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MANAGEMENT OF PATIENTS WITH PREDICTED DIFFICULT AIRWAYS IN AN ACADEMIC EMERGENCY DEPARTMENT

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□ Abstract—Background: Patients with difficult airways are sometimes encountered in the emergency department (ED), however, there is a little data available regarding their management. Objectives: To determine the incidence, management, and outcomes of patients with predicted difficult airways in the ED. Methods: Over the 1-year period from July 1, 2015 to June 30, 2016, data were prospectively collected on all patients intubated in an academic ED. After each intubation, the operator completed an airway management data form. Operators performed a pre-intubation difficult airway assessment and classified patients into routine, challenging, or difficult airways. All non-arrest patients were included in the study. Results: There were 456 patients that met inclusion criteria. Fifty (11%) had predicted difficult airways. In these 50 patients, neuromuscular blocking agents (NMBAs) were used in 40 (80%), an awake intubation technique with light sedation was used in 7 (14%), and no medications were used in 3 (6%). In the 40 difficult airway patients who underwent NMBA facilitated intubation, a video laryngoscope (GlideScope 21, Verathon, Bothell, WA and C-MAC 19, Karl Storz, Tuttlingen, Germany) was used in each of these, with a first-pass success of 90%. In the 7 patients who underwent awake intubation, a video laryngoscope was used in 5, and a flexible fiberoptic scope was used in 2. Ketamine was used in 6 of the awake in- tubations. None of these difficult airway patients required rescue with a surgical airway. Conclusions: Difficult airways were predicted in 11% of non-arrest patients requiring intubation in the ED, the majority of which were managed using an NMBA and a video laryngoscope with a high first-pass success. © 2017 Elsevier Inc. All rights reserved.

□ Keywords—difficult airway; airway management; tracheal intubation; intubation; video laryngoscopy; emergency department

INTRODUCTION

Critically ill patients in the emergency department (ED) frequently require tracheal intubation during their resuscitation. Because all of these patients are presumed to have a full stomach and are thus at high risk for aspiration, neuromuscular blocking agents (NMBA) are typically used, with a rapid sequence intubation (RSI) technique (1). More recently, delayed sequence intubation (DSI) has been used to optimize preoxygenation in patients at high risk of desaturation (2). Before intubation is attempted, it is common practice to perform a difficult airway assessment to determine if an NMBA can safely be used (3–5). If a difficult airway is predicted, it is generally recommended that an awake intubation be

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performed in order to maintain spontaneous ventilation and avoid a potentially catastrophic "can't intubate-can't oxygenate scenario" (4–7). Surprisingly, there is little research on the management of the difficult airway in the ED (8). The purpose of this investigation is to determine the incidence, management and outcomes of patients with predicted difficult airways in the ED.

MATERIALS AND METHODS

Study Design and Setting

This is a single-center prospective observational study of ED intubations performed over the 1-year period from July 1, 2015 to June 30, 2016, recorded in a continuous quality-improvement database. The study design complied with recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology statement (9). This project received an exemption from the University of Arizona Institutional Review Board.

This study was conducted at a 61-bed tertiary care academic ED certified by the American College of Surgeons as a Level I Trauma Center. There are 36 adult beds, 18 pediatric beds, and 7 trauma resuscitation bays. The annual census is approximately 78,000 visits. The ED has standard airway equipment as well as a wide array of difficult airway equipment available. There are 12 portable airway rolls containing conventional direct laryngoscopes with a variety of straight and curved blades. There are three mobile GlideScope® units (Verathon, Bothell, WA) with an assortment of adult hyperangulated blades (LoPro T3 and LoProT4), standard geometry Macintosh blades (Mac T3 and Mac T4), and pediatric blades (Cobalt video baton size 1-2 with Cobalt Stat blades size 1 and 2). There are two mobile C-MAC® units (Karl Storz, Tuttlingen, Germany) with a variety of standard geometry Macintosh blades (C-MAC Mac 2, 3 and 4) and straight blades (C-MAC Miller 0 and 1). A portable flexible fiberoptic scope (Olympus MAF GM®; Olympus, Center Valley, PA) and rigid intubating optical stylet (Karl Storz Bonfils®) are also both available in the ED. There are three difficult airway carts in the ED, which are stocked with tracheal tube introducers (bougies), LMA Fastrachs™ (size 3, 4 and 5; Teleflex Medical Europe, Ltd, Westmeath, Ireland) and a surgical airway kit (Cook Universal Cricothyrotomy Catheter Set™; Cook Medical Europe Ltd, Limerick, Ireland).

The ED is staffed full time by 65 board-eligible/board-certified emergency physicians who serve as faculty for a university-based 3-year emergency medicine (EM) residency program, a community-based 3-year EM residency program, and a university-based 5-year combined EM/pediatrics residency program. There are a total of 78 residents in the combined EM training programs. All ED intubations are the responsibility of the EM attending, and the vast majority are performed by EM residents, with an EM attending always at the bedside. In-house anesthesia back-up is available 24 h a day.

EM residents receive comprehensive airway training throughout their residency. During intern orientation there is a 1-day airway laboratory that includes both didactics and hands-on experience in a simulation laboratory with a variety of airway devices. All interns in the university-based residency programs rotate on the anesthesia service for 1 month. Regular didactics on airway management continue throughout the residency program, with ongoing training in both cadaver and simulation laboratories. There is a yearly difficult/failed airway laboratory that all residents are expected to attend. Clinical experience with airway management is obtained on rotations in the ED, in the operating room and in the intensive care unit.

Selection of Participants

This study included all non-arrest patients that underwent intubation in the ED over the 1-year study period.

Methods and Measurements

After each ED intubation, a paper-based airway data form is completed by the operator. Data collected on the airway form include patient, operator, and intubation characteristics. This includes data such as patient age, sex and diagnosis, operator postgraduate year (PGY) and specialty, reason for intubation, method of intubation, drugs used for intubation, device used on each attempt, number of attempts, outcome of each attempt, the presence of difficult airway characteristics, and the occurrence of any adverse events. Adverse events that are tracked, and their definitions, have been previously described (10). Residents are taught to perform a rapid, focused, difficult airway assessment that includes multiple predictors of difficult intubation. Because an airway assessment has been shown to be challenging to do on many patients in the ED, a list of dichotomous variables is used to assess anatomic airway difficulty (11,12). These include airway edema, blood in the airway, cervical immobility, facial/neck trauma, large tongue, obesity, restricted mouth opening, short neck, small mandible, and vomit in the airway. After the difficult airway evaluation is completed, operators make a pre-intubation assessment of airway difficulty and categorize the patient into one of three categories: routine airway, challenging airway, or difficult airway. We did not specify the definition of each of these airway categories, as this is a subjective evaluation by the operator and can vary with patient, operator, and clinical circumstances.