

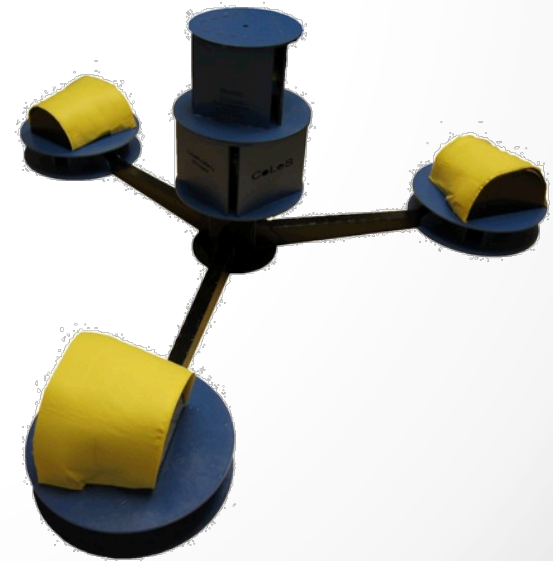


# *A Cricothyrotomy Training Device*

Eric Chehab  
Wisit Jirattigalachote  
Elyse Marr  
Wande Olabisi

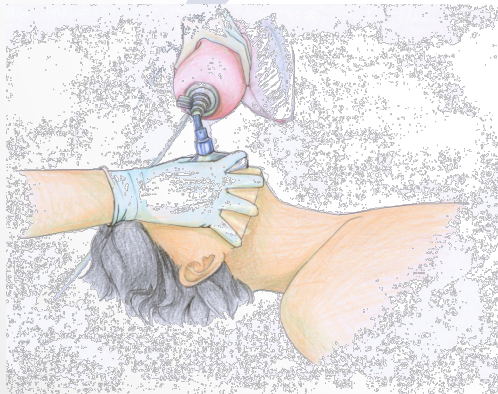
Project Coach: Dr. Yulia Zak

December 7<sup>th</sup>, 2010

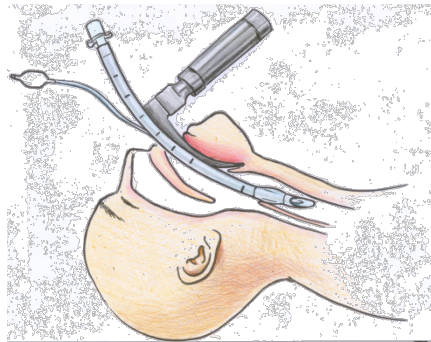


# Hierarchy of Treatments

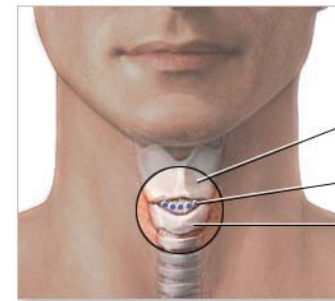
Mask  
Ventilation



Tracheal  
Intubation



Surgical  
Cricothyrotomy



Thyroid cartilage  
Incision site  
Cricoid cartilage

# Cricothyrotomy Procedure



**Step 1:** Locating the cricothyroid membrane



**Step 2:** 1<sup>st</sup> incision (skin)



**Step 3:** 2<sup>nd</sup> Incision (CT membrane)



**Step 4:** Insertion of tube



**Step 5:** Secure airway & Oxygenate

# Current Products in the Market

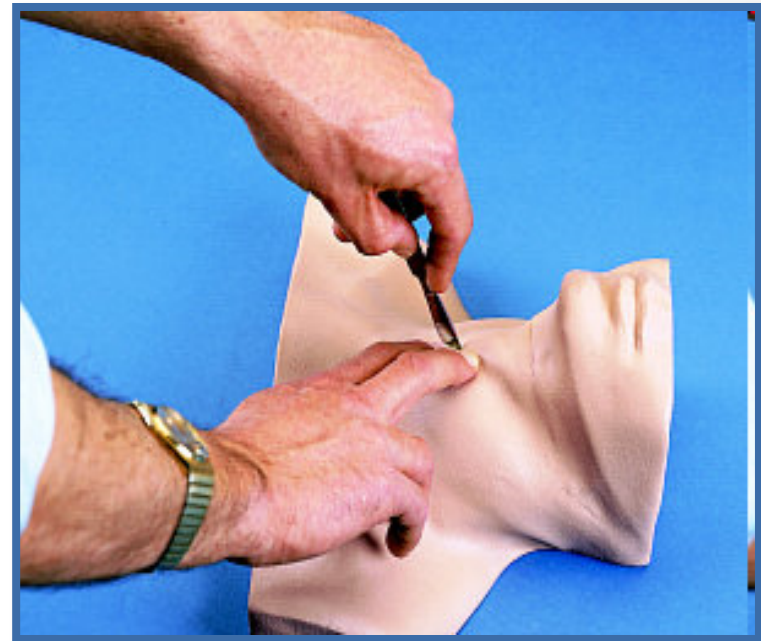
Trauma Man



## Advantages

- Realistic Appearance
- Anatomically Accurate
- Replaceable Skin Tissue/Parts
- High Quality Materials

Life/Form “Cric Simulator”



## Disadvantages

- Expensive
- Poor learning environment
- Nonrealistic surgical experience



# Approach to Simulation

## Task Analysis

Task  
task  
task  
task  
task  
task

Cognitive Skill

Dexterity Skill

# Problem Statement

A cricothyrotomy is a simple,  
but life-saving procedure.

Yet medical personnel *rarely* practice or have  
exposure to this operation.

**They need a simulation that helps them refine the  
critical dexterity skills for a CRIC procedure within a  
learning environment that mimics the stress of this  
crucial emergency operation.**

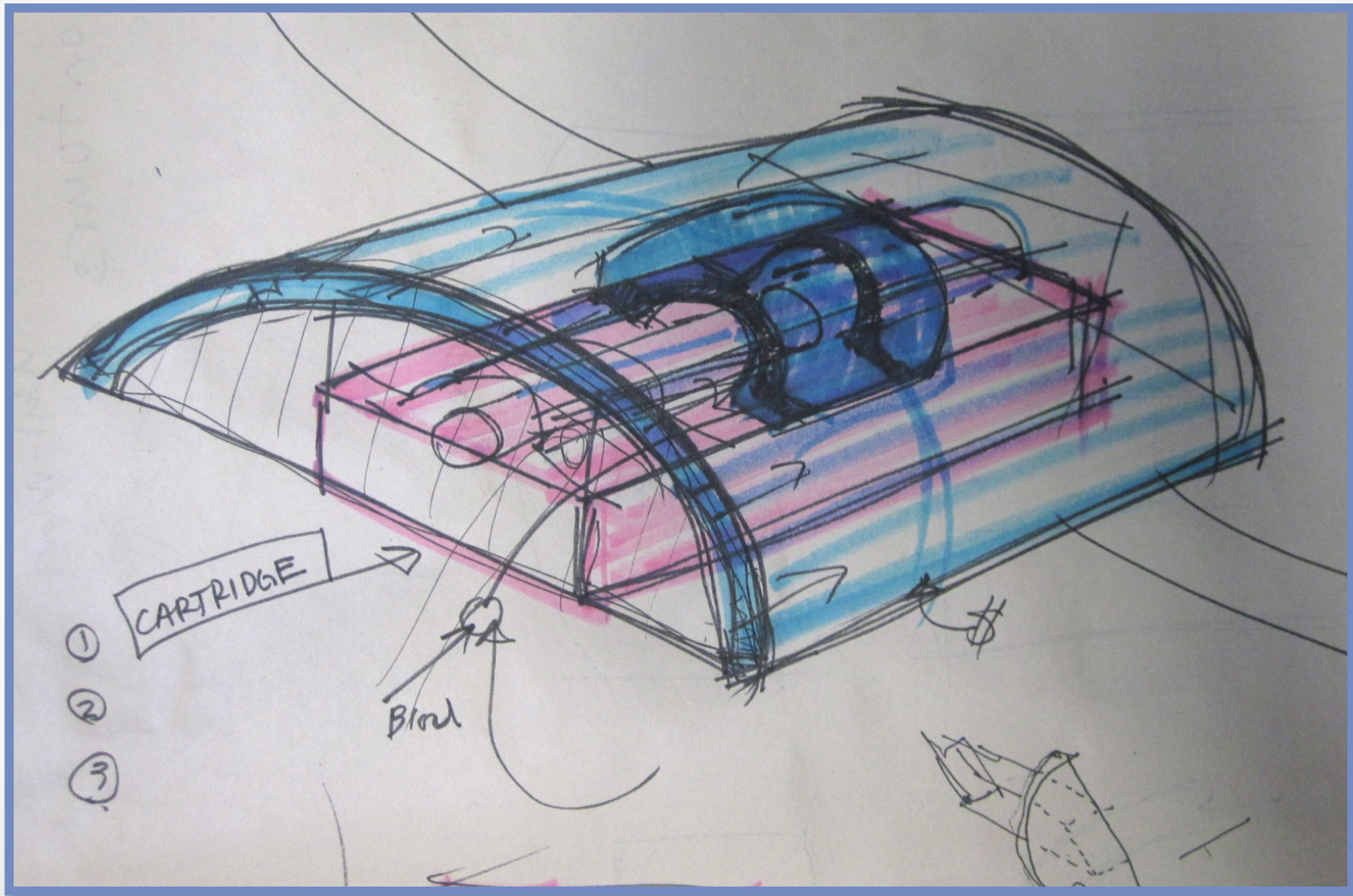




Tactile  
Feedback  
Varying Stress  
Scenarios Simulation  
Collaborative  
Structure

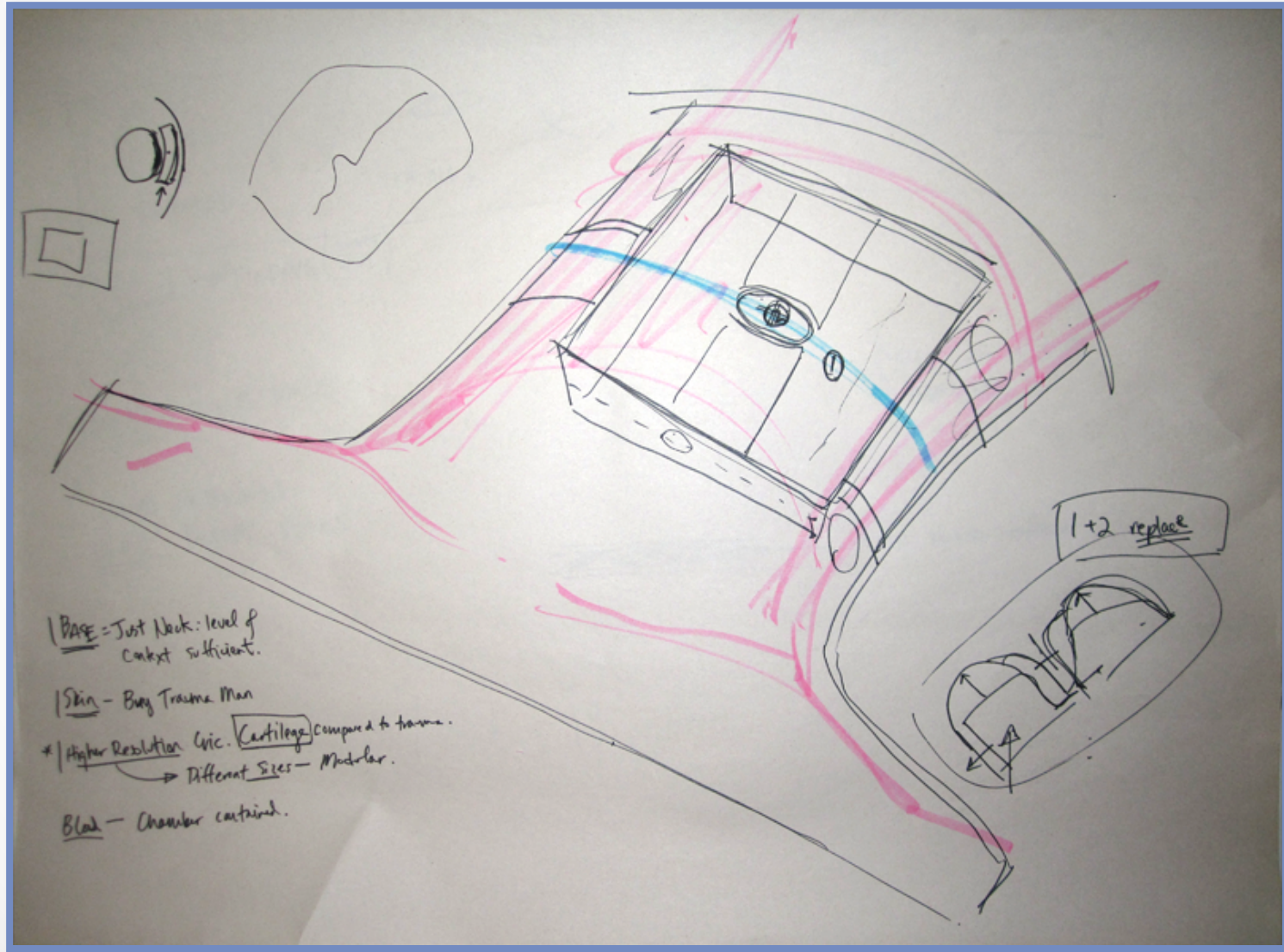
**Must  
Haves**

# Iterations – Cartridge Design



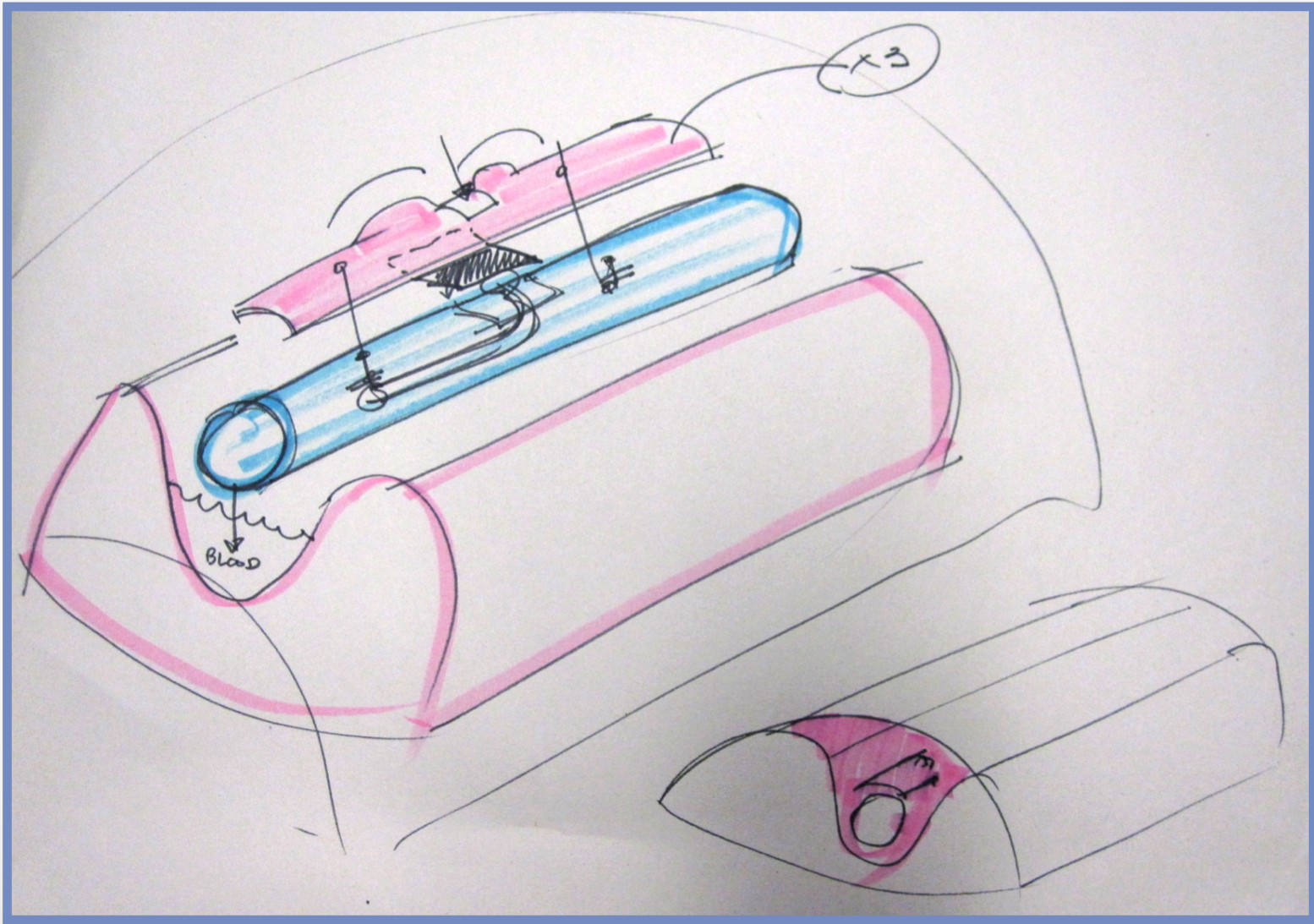


# Iterations – Cartridge Design

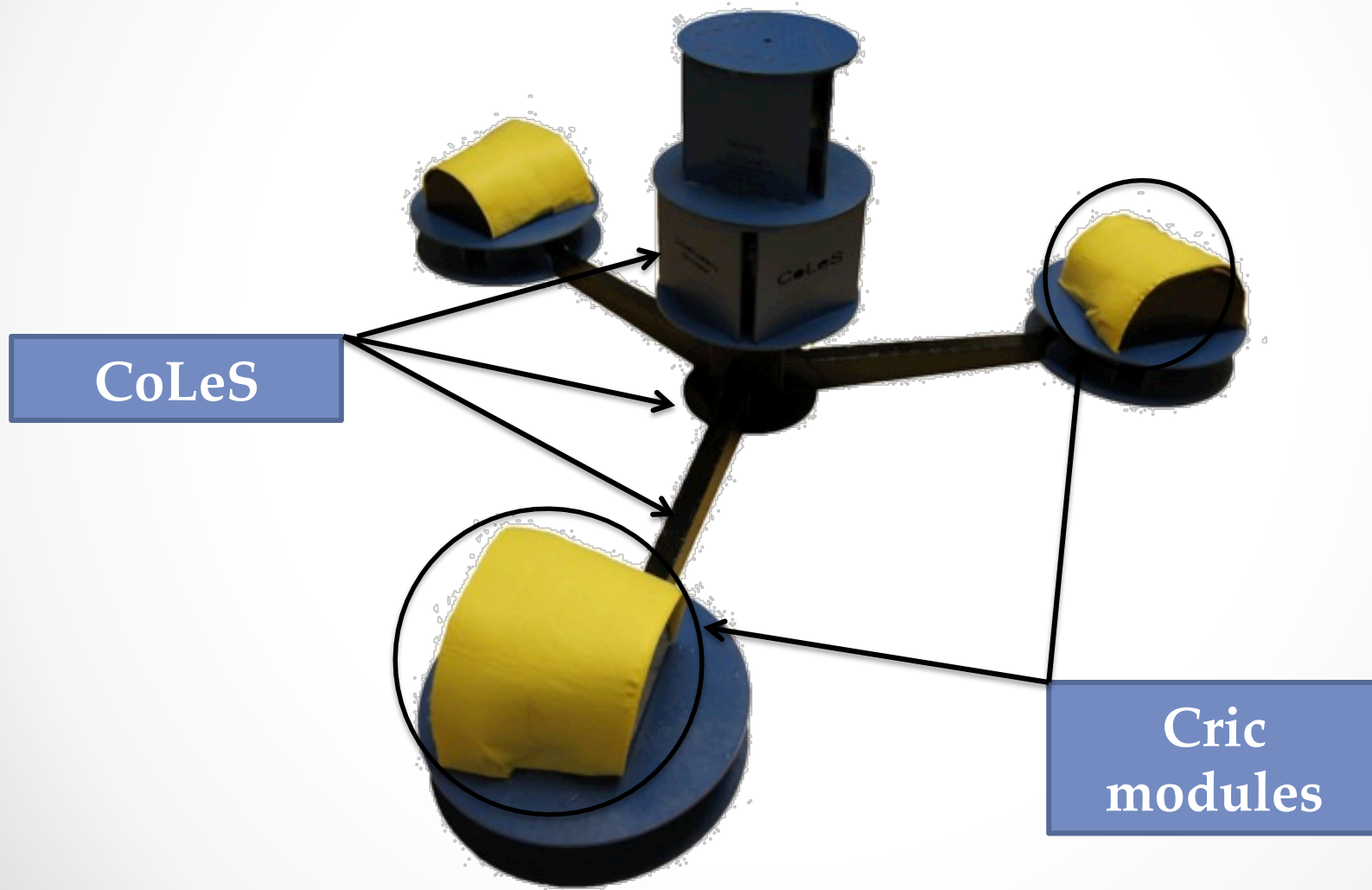




# Iterations – “Blood Pool” Design

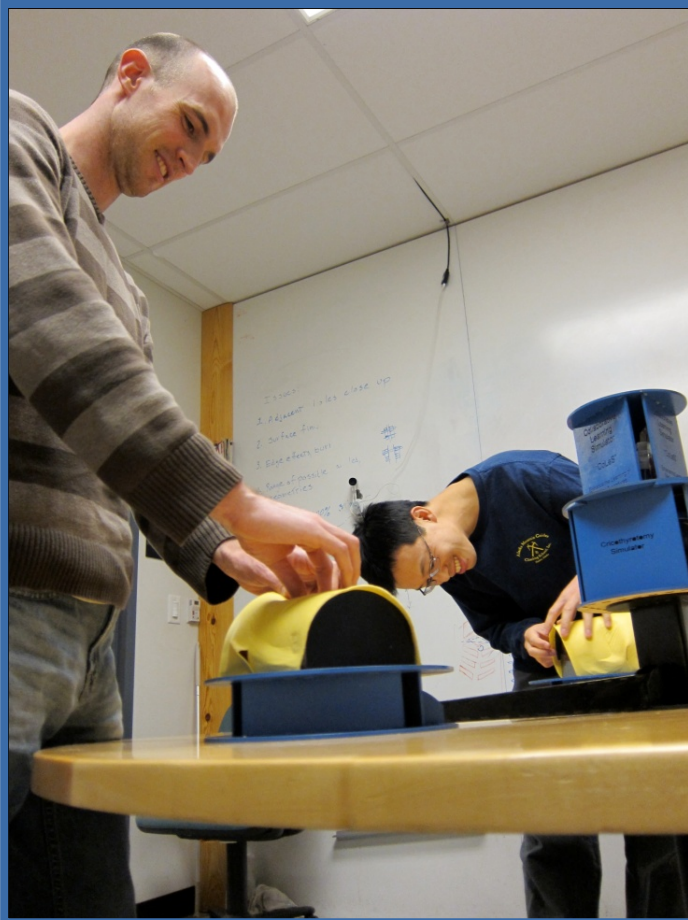


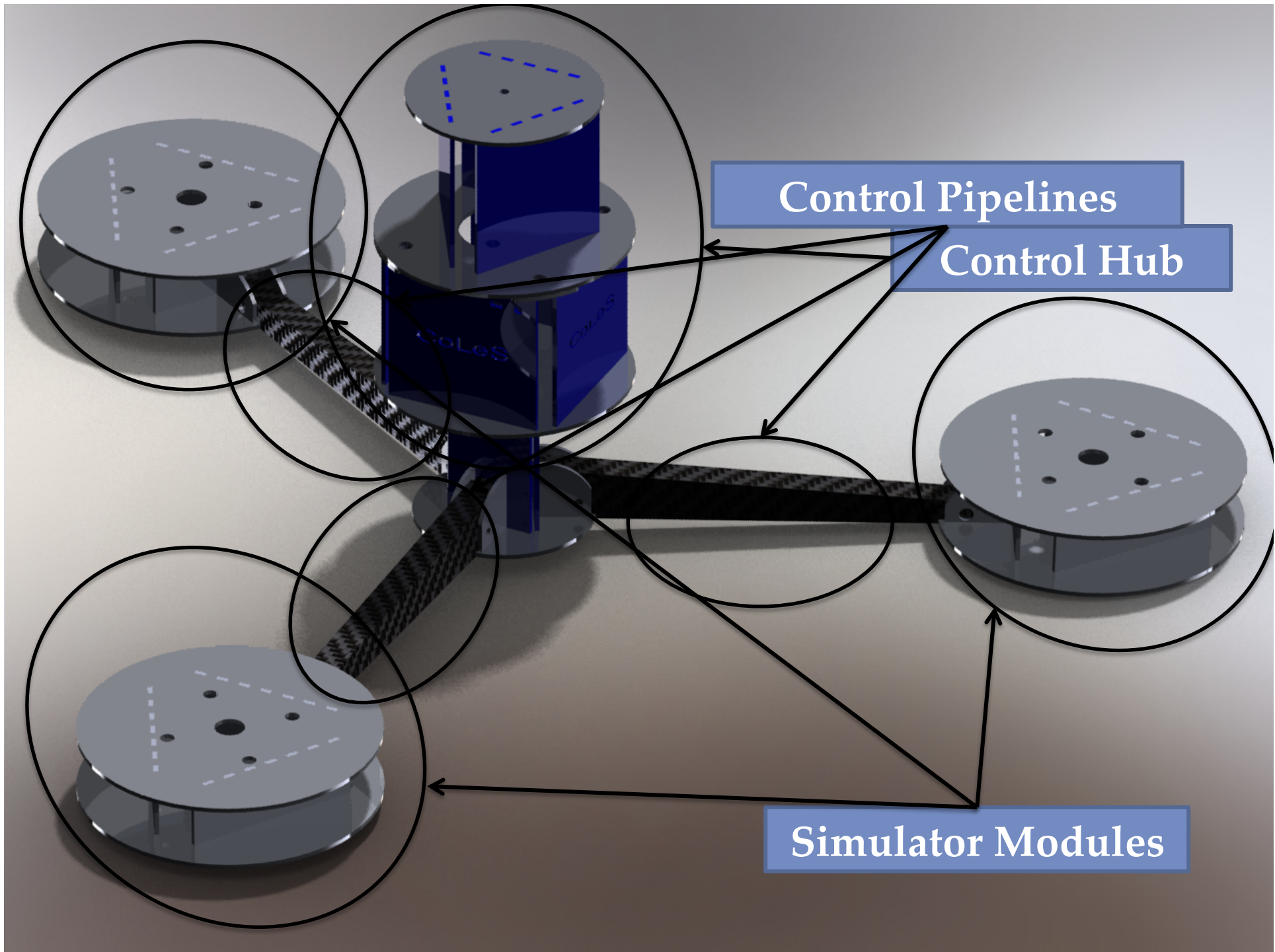
# Cricothyrotomy Training Device





# Collaborative Learning Simulator





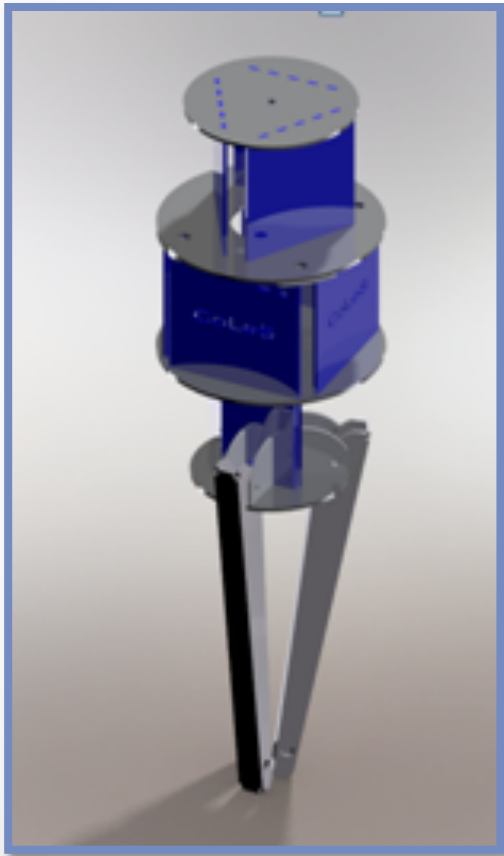
Control Pipelines

Control Hub

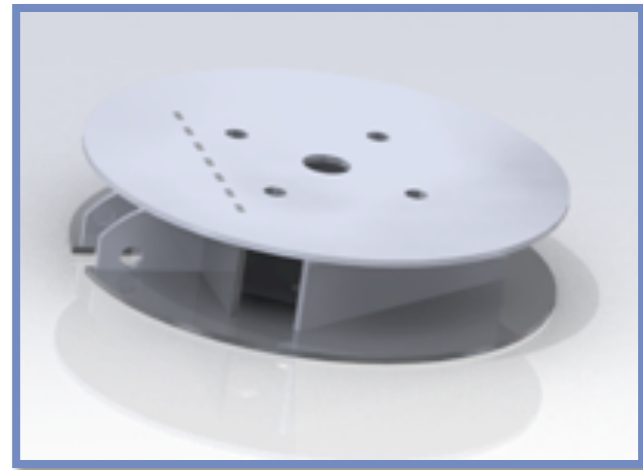
Simulator Modules

# A Compact System

Portable

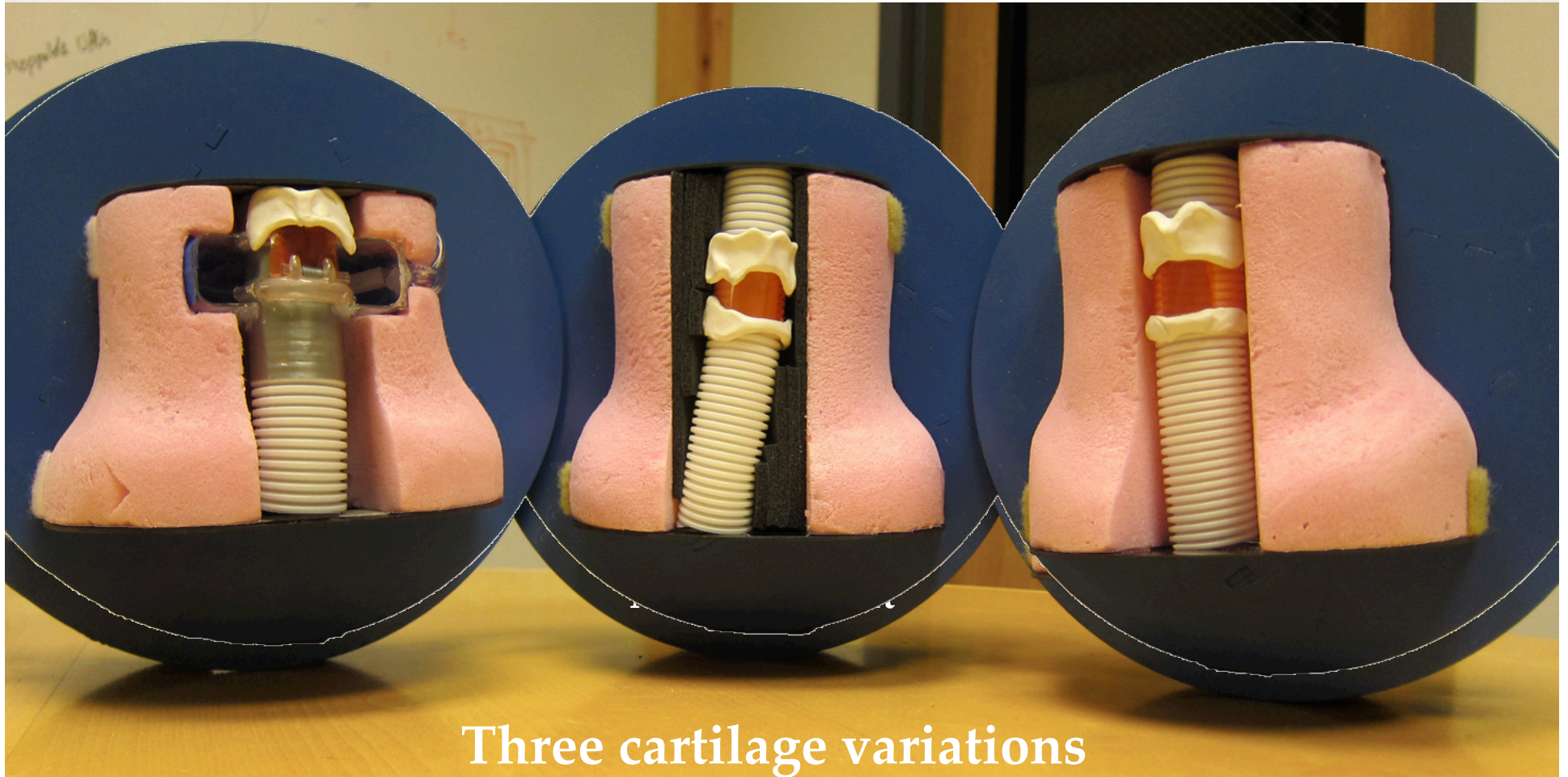


Detachable Bases





# Three Cricothyrotomy Simulation Modules



# Cric Module Structure

Non-crucial  
anatomy

Thyroid,  
Cricoid  
Cartilage

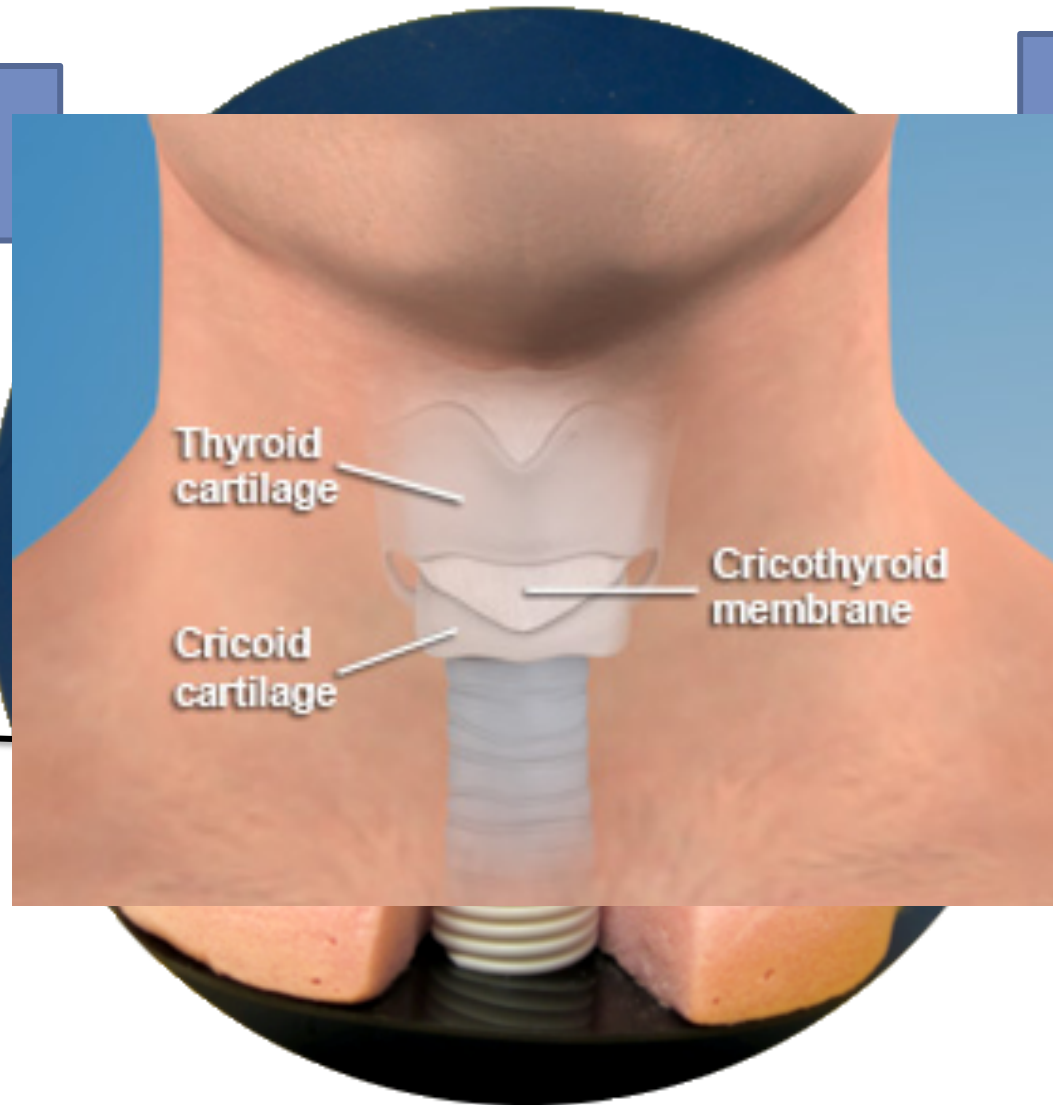
Thyroid  
cartilage

Cricothyroid  
membrane

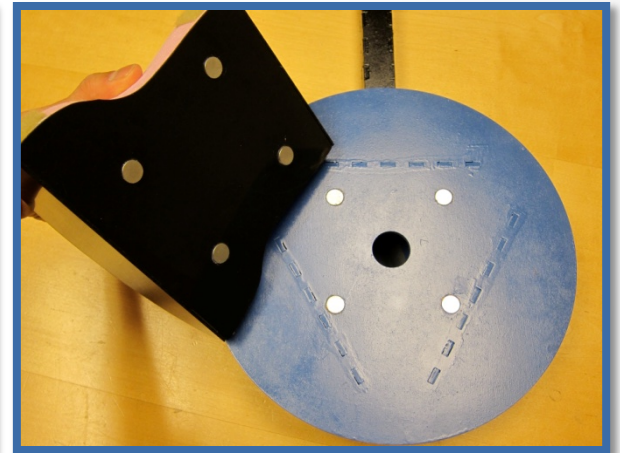
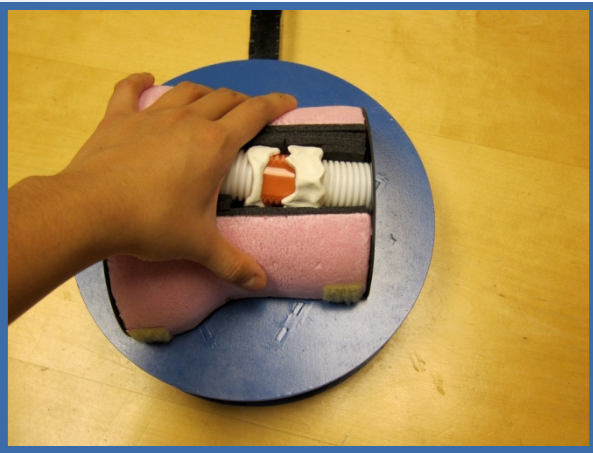
Cricoid  
cartilage

Cricothyroid  
Membrane

Trachea



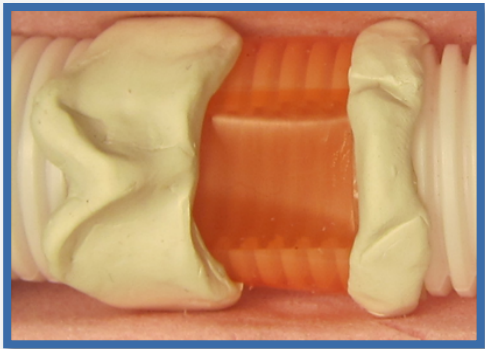
# Detachable Modules





# Basic Anatomical Variations

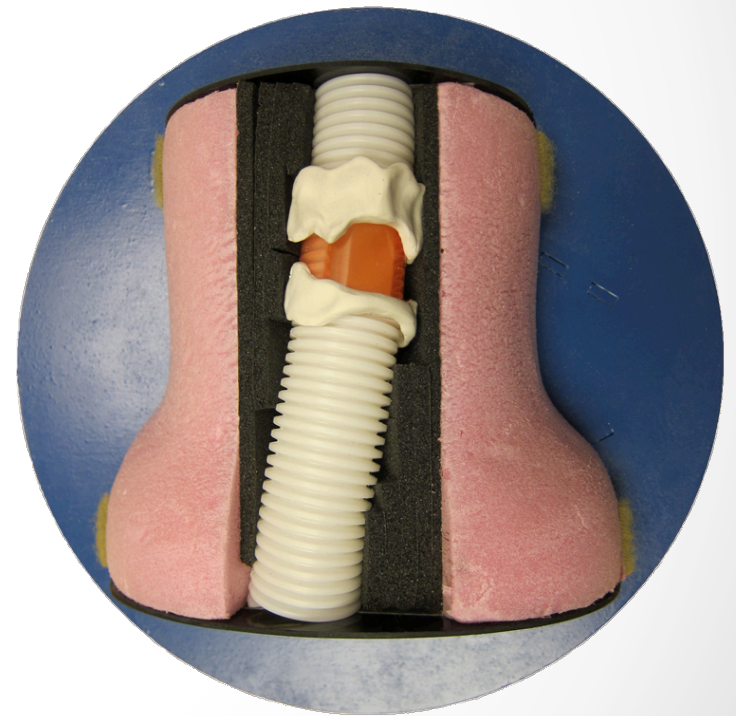
- Cartilage variations



- Fat
- Subcutaneous Edema

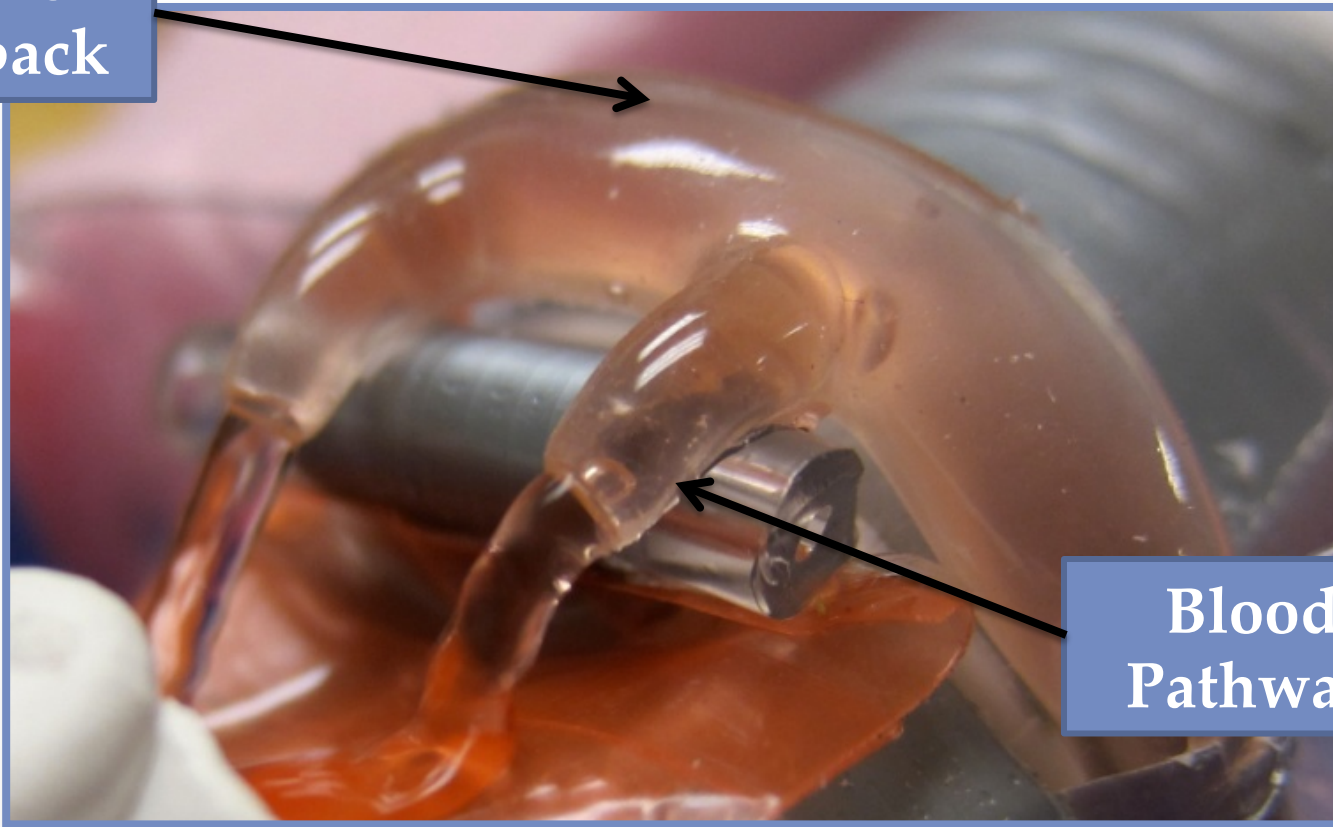


- Tracheal Deviation (Normal or Trauma)



# Blood Simulation

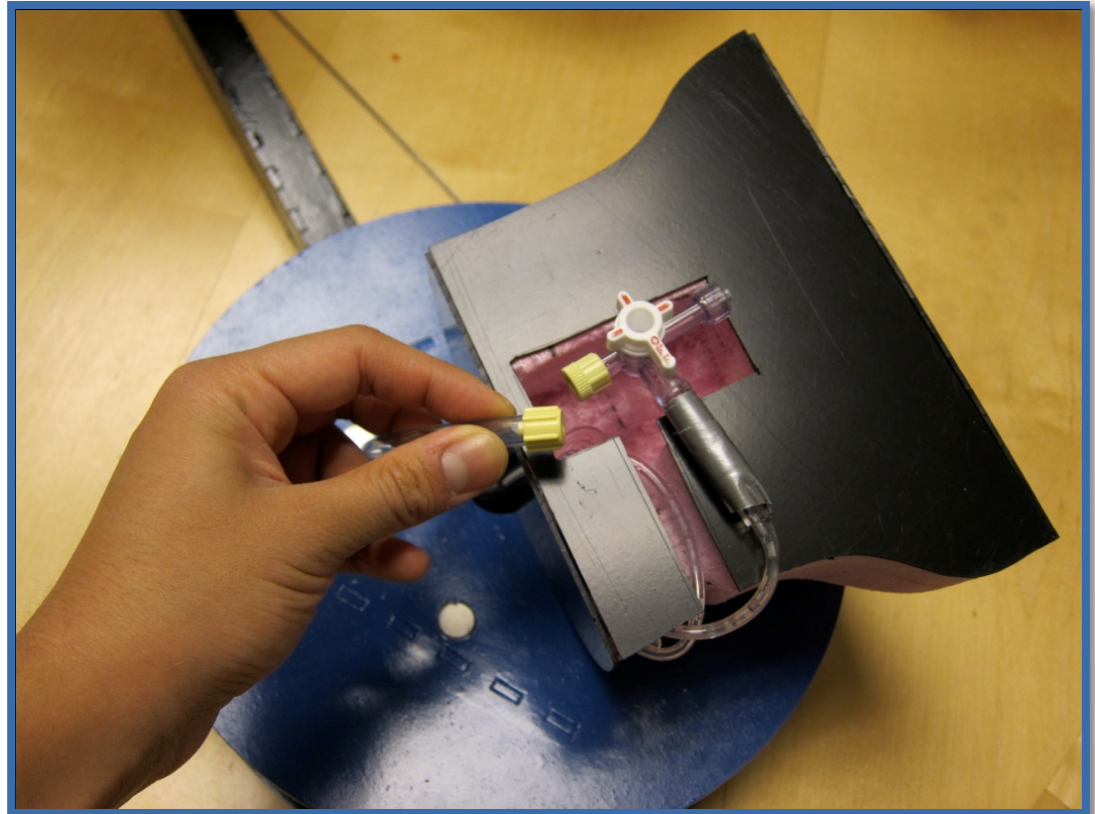
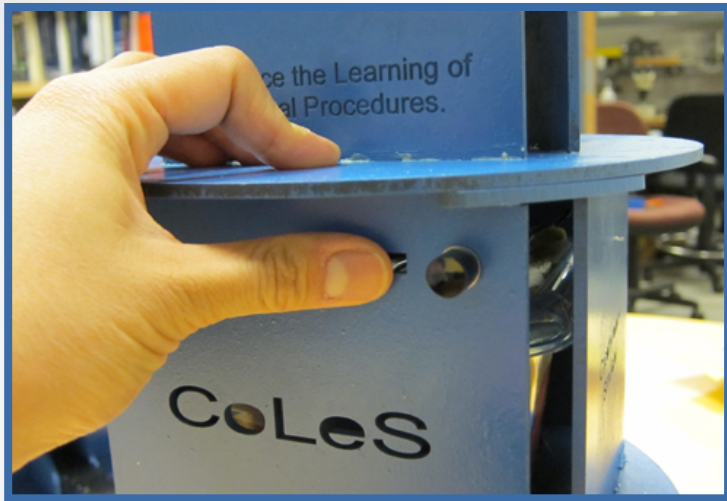
Tactile  
Feedback



Blood  
Pathway



# Blood Simulation: Modular Design



# Stress Simulation: Beeper

- Many medical procedures are usually performed under stressful conditions.
- So, how do we simulate these stressful situations?

**“Accelerated Beeping Sound”**



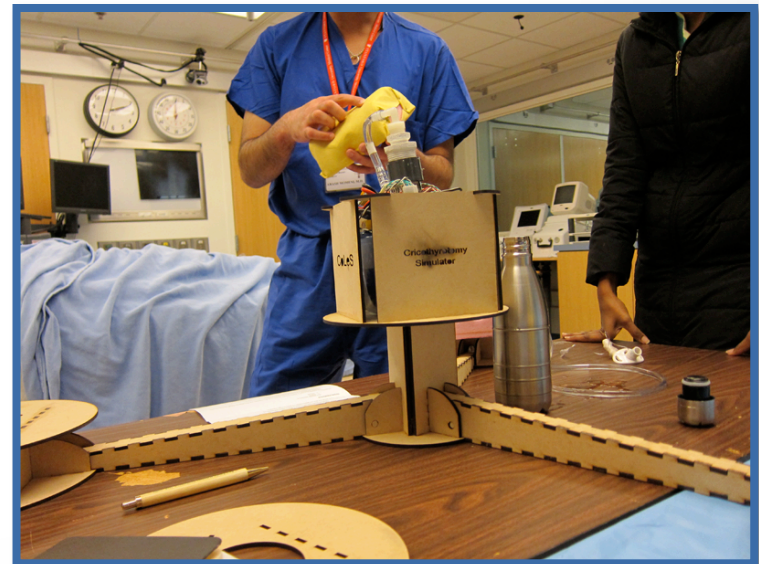
# Device Feedback: Medical Residents

## A near-complete simulation

- “We usually train until we hit the ‘I-got-it point’. For example, we found the airway, yet we forget we have to suture onto the skin, hook up the line, and make sure everything else is stable. It’s hard to focus on all of the details. This is good, it walks through all of the motions.”

## The harder the better

- Importance lies in “the leadership ability. Only people with this skill set have the comfort to make the decision and say ‘let’s cric ‘em!’”





# Device Feedback: Medical Residents

## Collaborative learning interpreted as competition

- “Yes, you’re acting, but let’s play on that. We get more into (the scenario), and take more away from it. This competition gives us adrenaline, and adrenaline is adrenaline, so it helps.”
- Competition and a fun atmosphere makes it more likely for surgeons to willingly use device to train.
- Peg Transfer Time Sheet!



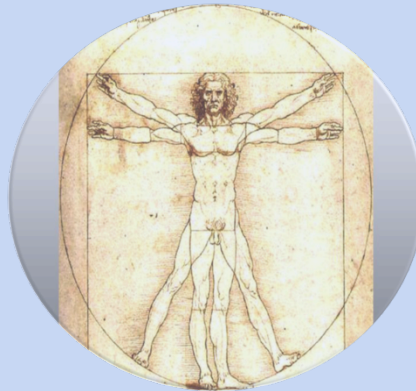
GRAND	TIME	DATE	INITIALS
Ron Joo	32	9-30-09	
Geoff Kremette	60	10-12-09	
Jordan Clardy	55	10-12-09	RMS
Zach Kosterby	44	11-23-09	DMS/KC
MARIE-EVE LARSEN	47	4-8-2010	PP
Peter Peng	38	4-8-2010	RMS
Andrew Joo	37	4-8-10	PP
Jay Lee	39	4-9-10	MZ
Jay Lee	37	8/3/10	MZ
Casey Allen, MS4	45	3/26/10	RE
Hysama Lalani, MS4	36.9	9/27/10	RSE
Casey Peng	41	9/27/10	HA-

# Future Directions



## Material Improvements

- Trachea
- Cricothyroid Membrane
- Skin



## Anatomical Variations

- Modular System for easier scenario variation
- More variations in structures for palpation



## CoLeS: Framework

- Harnesses collaborative (& competitive) atmosphere
- A foundation for future innovation



# Questions?

