

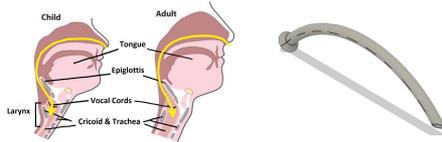
Pediatric Nasotracheal Intubation Assist Device

NEED

- Delays in airway management increase mortality rate from 1.8% to 11.8% in hospital and emergency settings^[1]
- 57% of complications in pediatric oral intubation cases involve pre-existing airway or craniofacial abnormalities requiring a different method – nasal intubation^[2]
- Differences in pediatric anatomy predisposes patients to airway obstruction and results in a sharper angle through which the fiberoptic scope must pass to reach the larynx and vocal cords

OBJECTIVE

- Create an easily removable assistive device for pediatric nasal fiberoptic intubation especially in challenging, difficult airways



CONSTRAINTS

Project	Design
<ul style="list-style-type: none"> Time – 9 months Budget – \$800 Resources – St. Christopher’s Hospital Standards – ISO 10993, ASTM D624, ASTM D3767-03 	<ul style="list-style-type: none"> Differences in patient anatomy Patient safety Disruption of normal procedure

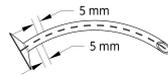
REQUIREMENTS

Outer Diameter	Inner Diameter	Length	Tear Strength	Flexibility
6.7 ± 0.2 mm	5 ± 0.2 mm	105 ± 0.2 mm	<14.3 N	(4.5 x 10 ⁻⁴ Nm ²)
✓	✓	✓	= 13.5 N	(2.9 x 10 ⁻⁴ Nm ²) p = 0.013

EXISTING SOLUTION

Nasal Trumpet (Nasopharyngeal Airway)

- Pros: opens obstructed airway, guides fiberoptic (off label use)
- Cons: prevents insertion of endotracheal tube, increases time required to establish airway, requires manual cut



- Engineering Drawing**
Same dimensions as existing (20 French) trumpet with added perforations

IMPACT

- Will benefit physicians, anesthesiologists, and patients by improving nasal intubation via fiberoptic guidance in emergencies

CONCLUSION

- Will assist in difficult pediatric nasotracheal intubation by reducing the risk of critical delays in airway management in cases where the mouth is inaccessible

PROTOTYPE

Prototype 1: 3D printed in Thermoplastic Polyurethane on Fused Deposition Modeling printer
Results: Prototype material was too stiff/brittle



Prototype 2: 3D printed Flexible Material on Stereolithography printer



- Nasal trumpet is inserted
- Nasal trumpet properly guides the fiberoptic to the correct location
- Pre-manufactured perforations ensure the trumpet is easily removed from patient and allows for the ET to be placed
- Fiberscope is in place and ready to use

REFERENCES

- [1] B. Morshedi, “Management of the trauma patient’s airway – pearls and pitfalls,” (2015)
- [2] Bai W, et al; “Evaluation of emergency pediatric tracheal intubation by pediatric anesthesiologists on inpatient units and the Emergency Department,” (2016)
- [3] ASTM International. “ASTM D3767-03 Standard Practice for Rubber—Measurement of Dimensions,” 2010.
- [4] ASTM International. “ASTM D624-00(2020) Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers