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Airway Management in Emergency Medicine

Zbrinjavanje dišnog puta u hitnoj medicinskoj službi

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Abstract. Airway management in emergency department (ED) is an essential skill for clinicians caring for critically ill or injured patients and provide the greatest challenge to the practice of emergency medicine. Compared to the elective setting in the operating room is associated with a higher rate of complications which include hypoxaemia, dysrhythmias, cardiovascular collapse, oesophageal intubation, aspiration and death. Due to specificities of airway management in terms of critical anatomical, physiological, and pathological features there is still an ongoing debate about who should manage and who should be responsible for endotracheal intubation (ETI) in critically ill patient, anesthesiologists or emergency physicians. This article reviews certain issues related to emergency airway management with a focus on the role of anaesthetists and emergency physicians (EP) in ED.

Keywords: airway management; emergency medicine; learning curve

Sažetak. Zbrinjavanje dišnog puta u hitnoj medicinskoj službi jedna je od najznačajnijih vještina za sve liječnike koji sudjeluju u zbrinjavanju kritičnih ili traumatiziranih bolesnika te je jedan od najvećih izazova u hitnoj medicini. U usporedbi s planiranim zbrinjavanjem dišnog puta u operacijskog dvorani, zbrinjavanje dišnog puta u hitnoj medicinskoj službi povezano je s većom učestalosti komplikacija koje uključuju hipoksemiju, poremećaje srčanog ritma, ezofagealnu intubaciju, aspiraciju i smrt. Zbog specifičnosti dišnog puta u hitnoj medicini u smislu poremećenih anatomskih i patofizioloških značajki, još uvijek se raspravlja o tome tko bi trebao zbrinjavati dišni put, odnosno tko bi trebao biti odgovoran za endotrahealnu intubaciju kod kritičnih bolesnika – anesteziolozi ili liječnici hitne medicine. Ovaj članak pruža pregled određenih pitanja vezanih uz zbrinjavanje dišnog puta u hitnoj medicini s naglaskom na ulogu anesteziologa i liječnika hitne medicine.

Ključne riječi: hitna medicinska služba; krivulja učenja; zbrinjavanje dišnog puta

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INTRODUCTION

Airway management is among the life-threatening procedures that are most often performed in operating room, emergency department (ED) or intensive care unit. In emergency medicine it is an essential skill and one of the most basic and important aspects of managing the critically ill patient. In many European countries, traditionally, most endotracheal intubations (ETI) are performed by anesthesiologists, but with the rapid growth of emergency medicine as a specialty in the past 15-20 years and the development of a structured training program things have changed dramatically and in many countries emergency medicine physicians become responsible for airway management in the ED. However, due to certain specificities in airway management there is still an ongoing debate about who should manage and who should be responsible for ETI in critically ill patient, anesthesiologists or emergency physicians. This article reviews certain issues related to emergency airway management with a focus on the role of anaesthetists and emergency physicians (EP) in ED.

Around 0.5% to 1% of patients in the Emergency Department (ED) require endotracheal intubation for various reasons. However, numerous studies indicate a significantly higher complication rate associated with ED intubations compared to the controlled conditions of an operating room. Failed intubation in the ED can be up to 20 times higher than in elective settings.

LEARNING CURVE

Approximately 0.5% – 1% of patients in the ED require endotracheal intubation for various reasons[1] but *many* studies *have shown* that endotracheal intubation in the ED associated with a high complication rate compared to controlled condition of operating room[2, 3]. The Royal College of Anaesthetists 4th National Audit Projects (NAP4) collected data on the incidence and causes of major complications of airway management in all National Health Service Hospitals in the United Kingdom. The NAP4 found that failed intubation is the most frequently reported complication in airway management[4]. In the controlled condition in elective surgery setting failed intubation incidence is approximately 1 in every 1000-2000 cases[5], with an even higher incidence 1 in 50-100 cases in emergency department[6]. More than 2 failed attempts of endotracheal intubations are associated with increased complications such as hypoxia, arrhythmias, cardiac arrest, and increase of mortality[2]. Critically ill patients have less physiological reserve and are more susceptible to complications.

As is the case with any manual technique, ETI skill has a learning curve. However, there is no consensus on how many ETI should physician perform to gain sufficient experience for intubation. Some suggest that in controlled settings, 20 to 50 intubations are sufficient to develop competence[7-9], however, other work suggests that 200 to 250 intubations are needed for emergency physicians to become competent and gain enough experience for safe endotracheal intubation in cardiopulmonary resuscitation[10, 11].

A systemic review performed by Buis at al. showed that at least 50 ETI with no more than *two* intubation *attempts* are needed to achieve a 90% success rate in elective settings[12].

Konrad *et al.* also described a learning curve for anesthesiology residents and showed that they needed 57 attempts to reach a "success" rate of 90%, but 18% of the residents still required assistance from an attending after 80 intubations[13].

However, as we emphasized earlier, since failed intubation in ED is up to 20 times higher than in the elective setting, it is apparent that education for EP is fundamental in the gain of airway management skills and should be developed in a structured training programme. After completion of initial training, an emergency physician must be able to maintain this competence. Our national anesthesiology residency programs require the minimum of 40 ETI for completion of the training program, but in *emergency medicine residency* training *programs* there are currently no recommendations regarding the minimum number of ETI. During a mandatory 1,5-month rotation in anesthesia during the first year of the residency, *emergency medicine resident* (EMR) will certainly

perform 50 – 60 intubation on stable patients in the operating room and most residents will likely attain ETI skills, however few questions still remain open. Is the number of 50 – 60 intubations sufficient for gain competence in ED airway management, how to maintain skill competency and what is the minimum number of ETI needed to maintain competency. Since it is well known that the number of endotracheal intubation attempts necessary for EMR to become proficient with this procedure in ED is much higher, it is clear that ETI skill requires a lot of time and practice to get it right. For this reason, the initial rotation in anesthesia should last a minimum of 6 months in order to enable the residents to perform a minimum of 200-250 ETI. The Croatian Society for Emergency Medicine submitted a proposal to the Ministry of Health to revise the current emergency medicine curricula.

The second problem is how to maintain skill competency. Several studies indicate that performing ETI in the ED may be too infrequent to maintain skill and also indicate that management skill performance declines early after initial training. Carlson et al. analysed 53,904 intubations *performed* by *2,108 emergency physicians* in 135 ED. They showed that the intubation incidence per ED physician varied between 0 and 109 intubations per year, with median 10 intubations per year, but 25% *emergency physicians* performing 4 or less and 5% performing zero intubations[7].

The problem with a small number of endotracheal intubation procedures per physician in ED can be partially overcome by simulation or non-simulation training (videos or clinical observation). However, for emergency physicians and anesthesiology residents, most effective method to acquire this skill is intubation in the real patient and in case of real need.

Therefore, the current recommendations support simulation and non-simulation airway management trainings only as an adjunctive tool to bridge the gap between theoretical education and practical application[14]. One of the possibilities for maintaining ETI skills, in addition to regular simulation training, is continuous access to and re-education in the operating room. Unfortunately, in some hospitals, the operating theatre remains difficult to access for emergency physicians.

SPECIFICITY OF AIRWAY MANAGEMENT IN CRITICAL SETTINGS

As mentioned before, patients come in the ED for a variety of reasons and approximately 0.5% – 1% of patients require endotracheal intubation. Numerous clinical conditions such as cardiac or respiratory arrest, facial/neck trauma, immobilized cervical spine, elevated intracranial pressure, gastrointestinal bleeding, and chest compression for resuscitation can cause difficulty in airway management. However, although the discussion on airway management in the emergency department has focused on tracheal intubation, it is important to emphasize that problems with airway management are not exclusively due to anatomically difficult airways, they are very frequently caused to physiologically or situationally difficult airways. Technological advances, such as flexible intubation scopes and supraglottic airway device (SAD), have significantly improved the ability and safe management of patients with anatomically difficult airways. The physiologically difficult airway is a term that describes severe physiologic derangements place patients at increased risk of cardiovascular collapse and death during or immediately after airway management. Patients with high-risk underlying conditions and those with pre-intubation hypotension, hypoxia and acidosis have a significantly higher risk of cardiovascular collapse and consequently, a worse outcome[15, 16]. Heffner et al.[17] reviewed all intubations at a single emergency department over a year and found that the incidence of peri-intubation cardiac arrest is as high as 1 in 25 emergency airways at a median of 6 min post-intubation. Nearly two-thirds of cardiac arrest occurred within 10 min.

Post-intubation hypotension is also increasingly recognized as a most common adverse events of *endotracheal intubation* associated with poor outcomes. Incidence rates of post-intubation hypotension in the ED setting range between 0.5% and 44%[18]. The International Observational Study to Understand the Impact and Best Practices of Airway Management in Critically Ill Patients

(INTUBE) enrolled critically ill patients undergoing tracheal intubation in the ED, intensive care unit (ICU) and wards. Adverse peri-intubation event occurred in 45.2% of patients. The most common events were cardiovascular instability, observed in 42.6% of patients. Severe hypoxemia and cardiac arrest were observed in 9.3% and 3.1% of patients respectively[19].

Except high-risk comorbidities and peri intubation factors such as hypoxia, hypotension and acidosis, sedative induction agents administered prior to intubation in critically ill patients can also predispose patients to hypotension through vasoplegia, blunting of catecholamine's, and reduced myocardial function[20-22]. The most common IV anesthetic agents used for induction of general anesthesia and prior to intubation in ED are propofol, ketamine, and etomidate. All these anesthetic affect cardiac output and systemic vascular resistance which are the main determinants of the arterial blood pressure. Therefore, the cardiodepressive and vasodilatory effects of anesthetics can lead to arterial hypotension. The choice between anesthetic is variable and depend mostly on patients' clinical condition and hemodynamic but also on the preference of the providers. A prospective survey audit which was conducted based on a self-administered questionnaire among emergency physicians and anesthesiologists with respect to the selection of drugs for RSI in trauma patients showed that propofol was more frequently used by anesthesiologists and etomidate by emergency physicians[23]. The more frequent use of propofol by anesthesiologists, despite the fact that it produces more profound hypotension and greater hemodynamic instability than etomidate and ketamine, indicates that anesthesiologists are more trained to administer and manage anesthesia.

Endotracheal intubation (ETI) in emergency medicine should not be specific to a single specialty group, whether it be anesthesiologists or emergency physicians. Regardless of the healthcare provider performing ETI, it is imperative that the competencies required for this procedure must be the same.

Because airway management involves more than the technical skill some anesthesiologists are concerned about the lack of sufficient experience among emergency physicians in airway management particularly in the use of drugs to facilitate tracheal intubation in the critically ill patient. Emergency physicians disagree with this and claim that there is often a significant delay before an anesthesiologist or intensivist arrives in the emergency room. *Survey* data from a prospective *observational study* of rapid sequence intubation in the emergency department showed that it took more than five minutes for an anesthesiologist to arrive in 17 of 35 cases intubated by an anesthesiologist, and in 25% of cases there was a delay of over 10 minutes before their arrival[24]. However, it is important to emphasize that anesthesiologists possess specific professional knowledge in pharmacology, physiology and clinical treatment of patients receiving sedation and analgesia, and this must become an important part of the education of emergency medicine residents.

CONCLUSION

In conclusion it is important to point out that endotracheal intubation should not be specific to one specialty group, anesthesiologist or emergency physicians, but regardless of who performs ETI, the competencies must be the same and the safety of airway management in the emergency department will be enhanced greatly by strong cooperation between departments of anaesthesia and emergency medicine.

Conflicts of Interest: Authors declare no conflicts of interest.

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