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HEAVEN Criteria for Difficult Airway Prediction

April 2019

Airway management has always been a crucial component of emergency and critical care medicine, in both the hospital and pre-hospital environment. It is a skill that requires training, practice, and foresight. The ability to predict the level of difficulty when establishing airway control allows the provider to adequately prepare the necessary equipment and resources to maximize the probability for successful airway management. For years, practical screening tools and predictors such as the LEMON mnemonic used to assess airway difficulty in the emergency setting were the same as the methods developed for use in the elective preoperative setting. However, several limitations with these methods exist in the crash airway setting. The HEAVEN criteria were developed to form a more applicable predictor for the assessment of a difficult airway in the emergency and pre-hospital setting.

A retrospective study was conducted spanning a one-year period, involving 160 air medical bases and over 2400 patients to evaluate the use of a new mnemonic (HEAVEN) with a nearly 100% positive predictive value for identifying a patient with a difficult airway. The problem with previously developed criteria, such as LEMON, is that they were designed for the awake and cooperative patient. Several components of the LEMON mnemonic were left to provider subjectivity, thus leading to uncertain and less reliable predictive values. The HEAVEN criteria displayed a high sensitivity at predicting the difficult airway in the emergency RSI patient population. Emergency airway providers may use these criteria before deciding to administer any medication used in the RSI procedure, to optimize success and patient outcome.

Hypoxemia- oxygen saturation value <93% at the time of initial laryngoscopy

Extremes of size- pediatric patients <8 years old or clinical obesity

Anatomic challenge- includes trauma, mass, swelling, foreign body, or other structural abnormality limiting normal laryngoscopic view

Vomit/blood/fluid- clinically significant fluid present in the pharynx/hypopharynx at the time of laryngoscopy

Exsanguination- suspected anemia that could potentially accelerate desaturation during RSI-associated apnea

Neck- limited cervical range-of-motion due to immobilization or arthritis

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In this study, standard test characteristics (sensitivity, specificity, positive predictive value, and negative predictive value) were determined for overall intubation success rates as well as first attempt success. First attempt success rates without desaturation were recorded for each of the HEAVEN criteria present, as well for cases where no criteria were met. The specificity for intubation difficulty increased proportionately with each additional HEAVEN criterion met. The total number of HEAVEN criteria met was inversely proportionate to the number of successful first pass intubation attempts, and first pass attempts without desaturation, as compared to success rates with no criteria met.

Anticipation of the difficult airway is paramount when providers are considering performing RSI and subsequently disabling a patient from breathing on their own. Proper assessment for airway difficulty and adequate preparation for difficulties likely to be encountered during the procedure will undoubtedly alleviate provider stress levels, as well as improve chances for success and more positive patient outcomes. The HEAVEN criteria for anticipating a difficult airway thus far has proven to be a useful tool for all medical providers who may be faced with the daunting task of establishing airway control on a difficult or complex patient or in less than optimal patient care settings.

References

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