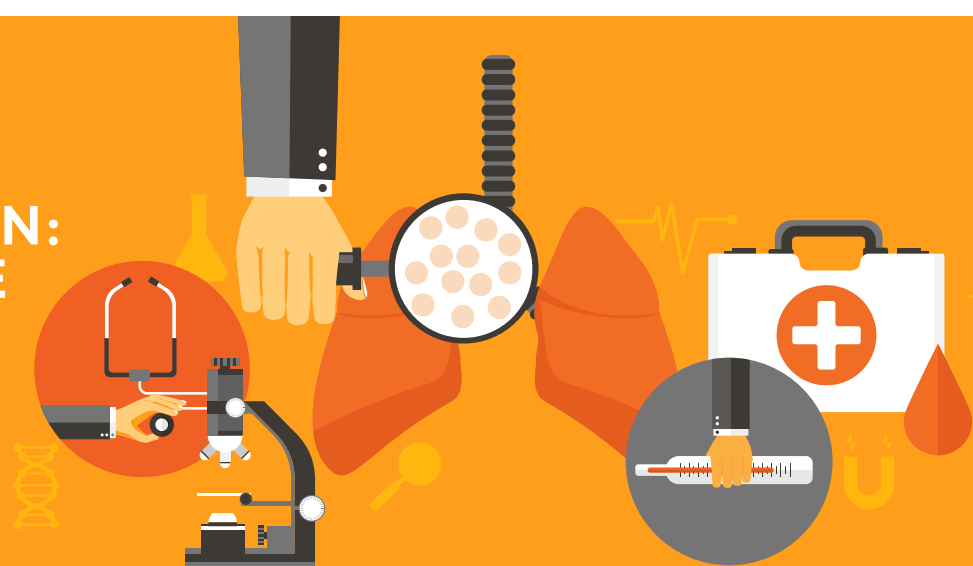


# ENDOTRACHEAL TUBE CUFF DESIGN: A CRITICAL ISSUE FOR AIRWAY MANAGEMENT



Cuffed endotracheal tubes are intended to seal the trachea to:<sup>1</sup>

- Enhance positive pressure ventilation<sup>1</sup>
- Prevent aspiration of fluid and pharyngeal contents into the lower trachea<sup>1</sup>

However, design modifications such as **changes in cuff material and shape** can reduce the impact of microaspiration.<sup>2</sup>

## RISKS TO CONSIDER

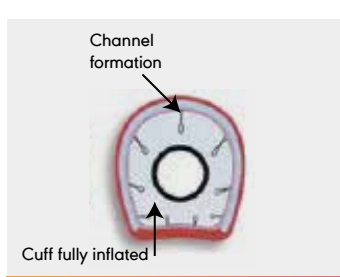
Leakage of oropharyngeal secretions beyond the endotracheal tube (ETT) cuff may lead to complications such as:<sup>3</sup>

- Bacterial tracheal colonization
- Development of ventilator-associated pneumonia (VAP)
  - Incidence of VAP accounts for **9%–27%** endotracheal intubated patients<sup>4</sup>
  - Mortality rate ranges from **25%–50%**<sup>4</sup>


## CUFF DESIGN CONSIDERATIONS

### MATERIAL

Standard HVLP polyvinyl chloride (PVC) cuffs are designed to inflate to 1.5–2 times the size of the normal trachea and are about 50–70 μm thick.<sup>2,5</sup>

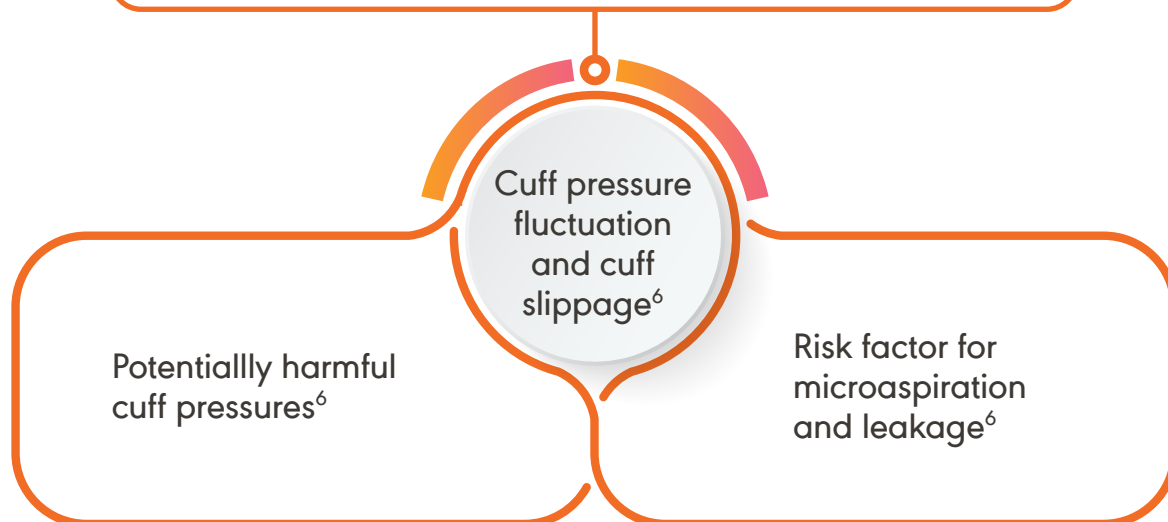


Longitudinal folds are created upon PVC cuff inflation, leading to microaspiration through these channels<sup>2</sup>

 The introduction of a thinner material may produce fewer folds or folds with smaller channels and reduce leakage.<sup>2</sup>

### SHAPE

Taper-shaped cuffs (compared with cylindrical - or spherical shaped cuffs) have a lower tracheal wall contact area<sup>6</sup>





## OUR SOLUTION

### MATERIAL

Avanos MICROCUFF\* tubes are made with **advanced microthin polyurethane (PU) cuff material** that 'seals' channels to reduce leakage

- Polyurethane (10 μm) cuff membranes are substantially thinner than conventional PVC cuffs (50 μm -80 μm)
- Cuff wall size of 7–10 μm **minimizes the channel size within the folds of the inflated cuff** and is intended to decrease leakage.<sup>5</sup>

Polyurethane can be made thinner while maintaining its strength

-  Puncture strength of MICROCUFF\* tube is almost 2x compared to conventional cuffs
-  Burst pressure of MICROCUFF\* tube is more than 2x compared to conventional cuffs



MICROCUFF\* "sealing" the channel and reducing the leakage

### SHAPE

Avanos MICROCUFF\* tubes have benefits such as:



- Cylindrical or barrel-shaped cuff **maximizes surface contact with the trachea**
- Long cuff length lengthens the 'channels' to improve seal

References: 1. Dullenkopf A, Gerber A, Weiss M. Fluid leakage past tracheal tube cuffs: evaluation of the new Microcuff endotracheal tube. Intensive Care Med. 2003; 29(10):1849-53. 2. Haas CF, Eakin RM, Konkle MA, Blank R. Endotracheal Tubes: Old and New Discussion. Respiratory care. 2014; 59(6):933-55. 3. Beuret P, Philippon B, Fabre X, Kaaki M. Effect of tracheal suctioning on aspiration past the tracheal tube cuff in mechanically ventilated patients. Ann Intensive Care. 2012; 2(1):45. 4. Mao Z, Gao L, Wang G, et al. Subglottic secretion suction for preventing ventilator-associated pneumonia: an updated meta-analysis and trial sequential analysis. Crit Care. 2016; 20(1):353. 5. Blot SI, Rello J, Koultenti D. The value of polyurethane-cuffed endotracheal tubes to reduce microaspiration and intubation-related pneumonia: a systematic review of laboratory and clinical studies. Crit Care. 2016; 20(1):203. 6. Huang WM, Huang XA, Du YP, et al. Tapered Cuff versus Conventional Cuff for Ventilator-Associated Pneumonia in Ventilated Patients: A Meta-Analysis of Randomized Controlled Trials. Canadian respiratory journal. 2019.