally valid way, i.e., tools and techniques function within the simulator environment in the same way that they do in actual human patients[1]. We hypothesized that the airway techniques suggested for use by the American Society of Anesthesiologists Difficult Airway Algorithm[2] would be evaluated to be functionally valid in the Laerdal SimMan.



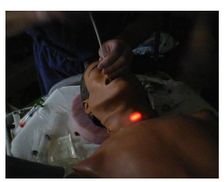
## INTRODUCTION



## METHODS

**Methods**: We invited 17 physicians experienced in difficult airway management to use a variety of techniques approved for use in the American Society of Anesthesiologists Difficult Airway Algorithm in the Laerdal SimMan and to rate the functional validity of those techniques compared with performing them in human patients. These experts were drawn from faculty of the Society for Airway Management, American Society of Anesthesiology Annual Meeting Difficult Airway Workshop, Post Graduate Assembly NY Difficult Airway Workshop and faculty from the WISER Difficult Airway Management for Anesthesia Caregivers training course. Trauma surgeons from the Department of Surgery at the University of Pittsburgh, School of Medicine were recruited to evaluate the standard and percutaneous cricothyrotomy techniques.

This study was approved by the Institutional Review Board of the University of Pittsburgh School of Medicine.



## METHODS

Participants were offered the opportunity to rate the validity of the lighted stylet, fiberoptic bronchoscope, Combitube, Laryngeal Mask Airway, the Fast Trach Intubating Laryngeal Mask Airway, Laryngeal Tube, intubating stylets (bougie), retrograde intubation, transtracheal jet ventilation, cricothyrotomy, and percutaneous cricothyrotomy. Participants were encouraged to rate only those techniques they felt comfortable performing in human patients in their daily practice. Participants rated individual techniques as valid or not valid. De-identified data was collected using a web-based application on a laptop computer in a fashion that blinded the authors to the decisions made by participants. Data was analyzed with the kappa statistic to determine if observed agreement was statistically different from chance. The null hypothesis (validity agreement was no greater than chance) was rejected for kappa values greater than 0.41.

## RESULTS

**Results**: The results are summarized in Table 1. All techniques tested were rated valid. Agreement as to functional validity of most techniques was in the very good to excellent range. The exceptions were the lighted stylet and cricothryrotomy, where agreement as to validity was good and fair, respectively.

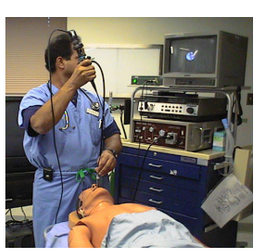
## RESULTS

Table 1. Validity Ratings of Individual Techniques Used in the ASA Difficult Airway Algorithm

| Device | Raters | Valid | Not Valid | Kappa | Agreement |
|---|---|---|---|---|---|
| | | | | | |
| Lighted stylet | 14 | 12 | 2 | 0.71 | Good |
| Fiberoptic bronchoscope | 17 | 16 | 1 | 0.88 | Very Good |
| Combitube | 16 | 15 | 1 | 0.88 | Very Good |
| Laryngeal Mask Airway | 17 | 16 | 1 | 0.88 | Very Good |
| Fast Trach Laryngeal Mask Airway | 16 | 16 | 0 | 1.0 | Excellent |
| Laryngeal tube | 15 | 14 | 1 | 0.87 | Very Good |
| Intubating stylet/bougie | 15 | 15 | 0 | 1.0 | Excellent |
| Retrograde intubation | 15 | 14 | 1 | 0.87 | Very Good |
| Transtracheal jet ventilation | 15 | 15 | 0 | 1.0 | Excellent |
| Cricothyrotomy | 14 | 11 | 3 | 0.57 | Fair |
| Percutaneous cricothyrotomy | 14 | 13 | 1 | 0.86 | Very Good |

## CONCLUSIONS

**Conclusions**: All airway techniques suggested within the ASA Difficult Airway Algorithm are functionally valid in the Laerdal SimMan.



## REFERENCES

1) Assessment instruments used during anesthetic simulation: review of published studies", Byrne, AJ, Greaves, JD, British Journal of Anaesthesia 86 (3): 445-50 (2001)

2) American Society of Anesthesiologist Practice guidelines for management of the difficult airway. Anesthesiology 78:597-602, 1993