



# DOES TRACH TUBE MALPOSITION VARY BY THE SURGEON'S SPECIALTY?

by *Herbert Patrick MD*

The peer-reviewed published research article selected to teach the Scientific Method in this issue's column is authored by: Ulrich Schmidt, MD, PhD; Dean Hess, PhD, RRT, FCCP; Jean Kwo, MD; Susan Lagambina, RRT; Elise Gettings, MPA, RN; Farah Khandwala, MSc; Luca M. Bigatello, MD; and Henry Thomas Stelfox, MD, PhD. The title is: *Tracheostomy Tube Malposition in Patients Admitted to a Respiratory Acute Care Unit Following Prolonged Ventilation*. This article appeared in the August issue of *CHEST 2008*; Volume 134 (Number 2): pages 289-294. The authors are from the Departments of Anesthesia and Critical Care (Drs. Schmidt, Kwo, and Bigatello, and Ms. Gettings), and Respiratory Care (Dr. Hess and Ms. Lagambina), Massachusetts General Hospital, Boston, MA; and the Department of Critical Care Medicine (Mr. Khandwala and Dr. Stelfox), University of Calgary, Calgary, AB, Canada.

**Trach tube malposition is usually defined as a 50% occlusion of the distal opening of the trach tube**

The Background or Introduction of the research project explains interest in the topic and why the topic is significant. The authors state that although tracheostomy (trach) tube malposition is one barrier to weaning patients from mechanical ventilation, there have been limited studies

describing the factors contributing to trach tube malposition. The authors used their experience to tabulate both patient associated factors and technical-mechanical associated factors that could contribute to trach tube malposition.

One of the questions being asked by the researchers was: Can factors be identified that contribute to trach tube malposition? Note: The question asked in a research project may have the possible answers: "yes" and "no" as in this study, or may be a numerical result. The preconceived answer by the researchers to the question is called the hypothesis. The authors implied that with proper experimental design and data, their hypothesis was yes, there are factors that contribute to trach tube malposition.

The Methods for the research project describe the study design, setting and steps to answer the Question. The study was approved by the Institutional Review Board (IRB) of the Massachusetts General Hospital. The setting was the Respiratory

Acute Care Unit (RU) of Massachusetts General Hospital in Boston Massachusetts. The authors describe the RU as a 10-bed unit for mechanically ventilated patients who are hemodynamically and metabolically stable. The RU is for the liberation of patients from mechanical ventilation using multidisciplinary guidelines for weaning, downsizing of trach tubes for speech and oral feeding, and trach tube decannulation. Trach tube insertion was performed by general as well as by subspecialty surgeons. The RU had one nurse for every two patients plus an on-site respiratory therapist and physician. For the study database, consecutive patients were enrolled if each met all of the criteria: a) greater than 18 years old, b) mechanical ventilation, c) trach tube, and, d) admitted to the RU between July 1, 2002 and December 31, 2005.

Trach tube malposition was defined using bedside bronchoscopy as a 50% occlusion of the distal opening of the trach tube. Each bronchoscopy was performed with the patient's head of the bed elevated at 30 degrees, using either an Olympus or a Pentax bronchoscope (Tokyo, Japan). For this project, the written report of each bronchoscopy was retrospectively reviewed for evidence of trach tube malposition. The types of occlusion of the trach tube that caused malposition included trach tube too short proximally or cuff in the stoma, or trach tube too short distally.

To search for the factors contributing to the trach tube malposition, two types of data were recorded from the medical record: patient associated factors and technical-mechanical factors. Patient associated factors included age, gender, height, weight, duration of mechanical ventilation, hospital admitting service, the unit in which the trach was performed, the etiology of respiratory failure, administration of steroids prior to trach, and comorbidities.

Trach-related technical-mechanical factors included a prior trach procedure, the time from the first intubation to trach, the duration of mechanical ventilation prior to trach, whether the trach was performed emergently, whether it was performed outside the operating room, whether it was percutaneous or open, the trach tube size as inner diameter, outer diameter, and length, presence of an inner cannula, cuff pressure, and the physician service that placed the trach tube: general surgery, thoracic surgery, or other surgical subspecialty.

Statistical analyses compared the data of patients without versus patients with trach tube malposition. The authors selected the procedure of multivariable analyses to examine the data.

The Results section compiles the data to answer the Question. The authors noted 403 patients met the inclusion criteria, 363 patients without trach tube malposition and 40 patients with trach tube malposition, making the occurrence of malposition  $40/403 = 10\%$ . In 4 patients, the trach tube was too short proximally or the cuff was found in the stoma, prompting an emergent trach change to a longer trach tube. In 28 patients, a longer trach tube was placed to bypass tracheomalacia affecting a short segment of the trachea. In 8 patients, there was dynamic airway collapse treated by altered ventilator settings, bronchodilators and corticosteroids.

The patient associated factor of shorter height was related to trach tube malposition. Only one of the technical-mechanical factors was associated with trach tube malposition: the subspecialty of the surgical service of the surgeon who performed the trach. Subspecialty surgeons were more likely to be associated with a trach tube malposition while thoracic surgeons and general surgeons were equally less likely. Of the 41 patients who had a trach performed by non-thoracic subspecialty surgeons, there was a 23% risk of trach malposition; these 41 non-thoracic physicians were categorized as: neurosurgeons (n = 1), otolaryngologists (n = 1), plastic surgeons (n = 1), transplant surgeons (n = 2), and vascular surgeons (n = 36).

The Discussion/Reflections/Future Research starts with a summary discussion of the project. The authors confirmed prior studies showing patients with a shorter height were at increased risk of trach tube malposition. The risk of malposition increased sixfold if a subspecialty surgeon other than a thoracic surgeon performed the trach. The authors offered an explanation for this finding in that nonthoracic subspecialty surgeons perform fewer tracheostomies compared to thoracic surgeons and general surgeons. Since a direct relationship exists between the number of procedures and desirable patient outcomes, the authors felt their data suggest this relationship may extend to trach. Future research describes modifications to the project or new projects that would contribute to this research topic. The authors note that their study was retrospective and may have missed factors identifying patients at risk for trach tube malposition.

The Conclusion is the final summary of the research project. The authors note that surgical expertise appears to be a factor for trach tube malposition. The answer to the question was yes, factors could be identified that contribute to trach tube malposition. The proposed hypothesis was correct.

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Conflicts of Interest are listed for all participating in authorship of the research project. Conflicts include advisory board membership, ownership of stock, and receipt of services, honoraria or gifts from companies related to the research project. The authors disclosed no potential conflicts of interest.

The Bibliography section includes references to support the research as included in the manuscript by reference number. For this research project, there were 19 references.

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