



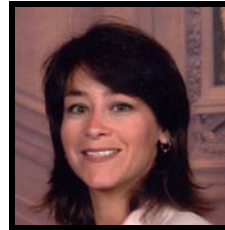
Joan Spiegel, MD

Young Clinician Award 2009

Investigator Profile

Education

- MD, University of Michigan
- BS, Molecular Biology, MIT
- Humanities Degree (Japanese Studies), MIT



Clinical/Professional Appointment

- Staff Physician, Department of Anesthesia, Critical Care, and Pain Medicine, BIDMC
- Instructor Anesthesia and Critical Care, Harvard Medical School

Recent Honors and Awards

- Finalist, 2008 MIT-CIMIT competition for 2 projects: "A New Pressure Sensing Syringe" and "A New Approach to Retrograde Intubation"

Impact on Care

- Improvement in patient safety is of particular concern in every field of medicine. In anesthesia and critical care settings, the safety focus is frequently upon airway control and maintenance. To improve safety outcomes in commonly performed procedures requires knowledge of pressure within certain human spaces.
- A few thousand critical care patients each day in the greater Boston area require pressure testing of an airway device. The two commonly used methods of monitoring tracheal cuff pressure- palpation of the pilot balloon or use of a hand-held manometer—can be inaccurate or inconvenient to implement at the bedside.
- One way to succeed in improving the safety of commonly performed invasive procedures and minimize patient morbidity is via the creation of easier ways to assess and measure the accuracy of the procedure at the time it is performed.
- Broader applications of this technology can provide additional improvements in the quality and safety of patient care:
 - For detection of excessive tissue pressures (i.e. Compartment Syndrome)
 - For monitoring excessive fluid pressures (i.e. Foley catheters and intraneural pressures)
 - For differentiating arterial vs venous pressures when inserting central lines

Abstract

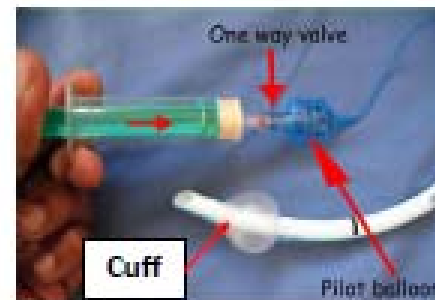
The practice of *precise* cuff pressure measurement is vastly underutilized despite the large body of literature suggesting a more vigilant management protocol (as recently as 2007), and despite the existence of various cuff pressure measuring devices.

The principle objective of the project is to create a pressure-sensing syringe prototype that can accurately measure pressures within the range of 20 to 40cmH₂O.

An alpha prototype of a pressure-sensing syringe that accurately senses pressure within cuffs and balloons used in patient care was developed as part of the MIT 2.75 course. A provisional patent has been filed. It features a low-cost, simple design of pressure sensing elements within a normal appearing syringe that allows the operator to both inject a fluid while at the same time observing the pressure created by the injectate within tissue spaces.

The next step will be to advance the alpha prototype, test it rigorously for accuracy, and perform a small clinical trial to assess its ease of use for medical personnel.

Following the endotracheal application, a secondary objective includes adapting the internal syringe components to allow for liquid (non-air) interface pressure measurements.



Demonstration of the inflation of an endotracheal cuff and modified syringe to allow it to simultaneously inflate and measure the pressure inside the cuff