

EDITORIAL

Factors for advancing emergency airway management practice

Hui-Chun Ku¹, Shih-Yi Lee^{2,3,*}

¹Department of Life Science, Fu Jen Catholic University, 242062 Taipei, Taiwan

²Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, MacKay Memorial Hospital, 10499 Taipei, Taiwan

³MacKay Junior College of Medicine, Nursing, and Management, 11260 Taipei, Taiwan

***Correspondence**

leesy15538@yahoo.com.tw
(Shih-Yi Lee)

Abstract

Compiling factors from scientific evidence of airway management in the emergency setting is a strategy for improving patient outcomes. Review and original articles in this special issue highlight the essential elements that deserve special attention in clinical practice, including airway assessments before artificial airway establishment, rapid sequence induction, continuous monitoring of vital signs after airway intubation, and management of artificial airway-associated discomfort.

Keywords

Capnography; Difficult airway; Difficult mask ventilation; Difficult intubation; Emergency airway management; Rapid sequence intubation; Tube-related sore throat

Emergency airway management is a crucial aspect in critical care. Relieving ventilation insufficiency and airway obstruction saves lives; airway management strategies must also be optimized to improve airway management quality [1–3]. Factors for advancing emergency airway management practice include airway assessments before artificial airway establishment [4, 5], rapid sequence induction [6], use of device to verify the position of the artificial airway and to monitor ventilation and pulmonary circulation after intubation [7, 8], and management of artificial airway-induced discomfort [9].

Difficult airway (DA) resulting in difficult mask ventilation or difficult intubation complicates emergency airway management. The difficulty in establishing sufficient oxygenation through bag-valve-mask ventilation potentially leads to complications such as eye and eyelid injury, airway trauma, nerve injury, gastric insufflation by overinflation (inflation pressure: >20 cmH₂O), vomiting and aspiration of gastric contents into the airway [10, 11]; multiple attempts to establish artificial airways possibly lead to adverse events such as airway trauma, esophageal intubation, aspiration, hypoxemia, hypotension, dysrhythmia, and cardiac arrest [12, 13].

A quick review among patients requiring airway management is a strategy to deduce a DA [14]. Successfully identifying physical features suggestive of a DA is crucial for accurate preparation before artificial airway intubation and for planning a safe emergency airway management [15]. The emergency airway assessment tool should be quick and effective. Age-related changes in the structure and function surrounding the airway ultimately result in the development of anatomic features of DA in elderly people [16]. One original study in this special issue evaluated whether age-related changes in the head and neck anatomy among apparently normal adult patients lead to difficulty in emergency airway management; hence, rapid decisions related to preparation for emergency airway

management may be guided by patient age [17].

In addition to airway obstruction in apparently normal patients, pathologic airway obstruction can limit airway flow [18–20]. Head and neck disease may change the internal anatomy surrounding supra- and infra-glottic airways [21, 22]. Vascular anomalies in the area below the larynx may cause airway narrowing and are not visible during examination with a laryngoscope during trachea intubation [23]. Therefore, multidisciplinary preoperative discussion is required to plan for special therapeutic considerations before, during, and after surgical reconstruction for vascular-related airway obstruction; moreover, physicians should remember to anticipate the signs of unexpected airway obstruction and prepare the equipment to resolve the problem when it occurs [24]. Furthermore, the next article in the special issue reviewed airway obstruction in deep neck infection. Deep neck infection potentially causes airway narrowing from the mouth along the trachea to the carina because of trismus, laryngeal edema, and the mass effect caused by the abscess in the suprahyoid space, infrahyoid space, or that spreading from the neck to the mediastinum [25]. Securing the airway in patients undergoing surgical intervention for deep neck infection is challenging because they usually exhibit limited mouth opening, airway distortion, tissue edema, or cervical immobility. Assessing the risk of a potential DA and planning the most appropriate airway management method are critical in managing patients with deep neck infection.

Rapid sequence intubation is the cornerstone of emergency airway management [5]. Administering a sedative agent immediately followed by a neuromuscular blocking agent to produce rapid unconsciousness and paralysis provides optimum intubation conditions while minimizing aspiration. Successful and safe tracheal intubations with anesthesia induction should prevent morbidity and serious consequences of a failure in airway establishment. However, upper airway obstruction eas-

ily occurs in critically ill patients with reduced consciousness levels [26]. Anesthesia induction in an unconscious patient can further result in loss of the pharyngeal tone and falling-back tongue, leading to airway narrowing and in turn desaturation, which complicates the tracheal intubation procedure, especially in the case of a DA [27, 28]. Moreover, physicians must be aware of the hemodynamic effects of general anesthesia agents used for critically ill patients during rapid sequence intubation [29]. An ideal sedative agent is effective, safe, and rapid acting; acts in a short duration; and allows optimum intubation conditions [30]. Because of its influence on catecholamine secretion and sympathetic nervous system stimulation, ketamine has been presumed to be a beneficial alternative for hemodynamically unstable patients [31]. The article by Bakhsh *et al.* [32] in this special issue discussed a study comparing the change in hemodynamic parameters between two commonly available induction agents for rapid sequence intubation, namely etomidate and ketamine [32].

Carbon dioxide is a crucial physiological indicator of ventilation, pulmonary circulation, and aerobic metabolism [33]. Among the methods for confirming endotracheal tube placement (*i.e.*, auscultation of the chest and epigastrium, visualization of symmetrical thoracic movement and fogging flow, ultrasonography, and radiography), capnography that detects end-tidal carbon dioxide in exhaled breath is the gold standard [34]. The readings of capnography are influenced by ventilation and cardiac output levels [33]; hence, simply using the values of end-tidal carbon dioxide detected by capnography is not considered very reliable for verifying the position of an endotracheal tube during emergency airway management [35, 36]. Real-time portable quantitative waveform capnography is another vital method in patients receiving emergency airway management and requiring continuous monitoring of ventilation and pulmonary circulation in near-arrest, during resuscitation, and during transport to critical care units after return of spontaneous circulation [5, 37, 38]. The review article by Huang *et al.* [39] in this special issue pointed out the components required for interpreting quantitative capnography waveform for physicians to deliver prompt accurate treatment in response to the clinical changes in patients requiring emergency airway management [39].

Physicians should also pay attention to artificial airway-induced discomfort because intubated patients are unable to voice their needs [40–42]. The care of postoperative sore throat has been extensively studied [9, 43]; however, the medical care of discomfort from prolonged endotracheal intubation in critical patients has not been extensively explored [44–47]. The final article in this special issue compared the therapeutic effects of two common pain relievers, oral acetaminophen and local lidocaine application, on endotracheal tube-related sore throat in critically ill patients [48].

This special issue is intended to give the readers of *Signa Vitae-Journal of Anesthesia, Intensive Care, Emergency and Pain Medicine* a quick review of the factors required to obtain favorable clinical outcomes in patients requiring emergency airway management. The special issue also attempts to provide a perspective for future studies involved in emergency airway management. The introduction of new technologies, such as video laryngoscopy with a hyperangulated blade and laryngeal

mask airway, for airway management promotes evolutionary changes in the DA definition, with changes to target study groups depending on the equipment and environment used for practicing emergency airway management [49–56]. Moreover, studies focusing on an intervention for tracheal tube-related sore throat, a major source of stress but an easily neglected discomfort in critically ill patients [57, 58], are warranted to fill the unmet need.

AUTHOR CONTRIBUTIONS

SYL and HCK designed the study, SYL and HCK searched, reviewed, and analyzed the articles. HCK drafted the manuscript. SYL and HCK completed and proofread the article.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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CONFLICT OF INTEREST

The authors declare no conflict of interest. Shih-Yi Lee is serving as one of the Editorial Board members of this journal. We declare that Shih-Yi Lee had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to PB.

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