University of Pittsburgh

ID: 02853

Featured Innovators: Matt Sundermann MS, David Salcido PhD, James Menegazzi PhD

‘SMART’ CPR that Adapts to the Patient

Value Proposition

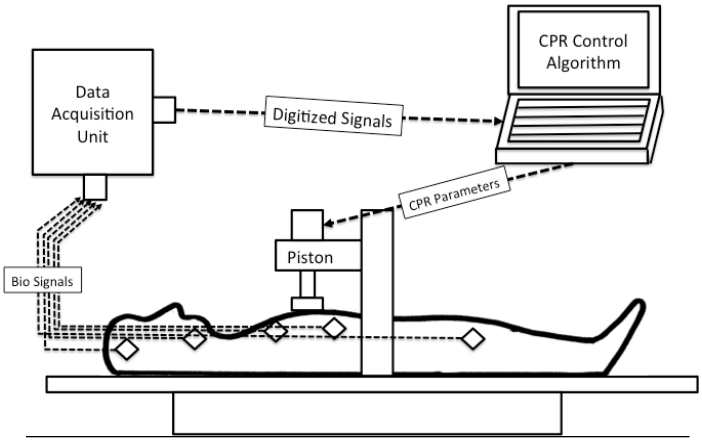
Our automated mechanical chest compression device for cardiopulmonary resuscitation (‘SMART’ CPR) has the ability to **improve patient outcomes from cardiac arrest by utilizing an adaptive, patient specific approach to CPR.** This approach improves on the current technique of CPR where chest compressions 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
3. Reynolds JC, **Salcido DD**, Menegazzi JJ. Conceptual models of coronary perfusion pressure and their relationship to defibrillation success in a porcine model of prolonged out-of-hospital cardiac arrest. *Resuscitation.* 2012. 83(7) 900-6.
4. **Salcido DD,** Kim YM, Sherman LD, Housler G, Teng X, Logue ES, Menegazzi JJ. Quantitative waveform measures of the electrocardiogram as physiologic feedback uring resuscitation with cardiopulmonary bypass. *Resuscitation.* 2012. 83(4).

James Menegazzi

Jim is Professor of Emergency Medicine at the University of Pittsburgh and serves as the Principal Investigator for the Automated ʻSmartʼ 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

1. Reynolds JC, Salcido DD, **Sundermann ML**, Koller AC, Menegazzi JJ. Extracorporeal life support during cardiac arrest resuscitation in a porcine model of ventricular fibrillation. *J Extra Corpor Technol.* 2013. 45(1) 33-9
2. Reynolds JC, Salcido D, Koller AC, **Sundermann ML,** Frisch A, Suffoletto BP, Menegazzi JJ. Tissue oximetry by near-infrared spectroscopy in a porcine model of out- of-hospital cardiac arrest and resuscitation of-hospital cardiac arrest and resuscitation. *Resuscitation.* 2013. 84(6). 843-7.

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