

Hamrick J, Kattail D, Kahntroff S, Shane M, Frazee T, Yaster M
Johns Hopkins University , Baltimore , MD, USA

INTRODUCTION

Children, particularly those less than 8 years of age, are thought to be especially vulnerable to endotracheal tube (ETT) cuff over inflation injury due to tracheal anatomy differences.¹ Until recently, this precluded routine use of cuffed ETTs in this age group. Improvements in the design and materials of cuffed ETTs (e.g., polyurethane versus polyethylene) have made them safer to use in pediatrics resulting in a fundamental change in practice.² However, to be used safely, ETT cuff and leak pressures must be measured. We suspected that ETT cuff pressures were not being measured and, if measured, would be outside the recommended 10-30 cm H₂O limits, regardless of who provided anesthesia or setting (academic v. private practice).

METHODS

This study was performed by fellows in training in part to fulfill ACGME core competency (Practice Based Learning and Improvement and Systems Based Learning) requirements. Following IRB approval, children undergoing surgery at 2 pediatric hospitals (university vs. private practice) were enrolled. Anesthesia providers not directly involved in the patient's care measured the leak around the ETT and the ETT cuff pressure within 60 minutes of intubation. The leak around the ETT was measured by closing the pop off valve on the anesthesia machine and listening over the trachea. The ETT cuff pressure was measured using a calibrated, hand held manometer (Posey Cufflator Endotracheal Tube Inflator and Manometer™, JT Posey Company, Arcadia, CA). Pressures were recorded in cm H₂O. Additional data collected included the patient's demographic data (age and weight) and the type of anesthesia provider (resident, fellow, certified registered nurse anesthetist – CRNA or student registered nurse anesthetist –SRNA) who intubated the trachea. Data are presented as average±-standard deviation.

RESULTS

This study evaluated 220 patients averaging 8.7±6.2(range 0-21, 52% below 8) years and 33.6±27.7 kg. The primary anesthesia providers did not measure ETT cuff pressures in any patient using manometry. When cuff pressures were measured by study investigators, over 52% of patients had a cuff pressure outside of the recommended range of 10-30 cm H₂O. In 54 patients (24.5%), ETT cuff pressures were elevated >30 cm H₂O; and 11 patients (5%) had cuff pressures >60 cm H₂O. University and private practice settings had similar incidence of elevated cuff pressures (53% and 34% respectively). No correlation was noted based on level of training and incidence of an elevated cuff pressure. Although there was no significant difference between the clinicians' estimation and actual measurements of ETT cuff pressures overall (p=0.48), clinicians were unable to accurately predict cuff pressures when >30 cm H₂O (p=<0.0001).

DISCUSSION

This systematic analysis of practice was designed to identify areas of practice improvement and to identify systems errors as part of the ACGME's 6 core competencies. Regardless of training or practice location, we identified a failure by providers to identify high cuff pressures. This will allow us to implement changes with the goal of practice improvement in the future.
