SAFE Cuff PRESSURE

Should ET tube intracuff pressure be measured in the prehospital setting?

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In today's changing healthcare climate where performance is constantly measured, procedures performed in the prehospital setting need to be reevaluated for their impact on patient outcomes. With the introduction of the Affordable Care Act, medical conditions caused by the action, inaction or conditions within the healthcare system will no longer be reimbursed by insurance. For example, if a hospital patient develops an infection, the hospital will not be compensated for the extra treatment or longer stay.

Some complications may occur due to the environment in which EMS care is provided (e.g., dust from a motor vehicle collision causing a wound infection). However, some problems may be preventable, such as tracheal damage caused by excessive pressure in the cuff of an endotracheal (ET) tube or supraglottic airway.

ET intubation has been an airway management mainstay for decades and is part of most protocols. However, many protocols fail to mention the caution that should be taken to avoid excessive ET tube cuff pressure, explain a technique for proper cuff inflation, or provide a procedure to measure or monitor cuff pressure.

A study found that most ET tube pressures exceeded the recommended limits and that the time spent in the ED or prehospital setting may be long enough for tracheal damage to occur. However, the routine measuring of cuff pressure is rarely done in EMS.

Effective ET tube cuff pressure by over-inflation of the cuff may lead to tracheal necrosis, stenosis and even rupture. At a minimum, the patient will develop a sore throat. Even a simple sore throat could have an impact on the hospital patient satisfaction and Hospital Consumer Assessment of Healthcare Providers and Systems (HCAPS) score. A low HCAPS score can have a negative impact on hospital reimbursement. (See "The Patient Experience Revolution: The Affordable Care Act's emphasis on patient-centered care will transform our industry," by Doug Hosten, MBA and Matt Zawaliski, MS-RT, EMT, in the February issue of JEMS.)

Cuffed ET tubes are designed to maintain a seal for positive pressure ventilation and prevent pulmonary aspiration in ventilated patients. The pressure exerted on the tracheal wall is directly related to the cuff pressure. The perfusion pressure for the tracheal mucosa is 40 cmH₂O, so a cuff pressure in excess of 40 cmH₂O will reduce or eliminate blood flow to the tissue.

The recommended safe cuff pressure is between 20 and 30 cmH₂O. Many clinicians from anesthesiologists to paramedics have been taught to inflate the cuff with the minimal amount of air to prevent a leak and then monitor the pressure by feeling the pilot balloon, but studies have shown this to be inaccurate. Additionally, clinicians were found to be unable to inflate ET tube cuffs to safe pressures by measuring the amount of air used. Conversely, an under-inflated cuff not only affects tidal volume because of an air leak but has also been shown to be a leading cause of aspiration, which is directly related to ventilator-associated pneumonia (VAP). Mortality associated with the development of VAP is high, with mortality rates ranging from 20-41%.

Consider using manometers to facilitate safe inflation and accurate measurement of ET tube airway cuff pressure. Photo: Courtney McCain.
Even though most supraglottic airways never enter the trachea, excessive cuff pressure can still lead to tissue and nerve damage. According to researchers at the University of Washington in Seattle, the average supraglottic airway cuff pressure measured was 90 cmH2O—well above the recommended safe zone of 60 cmH2O.1

So, with the problem identified, how should EMS approach the problem? Currently there’s no universal standard of how and when to check cuff pressures. However, there are studies that support continuous monitoring and automatic adjustments. Cuff pressure can change due to patient movement or an increase or decrease in airway swelling. Clinicians should consider using manometers to facilitate safe inflation and accurate measurement of ET tube and supraglottic airway cuff pressure, with the best alternative being a device that not only monitors but also adjusts the volume of air in the cuff automatically.

EMTs and paramedics need to view patient care as a continuous effort to ensure accurate and safe airway management at times that require the use of these devices in the ICU. EMERGENCY physicians cannot safely inflate or estimate endotracheal tube cuff pressure using standard techniques. 

REFERENCES