Wayne Chung, and Abraham Umo for their insight and guidance, the COE Makerspace and Timothy Angert. Our team would like to thank Dr. Zapanta for his guidance in choosing the topic researched, Dr. Paul Diana, $12.8$ Billion spent on medical damages. Both medical professionals and patients are affected by the negative impact of unsuccessful intubations.

**Intubation Medical Costs and Damages**
- 2009 study -- 170 teeth injured in 130 intubations
- 40 Million Intubations are done year, ~50% are in emergency situations
- 35% of emergency intubations are done improperly, anesthesiologists are not always available or nearby
- $12.8$ Billion spent on medical damages
- Both medical professionals and patients are affected by the negative impact of unsuccessful intubations

**Endotracheal Intubation (Figure 1)**
- Procedure to create a clear path to pass a tube into the airway
- Axial pull lifts the epiglottis exposing vocal cords and trachea
- Tube is inserted through the vocal cords, into the trachea
- Anesthesiologist controls oxygen levels, airflow, breathing

**Problems**
- In emergency settings, a first responder has little time and using multiple devices adds time to successful intubation
- Tooth damage is common during intubation, protection is rarely used
- Current design is not intuitive for an axial pull for successful procedures

**Current Solutions**: Airtraq & Mouthguard
- Airtraq camera lets user see trachea without having to look past the laryngoscope
- Does not minimize tooth damage during intubation
- Mouthguards rest on the teeth and get knocked off frequently
- Obstruct the user making intubation more challenging

**Design Process**

**Clinical Research**
- Anesthesiologists frequently grip the device at the joint between the handle and blade.
- Common problem is leveraging the blade against the teeth when the mouth is difficult to open with just an axial force along the handle.
- Pre Existing devices and handles give direction to the design (Door knob, Gear shift)

**Key Design Elements**
- Attached tube for suction or O2 in an emergency or trauma setting
- Ergonomic intuitive handle that promotes axial pulling motion to maintain proper intubation form even for new users
- EVA plastic moulded tongue guard that will compress without harm or chipping the teeth.

**Acknowledgments**
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