Evaluation of Paramedic Utilization of the Intubating Laryngeal Mask Airway in High-Fidelity Simulated Critical Care Scenarios

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Abstract

Introduction: Successful oxygenation and ventilation can mean the difference between life and death in the prehospital setting. While airway challenges can be numerous within the confines of the emergency department, there are many additional confounding difficulties in the prehospital setting, which include limited access to equipment, poor lighting, extreme environments, limited personnel to assist, no immediate backup, and limited rescue airway options. The concept of an easy, reliable, and rapidly deployable alternative rescue airway device is critical, especially when considering the addition of rapid sequence intubation protocols in the prehospital setting.

Hypothesis: The primary objective of this study was to ascertain whether paramedics can be trained to deploy this alternative airway device with an acceptable success rate in a simulated critical care airway scenario. The secondary objective was to determine whether the previously-trained paramedics were able to retain their ability to deploy the device successfully at one year.

Methods: This was a prospective, observational, single-group, descriptive cohort, educational trial. Forty paramedics were trained in the use of the Intubating Laryngeal Mask Airway (I-LMA) in a simulation medicine curriculum culminating in a simulated critical care difficult airway scenario requiring urgent oxygenation and ventilation after failed traditional endotracheal intubation. An emergency medicine physician proctor determined successful airway management. Repeat testing was then performed at approximately one year out, challenging the medics to intubate a mannequin using the I-LMA during an unrelated training session.

Results: Of the 40 paramedics who underwent complete simulation training, 39 were able to intubate and ventilate the simulated difficult airway using the I-LMA during the critical care scenario. This yields a success rate of 97.5% (95% CI, 87.1%-99.4%). At approximately one year out, 35 out of 35 medics were able to intubate the mannequin using the I-LMA, resulting in a success rate of 100% (95% CI, 91.4%-100%).

Conclusions: In this study, paramedics were able to deploy the I-LMA with a high degree of success in a simulated difficult airway, with a high degree of skill retention at one year out.


Introduction

Successful oxygenation and ventilation can mean the difference between life and death in the prehospital setting. While airway challenges can be numerous within the confines of the emergency department, there are many additional confounding difficulties in the prehospital setting, which include limited access to equipment, poor lighting, extreme environments, limited personnel to assist, no immediate backup, and limited rescue airway options. Given this multitude of difficulties, it is no wonder that the prehospital success rate for conventional endotracheal intubation is lower than in the controlled setting of the emergency department.1 For most Emergency Medical Services (EMS) systems, alternative rescue airway devices are very limited, and training is often limited to static mannequins that often do not simulate adequately real-world difficult airways.2
The concept of an easy, reliable, and rapidly deployable alternative rescue airway device is critical, especially when considering the addition of rapid sequence intubation protocols in the austere, resource-limited prehospital setting. The Intubating Laryngeal Mask Airway (I-LMA) device (LMA North America, San Diego, California USA) has the potential to revolutionize management of the difficult airway both in the emergency department and in the prehospital setting. The question that perplexes EMS medical directors is just how to translate knowledge from the relatively controlled, resource-rich setting of the emergency department to the chaotic environment of the prehospital setting. It is clear that didactic education alone is not sufficient for critical care skills and technologies, and there is a significant gap between classroom instruction and the practical field application. Simulation Medicine may serve to bridge this gap in education.

The objective of this study is to ascertain whether paramedics can be trained to deploy this alternative airway device with an acceptable success rate in a simulated critical airway scenario. The secondary objective is to determine whether the previously-trained paramedics are able to retain their ability to successfully deploy the device at one year.

The I-LMA Fastrach is a supraglottic airway positioned in the hypopharynx; when the cuff is inflated, the device allows for positive pressure ventilation. In addition, the inner diameter of the device allows for the insertion of a traditional endotracheal tube up to an 8.0 mm size. This rescue airway device is somewhat unique in so much as device placement and endotracheal tube insertion are done blindly; and the device requires no battery or electrical power, which may make it particularly suited to the resource limited, austere prehospital environment.

Methods
This was a prospective, observational, single-group, descriptive cohort, educational trial. The study subjects were all professional paramedics employed by the City of Portsmouth, Virginia (USA). The local Institutional Review Board approved this study and all paramedics were consented according to protocol. Forty paramedics were trained in the use of the I-LMA in a simulation medicine curriculum followed by testing using a high-fidelity simulation mannequin, a Laerdal SimMan (Laerdal Medical, Stavanger, Norway) with difficult airway settings maximized. The simulation curriculum consisted of a brief didactic lecture and small group static stations for practice, culminating in a simulated critical care difficult airway scenario requiring urgent oxygenation and ventilation after failed traditional endotracheal intubation. An emergency medicine physician proctor using real time audio, video, and telemetry feeds determined successful airway management. Repeat testing was then performed at approximately one year out, challenging the medics to intubate a mannequin using the I-LMA during an unrelated training session. No further educational interventions were done between testing periods.

Results
Of the 40 paramedics who underwent complete simulation training, 39 out of 40 were able to intubate and ventilate the simulated difficult airway using the I-LMA during the critical care scenario. This yields a success rate of 97.5% (95% CI, 87.1%-99.4%). At approximately one year out, 35 out of 35 medics were able to intubate the mannequin using the I-LMA, resulting in a success rate of 100% (95% CI, 91.4%-100%). There were five medics unable to attend the follow-up training. The one paramedic who failed to intubate properly the first time was able to perform the skill successfully at one year out.

Conclusion
In this study, paramedics were able to deploy the I-LMA with a high degree of success in a simulated difficult airway. Importantly, there appeared to be a high degree of skill retention at one year out, with no formal refresher training.

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References