Healthcare Engineering Lecture Series
Title: Medical technology for COVID-19 and chest wall strapping for lung disease
Speaker: Sai Medi, MD, Internal Medicine and Pediatrics. Hospital & Emergency Medicine, Banner Health, Denver, Colorado.

Education:
- Residency, University of Texas Health Science Center at Houston
- M.D., School of Medicine, University of Texas Medical Branch, Galveston
- BS, Houston Baptist University

Qualifications:
- Co-founder of Respivest LLC, a medical device company for lung diseases founded during early COVID pandemic
- Co-founder of ModHealth LLC, an urgent care technology company
- Advisor, CareMeridian, Altitude Kidney Health, Doctorpedia
- Additional expertise: healthcare informatics, process improvement and infectious diseases

Time: March 4, 2021, 4:00 – 5:20 pm
Zoom: [https://zoom.us/j/98890792479?pwd=eTZCV0JtSmxRTHTRT1A0UWhXNiB1dz09](https://zoom.us/j/98890792479?pwd=eTZCV0JtSmxRTHTRT1A0UWhXNiB1dz09)

Abstract:
This talk has a twofold purpose 1) to provide a framework for understanding shifts in health technology in light of the COVID-19 pandemic and 2) to introduce a novel medical device for the treatment of lung disease. COVID-19 was a tremendous shock to the world’s economy and healthcare system, forcing a reevaluation of the relationship between technology and healthcare. Early on healthcare workers faced shortages of PPE and N-95 respirators. Many innovators and engineers stepped up and produced devices such as 3-D printed respirators and air filtration systems. There was an anticipated shortage of mechanical ventilators, and companies scrambled to procure ventilators and retrofit other devices to perform mechanical ventilation; however there is now some debate over whether early/routine intubation and mechanical ventilation actually benefits patients and soon emerged a shift away from intubation/mechanical ventilation except as a last resort. Ironically, this led to a ventilator excess. This pandemic has forced more general shifts in healthcare and health technology. CMS has changed reimbursement guidelines for Telehealth and remote monitoring, which will hasten widespread adoption. Investors including VC firms have drastically increased spending in digital health in 2020. From an engineering standpoint this means greater projected demand for remote monitoring devices, thereby allowing for medical care and treatments outside of a traditional care setting. The medical community was consumed with learning about COVID-19’s effects on the lungs and lung diseases in general. While in this mindset, we became aware of an obscure and under-explored therapy for lung diseases, particularly obstructive lung diseases, called chest wall strapping (CWS). A significant number of patients who long having recovered from COVID are currently experiencing prolonged inflammation in the lungs and chronic symptoms. There is now an entire class of diseases that falls under the term “post COVID syndrome.”
Chest wall strapping (CWS) therapy is a means of decreasing pulmonary compliance for the treatment of certain lung diseases, namely obstructive diseases such as asthma and COPD. Increase in lung compliance is a well-known feature of obstructive pulmonary disease. Pulmonary compliance determines the effort it takes to expel air from the lungs. It is given by the equation: Compliance = ΔV / ΔP where ΔV is the change in volume, ΔP is the change in pressure. Respiratory compromise in asthma is the result of narrowing of small airways and air trapping during expiration, thereby resulting in perfusion mismatch and ventilatory muscle fatigue. CWS can help mitigate that by decreasing compliance and helping to expel air from the lungs. Human physiology experiments have shown CWS improves airflow, pulmonary compliance and also small airway diameter as measured by CT scans. The mainstay of asthma and obstructive lung disease therapy is medication, and in extreme cases lung volume reduction surgery. Despite ample data showing the potential benefit of CWS therapy in obstructive lung disease, to date no such therapy or device exists. We propose a novel method of decreasing lung compliance by means of CWS device utilizing a ratchet-tightening system. Such a device will be placed on patients suffering from one of the abovementioned conditions and be tightened to allow for better air flow and less air trapping thereby leading to a decrease in their symptoms. This device would need to be customizable and individually fitted for each patient with settings that can be replicated with a high degree of fidelity. We anticipate this device will be classified as an FDA class I device. Clinical studies will need to be conducted regarding true efficacy; however ample data referenced above strongly suggests that this simple, noninvasive treatment modality would indeed be effective. A provisional patent has been granted to our company and a final one will have to be filed by August, while in the meantime, changes and tweaks can be made. The next steps will be to introduce our concept to engineering experts as a means of collaboration, which will help facilitate design of the prototype. We believe this product is simple and yet can provide significant benefit for patients suffering from certain lung diseases. We are excited for the chance to collaborate.

Biography:
Sai Medi, M.D. is a co-founder of Respivest LLC, a medical device company for lung diseases. Dr. Medi is a hospitalist and emergency medicine physician based in Denver, Colorado. Trained in Internal Medicine and Pediatrics, Dr. Medi practices in a wide variety of settings. He is also a co-founder of ModHealth LLC, an urgent care technology company and has had advisory roles in multiple companies including CareMeridian, Altitude Kidney Health and is currently advising Doctorpedia.

Host/Organizer:
Ming Chyu, PhD, PE
Professor, Department of Mechanical Engineering
Adjunct Professor, School of Medicine
Founder, College of Engineering Graduate Healthcare Engineering Option
Texas Tech University
Founding Editor-in-Chief, Journal of Healthcare Engineering
Founding President, Healthcare Engineering Alliance Society (HEALS)