Pediatric Nasotracheal Intubation Assist Device

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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

EXISTING SOLUTION

Nasal Trumpet (Nasopharyngeal Airway)

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

OBJECTIVE

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

SOLUTION

Engineering Drawing

Same dimensions as existing (20 French) trumpet with added perforations

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

CONSTRUCTION

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

RESULTS

- Prototype material was too stiff/brittle

IMPACT

- Will benefit physicians, anesthesiologists, and patients by improving nasal intubation via fiberoptic guidance in emergencies
- Will assist in difficult pediatric nasotracheal intubation by reducing the risk of critical delays in airway management in cases where the mouth is inaccessible

REFERENCES


CONSTRAINTS

- Time – 9 months
- Budget – $800
- Resources – St. Christopher’s Hospital
- Standards – ISO 10993, ASTM D24, ASTM D5767-03

REQUIREMENTS

<table>
<thead>
<tr>
<th>Outer Diameter</th>
<th>Inner Diameter</th>
<th>Length</th>
<th>Tear Strength</th>
<th>Flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.7 ± 0.2 mm</td>
<td>5 ± 0.2 mm</td>
<td>105 ± 0.2 mm</td>
<td>≤ 13.5 N</td>
<td>(2.9 x 10^6 Nm²)</td>
</tr>
</tbody>
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CONCLUSION