Advanced Airway Training Device
Muhammad Akram, Jesus Espinoza, Jonathan Kurtz, Nathaniel Odenweller, Muhammad Sajjad, Daniel Smith

UTSW – Center for Minimally Invasive Surgery
Departments of Mechanical Engineering & Bioengineering
MECH 4382/BMEN 4389 – Spring 2017

Project Background

- UT Southwestern’s Center for Minimally Invasive Surgery uses realistic simulations via mannequins to train students about the various scenarios that one can face as a doctor, EMT, or nurse.
- Current mannequins on the market are not realistic and do not teach students how to properly perform certain procedures.
- The team was challenged to design and build a prototype that has the correct anatomical features, has the feel of human skin, emulates various pathologies, and provides realistic training.

Objectives

- Neck joint with sniffing position
- Simulation of pathologies
  - Laryngospasm
  - Bronchospasm
  - Pharyngeal Airway Obstruction
  - Tongue Swelling
  - Airway Grade
- Realistic skull weight
- Realistic airway anatomy
- Realistic jaw motion
- Position Adjustment table (8-12 inches)
- Self-powered system
- Lubrication system
- User interface panel

Conclusion and Future Applications

With the Advanced Airway Training Device:

- Instructor has the ability to control the various pathologies
- User interface is concealed so students do not know what pathology is chosen
- User is able to adjust mannequin to their preferred height
- Realistic pathological simulations
- Realistic training provided to students

Future Applications

UTSW will improve on some aspects of the prototype prior to commercialization. A patent will be obtained on the final design and will be commercialized to provide other healthcare providers and medical schools realistic mannequins for training at a reasonable cost.

Acknowledgements

Our team would like to thank Dr. Hart, Matthew Kosemund, Dr. Polk, Dr. Pacheco, Dr. Jerry Green, Dr. Ravi Bhoja, Gene Woten, and Dr. Meyer for their advice and support throughout the project.

Contact Information
Name: Nathaniel Odenweller
Email: njo130030@utdallas.edu

Advanced Airway Training Device

- Molding done with Dragon FX 10A, provides realistic look and feel
- Neck joint 3-D printed with Vero clear material
- Pathologies are simulated using air bags, which are controlled by the user interface panel
- Table created out of 80/20 framing and external parts to allow for height adjustability, table-top of melamine for durability
- Powered by 12V lead-acid battery
- Skull is embedded with lead weights for realistic feel
- Lubrication is simulated using a gear pump

User Interface

- On/off switch to control system power
- Push button for lubrication
- Switches available for different pathologies

CAD rendering of our neck joint with sniffing position available and molded airway for realistic feel

Pneumatics will be powered by air and gear pumps respectively