ENDOTRACHEAL TUBE PRESSURE MONITOR

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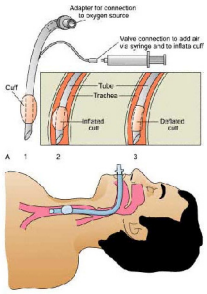
Client: Dr. Lester Proctor

ABSTRACT

The goal of this project is to design an external pressure monitor for inflation of the cuff on endotracheal tubes. This device would reduce the risk of over-inflation of the cuff which can lead to tracheal damage. The chosen design incorporates a moving diaphragm that compresses an indicating disk up a plastic cylinder with pressure markings. Testing was conducted to calibrate the device and to assure material integrity. Future work for this device includes replacing the rolling diaphragm and spring system with a bellows and pursuing a patent.

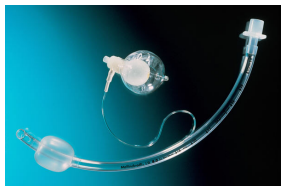
PROBLEM DEFINITION

Dr. Lester Proctor, a professor of anesthesiology and pediatrics for the UW medical school, has expressed the need for a pressure indicator which would be used for endotracheal tubes. Over-inflation of the cuff on an endotracheal tube can cause tracheal damage, especially in children. Dr. Proctor is looking for a qualitative indicator which would be attached to the endotracheal tube and give a consistent reading of the pressure in the inflated cuff.



Above: **ET Tube inserted into trachea**

EXISTING DEVICES



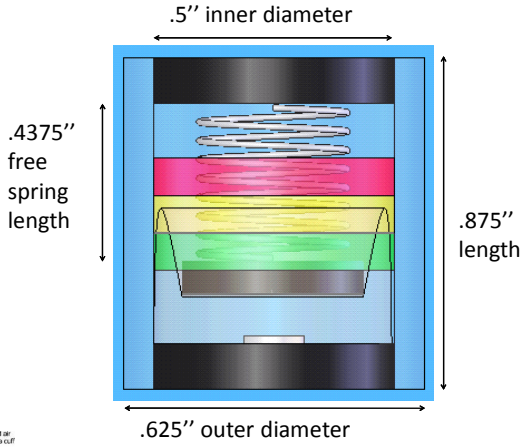
Left: **Posey® Cufflator Endotracheal Tube Inflator and Manometer**
Right: **Hi-Lo® Tracheal Tubes With Lanz® Pressure-Regulating Valve**

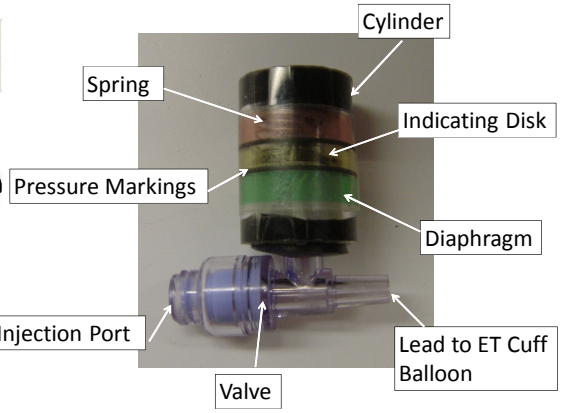
Problems with Existing Devices:
•Too expensive (up to $400)
•Does not dynamically monitor pressure

DESIGN CRITERIA

- Monitor the cuff valve pressure consistently using qualitative markers (+/- 2 cm H_2O error)
- Device is as small as possible (pencil eraser size)
- Permanently attached to the endotracheal tube
- Versatile enough to function on any type/size ET tube
- Easily readable
- Low manufacturing cost ($1 during mass production)
- Disposable and FDA approved

FINAL DESIGN





New Pressure Monitor compared to old prototype developed by Fall 2006 design team. Improvements have been made on prototype's mechanics, size, cost, and aesthetics.

BUDGET

Approx. Cost per unit: $0.70

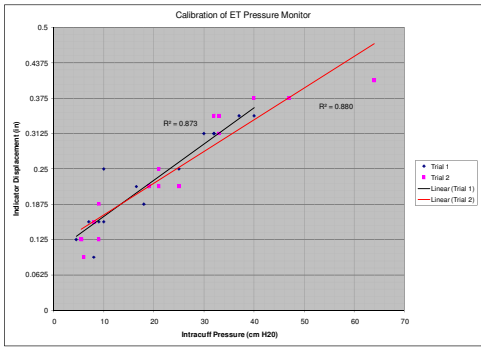
Item	Cost
Clear PETG Tubing	$27.42
Black Polyurethane Rods	$33.99
Teflon Film	$8.50
Assorted Springs	$4.19
Music Wire	$2.89
Nitrile Gloves	$1.09
TOTAL	**$78.08**

Special **THANKS** to Qosina, EMS Industrial, Halkey-Roberts and OnlineLabels.com for supplying free samples to us.

TESTING

Tests Conducted
- Stress test
- Sterilization
- Air Leak and constant Air pressure test
- Calibration
  - ➢Cuff inflated to certain pressure
  - ➢Length of spring compression measured
  - ➢Labels made to account for ranges

Results
- Device resists deformation due to force
- Device can withstand sterilization process
- Pressure Monitor maintains constant pressure without air leakage



FUTURE WORK

- Bellows
- Perfect spring
- More calibration testing
- Better diaphragm material
- Decrease size

Above: **Bellow**

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