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Commentary

Commentary on Current Practices in Endotracheal Tube Size Selection for Adults

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DISCRIPTION

Intubation with inappropriately sized Endotracheal Tubes (ETT) can cause complications including sore throat, hoarseness, vocal cord injury, acute laryngeal injury, and laryngotracheomalacia [1-3]. As no widely accepted guidelines currently exist for determining appropriate ETT size in adults, practitioners often rely on heuristics and clinical judgment. There is increasing evidence that tracheal dimensions are correlated with patient characteristics such as height and sex; however it remains unclear if this data is being incorporated into clinical practice.

We recently published a retrospective cohort study designed to determine the rate of appropriate ETT size selection in adult patients at a large academic hospital [4]. To estimate the recommended endotracheal tube size for each patient, we used a height-based model derived from Coordes et al., which demonstrated a linear correlation between height, coronal subcricoid tracheal diameter, and distance between lower incisors and cricoid cartilage [5]. Our study demonstrated that height-based ETT size selection has yet to be widely implemented. 22% of our patients were intubated with an inappropriately large tube, which was defined as at least 1.0 mm larger than the recommended size. Female patients and patients with shorter height (<1.6 m) were significantly more susceptible to intubation with an inappropriately large ETT. We hypothesize that this may contribute to the increased rates of post-intubation tracheal stenosis in women [6,7].

In our study, providers across clinical settings defaulted to using a 7.0 mm ETT for female patients and an 8.0 mm for males. In the absence of widely disseminated guidelines, the increased rate of inappropriate ETT may be best explained by the sex-based heuristic sizing seen in our cohort. While it is clear that sex is a major determinant of tracheal dimensions, Coordes et al. showed that the difference in tracheal diameter between sexes vanished after controlling for patient height. Two other imaging studies in the literature stratified their patients by sex and do not discuss the role of patient height [8,9]. With these findings, we recommend that a size 6.0-6.5 endotracheal tube should be considered for females below average height (163 cm), and a size 7.0-7.5 should be considered for males below average height (177 cm). For females, ETT larger than 7.0 should only be used if adequate ventilation is not possible with a smaller tube.

There is also ongoing discussion about the role of BMI in ETT sizing. While there are anecdotal reports that providers tend to place larger ETT in obese patients, D'Anza demonstrates that BMI appears to be inversely related to tracheal width [9,10]. In our cohort, we did not find evidence of increased inappropriate ETT sizing in obese patients.

Finally, we hypothesized that practitioners may be more likely to select an inappropriately large ETT in severely ill patients, anticipating bronchoscopy or an increased sensitivity to changes in ventilation [11]. However, we did not find an association between inappropriate ETT sizing and disease severity risk factors, including setting of intubation, emergent intubation, elevated SAPS II, or requiring bronchoscopy during hospitalization. While providers likely consider these factors, our data indicates that other heuristics predominate in size selection, even in severely ill patients.

The primary barrier to implementation of standardized, height-based ETT size selection in adults is the lack of published guidelines. Once such guidelines are adopted and disseminated, simple interventions such as checklists or web-based training will be critical for standardizing the practice of height-based ETT size selection across institutions.

DISCUSSION AND CONCLUSIONS

We believe that our study highlights the following:

1. There is a need for intubating providers to shift from sex-based heuristics to height-based guidelines for endotracheal tube size selection in adults.
2. The rate of inappropriate ETT sizing was significantly higher in female patients and patients with shorter stature.
3. Size 6.0-6.5 ETT can be considered more often for females below average height, and 7.0-7.5 can be considered for males below average height.

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4. Further validation and adoption of guidelines for ETT size selection may significantly reduce the rate of post-intubation complications in the adult population.

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