Endotracheal Tube Adaptor

Team Members:
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- Ozair Chaudhry - Communicator
- Ryan Childs – BSAC
- Tim Barry - BWIG

Advisor:
- Professor Paul Thompson

Client:
- Mark E. Schroeder, MD

Client Background

- Mark Schroeder, MD
  - Anesthesiologist at UW-Hospital
  - Associate professor
- 2-3 patients/month require medication during surgery
- Administration of aerosolized medication to anesthetized patients
  - New metered dose inhaler (MDI) are incompatible with his current adaptor
  - Albuterol and Ipratropium medications

1)

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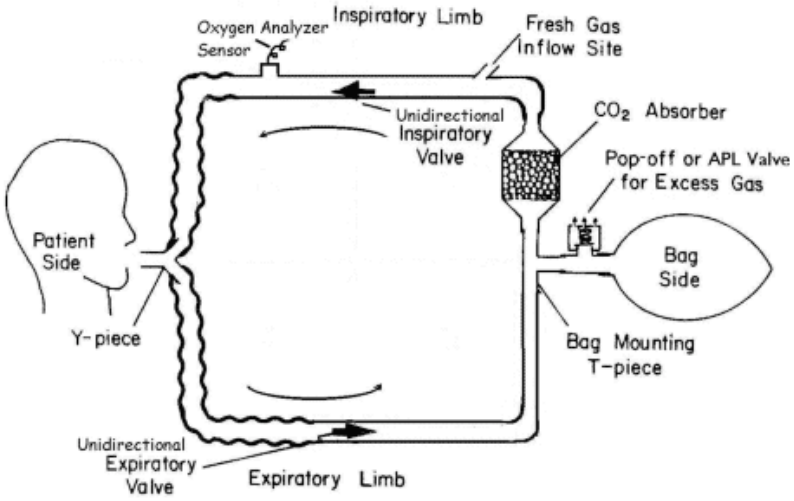
Anesthesia Circuit Basics



2)

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Why build an adaptor?

- Currently uses the "Bronchodilator Tee" by Boehringer Labs
  - Adaptor connecting MDI, endotracheal tube, and anesthesia circuit
- Medication delivery without compromising circuit
  - 4-5L/min gas flow
  - Needs to be a closed circuit
  - Prevent dilution of anesthesia mixture

3)

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Why a New Adaptor is Needed

- Propellant and geometrical changes
  - HFA vs. CFCs--environment
  - Actuation counter--patient knowledge
- New canister
  - GlaxoSmithKline
  - Nipple piece is incompatible

4)

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Existing Adaptors

- Bronchodilator Tee
- Nebulizer
- Syringe and old MDI adaptor
- Other patents in various shapes and sizes

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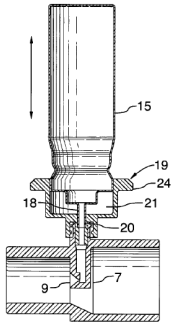

FIG.6

6)

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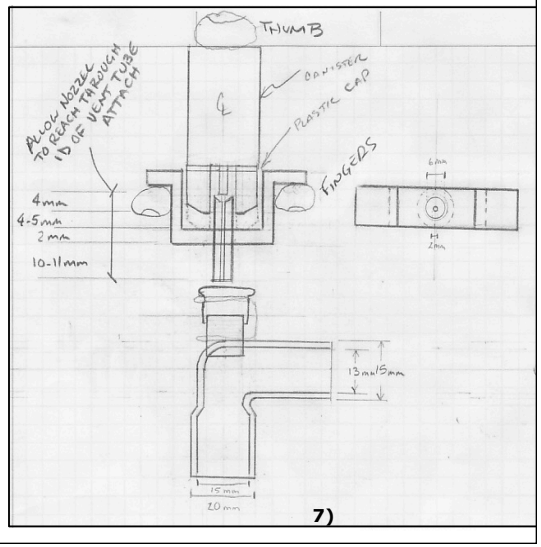
Client Requirements

- Must Have Features
  - Adaptor must be compatible with the new MDI
  - Maintain 4-5L/min airflow rate
  - 70% delivery efficiency
  - Needs to be sterilized after use with MetriCide
- Client Desirable Features
  - Prototype cost should be under $300
  - As “universal” as possible
  - Medication delivered directly above endotracheal tube

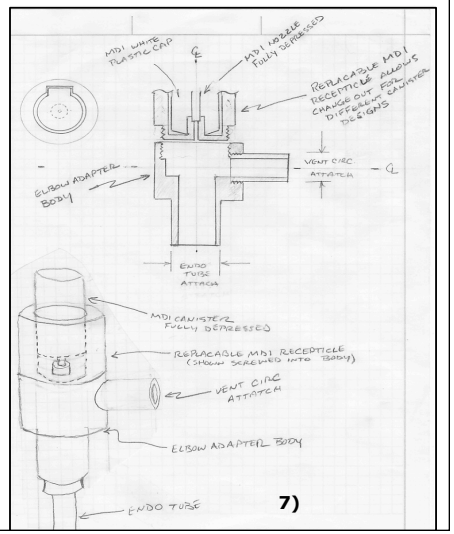
Design Alternative - Syringe

- **Basic Concept:** Adapter "Syringe" inserted into female Luer port and canister depressed to administer dose
- Advantages
  - Fits existing elbow
  - Adaptable
  - Ergonomically friendly
- Disadvantages
  - Fabrication
  - Could be misplaced



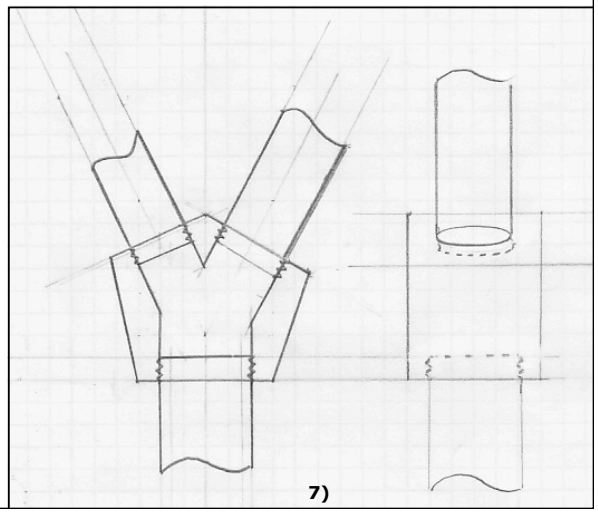
Design Alternative – Canister Tee

- **Basic Concept:** Modeled after existing device; top portion similar to MDI, bottom portion same as Bronchodilator Tee
- Advantages
  - Failsafe method
  - Already have geometry
- Disadvantages
  - Efficiency issues
  - Difficult/expensive to fabricate



Design Alternative – The "Y"

- Basic Concept: Uses a "Y"-like geometry to minimize the injection to gas flow angle
- Advantages
  - Most efficient
  - Adaptable
- Disadvantages
  - Bulky
  - Hard to sterilize and fabricate



Design Matrix

	Efficiency .3	Adaptability .25	Ease of Use .15	Fabrication .1	Sterilization .2	Total 1.0
Syringe	**8** (2.4)	**10** (2.5)	**9** (1.35)	**8** (0.8)	**9** (1.8)	**8.85**
Canister Tee	**7** (2.1)	**5** (1.25)	**7** (1.05)	**3** (0.3)	**4** (0.8)	**5.5**
The "Y"	**10** (3.0)	**7** (1.75)	**6** (0.9)	**4** (0.4)	**6** (1.2)	**7.25**

Possible Materials

- Metals
  - Aluminum
  - Brass
  - Stainless steel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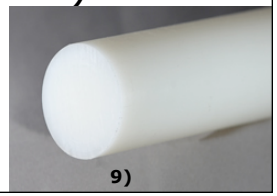
- Plastics
  - High density polyethylene (HDPE)
  - Acrylonitrile butadiene styrene (ABS)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Future Work

- SolidWorks model of prototype
- Find company to manufacture device
- Test prototype
  - Anesthesia gas flow rate and delivery efficiency
  - Cleaning/durability

Special Thanks To…

- Mark Schroeder and the UW-hospital
- Professor Thompson
- Mark Childs for turning our ideas into sketches

References

1) http://findadoctor.uwhealth.org/providers/schroder_mar.jpg
2) http://www.osha.gov/dts/osta/anestheticgases/fig05.gif
3) http://www.boehringerlabs.com/broncho.htm
4) Pictures from client
5) http://www.myrespiratorysupply.com/images/nebulizer%20kit.JPG
6) http://www.patentstorm.us/patents/7207329/description.html
7) Sketches from Mark Childs
8) http://www.rajshreeoverseas.net/full-images/1061048.jpg
9) http://www.directplasticsonline.co.uk/webshop/categories/HDPE%20White_100.jpg

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QUESTIONS????

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