Innovation Institute

Value Proposition
Our automated mechanical chest compression device for cardiopulmonary resuscitation (‘SMART’ CPR) has the ability to improve patient outcomes from cardiac arrest by utilizing an adaptive, patient specific approach to CPR. This approach improves on the current technique of CPR where chest compressions are “fixed” at constant depth and rate. Our device adjusts depth and rate to adapt to the patient’s physiology such as chest size, blood perfusion signals, and cardiac arrest cause. Our animal studies have shown that ‘SMART’ CPR provides greater blood perfusion and leads to more favorable survival rates from cardiac arrest.

Market Opportunity
Our smart chest compression device would be available for use in ambulances and hospitals. There are over 300,000 out-of-hospital cardiac arrests in America every year where our device could be utilized. It would be placed in the ~48,000 ambulances in the US, with the potential to expand to ~5,700 US hospitals and international markets. We also believe we could sell our device at a competitive price compared to automatic chest compression devices currently on the market.

Competitive Landscape
There are three main competitors: Zoll, Physio-Control, and Michigan Instruments. All of these devices give compressions at a fixed depth and rate regardless of patient chest size, cardiac arrest cause, or response to therapy. We expect our device to have a sizable advantage over the current market by integrating patient physiology with adaptive treatment.

Technology
Our device compresses the patient’s chest through a linear actuator controlled by a SmartMotor™. The position of the actuator is calculated with high precision by an optical encoder and a potentiometer. Our device could then for instance, lengthen the depth of compression for larger patients or increase the rate of compression for patients whose perfusion signals are declining. Our device would likely be linked to a cardiac monitoring system within the ambulance, capable of measuring electrocardiogram and perfusion signals. These monitoring systems are already ubiquitous throughout ambulances.

Stage of Development
We have a working prototype and are conducting animal studies.

IP Status
We filed a provisional patent in December 2013 and plan on filing a full patent by the end of 2014.

Funding to Date
Center for Medical Innovation grants totaling $19,000
# Featured Innovators:

**David Salcido**

David is originally from Pittsburgh and is a post-doctoral researcher in the department of Emergency Medicine.

**Education**
University of Pittsburgh, BS  
University of Pittsburgh, MPH  
University of Pittsburgh, PhD

**Publications**
1. Salcido DD, Menegazzi JJ, Rittenberger JC. Electrophysiology and hemodynamics of open chest resuscitation from cardiac arrest in a swine. *Acad Emerg Med*. 2009. 16(1) 89-90

2. Reynolds JC, Salcido DD, Menegazzi JJ. Correlation between coronary perfusion pressure and quantitative ECG waveform measures during resuscitation of prolonged ventricular fibrillation. *Resuscitation*. 83(12) 1497-502


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**James Menegazzi**

Jim is Professor of Emergency Medicine at the University of Pittsburgh and serves as the Principal Investigator for the Automated ‘Smart’ CPR Technology.

**Education**
University of Pittsburgh, BS  
University of Pittsburgh, PhD

**Matt Sundermann**

Matt is originally from Pittsburgh and is currently a graduate student in the bioengineering program at the University of Pittsburgh.

**Education**
Vanderbilt University, BE  
University of Pittsburgh, MS

**Publications**


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