Strengthening the Chain of Survival in Sudden Cardiac Arrest

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Disclosure: Employed by Advanced Circulatory Systems, Inc. (manufacture of ITD technology)

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Sudden Cardiac Arrest (SCA)

- Prevalence
  310,000 coronary heart disease deaths
  166,200 are sudden cardiac arrest
  Nearly 450 per day

- Survival has been dismal
  In-hospital: ≈ 20%
  Out-of-hospital: 5 - 10%

Source: americanheart.org
Strengthening the Chain of Survival
Increase knowledge of CPR

• 80% of cardiac arrests occur at home & witnessed by family member

• Survey done by AHA January 8 – 21, 2008 of 1,132 people

  89% were willing & able to help a witnessed a medical emergency

  <20% confident to perform CPR or use an AED

  Likely to perform CPR on adult (39%) or child (37%) they know.

  <17% believe they are at risk for sudden cardiac arrest.

www.amERICANheart.org
Hands Only CPR

Get non healthcare providers to do SOMETHING!
Mechanical CPR:

Available only outside of USA

ACD: Activite Chest Decompression
Device Features

Ventilation Port

2 Timing Assist Lights
Promote proper ventilation & compression rate

Timming Assist Lights ON/OFF Switch
Turns timing assist lights on & off

Atmospheric Pressure Sensor System
Provides selective impedance to inspiratory air flow

Safety Check Valve
Enables inspiration @ -10 cmH₂O with spontaneous respiration

Patient Port
Something to think about …

Brain dies because of lack of perfusion and failure to ventilate – *not* failure to intubate.
Clinical Benefits

Impedance Threshold Device Therapy

Brand name: ResQPOD 10.0 ITD (Perfusion on Demand)

Animal and clinical studies have shown:

- Doubles blood flow to the heart
- Increases blood flow to the brain by 50%
- Doubles systolic blood pressure
- Increases survival

The generally cleared indication for the ResQPOD is for a temporary increase in blood circulation during emergency care, hospital, clinic and home use. Studies are ongoing in the United States to evaluate the long-term benefit of the ResQPOD for indications related to patients suffering from cardiac arrest, hypotension during dialysis and severe blood loss. The presentation of clinical data is not intended to imply specific outcome-based claims not yet cleared by the US Food and Drug Administration.
Incorporating ITD into AHA Curriculum

August 2007
## 2005 AHA CPR Guidelines

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Conventional CPR w/ ResQPOD

Enhancing greater vacuum (negative pressure) in the chest during chest decompressions

Conventional CPR

Ventilation (positive pressure)

Chest Compressions (positive pressure)

Chest Decompressions (negative pressure)

Conventional CPR w/ ResQPOD

Priming the pump

Enhanced vacuum
Tale of Seven EMS Systems

Allina Medical (Anoka county, MN), Cypress Creek EMS, TX, Madison Fire Dept. (Madison, WI), Medical College of Wisconsin (Milwaukee, WI), Omaha Fire Dept. (Omaha, NE), Pinellas County EMS (Largo, FL), Wake County EMS (North Carolina)

Survival to Hospital Discharge

Aufderheide et al. Circulation 2007;Suppl II;116(16):II-936
Any Electrical Activity Initially
(VF/VT/PEA) (n = 111)

In-hospital Cardiac Arrest

Survival to Hospital Discharge

Old CPR
New CPR + ITD

62% Improvement
Odds ratio: 1.87
95% CI: 1.03, 3.41
P=0.034

N = 157
N = 136

Thigpen et al. ACEP’s ICEM in April 2008
Yannopoulos et al Critical Care Medicine, 2006

15:2 vs 30:2 +/- ITD in pigs

Cardiac output (L/min)

Common carotid blood flow (ml/min)

End tidal CO2 (mmHg)
Keys to Optimal CPR

- Begin performing chest compressions as soon as cardiac arrest is confirmed.
- Ventilate over 1 second (until chest rise) for both facemask and advanced airway.
- Use 2 hands to help maintain a facemask seal at all times.
- Assure complete chest wall recoil.
- Rotate duties frequently to avoid fatigue.
- DO NOT hyperventilate.
- Avoid unnecessary delays or interruptions in chest compressions; ideally no more than 5 – 10 seconds.
A 3 Phase Demonstration Project deploying recent advances in resuscitation science to significantly increase resuscitation rates after cardiac arrest.

Phase I: St. Cloud MN and Anoka County MN (complete).
Phase II: Columbus OH and Austin TX (in process).
Phase III: 20 US Cities and 3 States (Minn, Tex, Miss) (initial planning stages)
Multi-Level Focus and Translational Effort

- Widespread CPR Training (e.g. CPR Anytime)
- AEDs
- Public Education

- Rapid Response
- Start CPR immediately
- Rapid AED application
- High Quality CPR
- ITD (ResQPOD)

Resuscitation Centers of Excellence
- Hypothermia
- 24/7 cath lab
- CPR to cath lab
- EP/ICDs

- High Quality CPR
- IO drug delivery prn
- ITD (e.g. ResQPOD)
- Automated CPR Devices (LUCAS)
Transformative technologies

- CPR Anytime Kit
- ITD (ACD CPR)
- Intra-osseous bone injection
- ICD
- Angiography
- Lay Public
- First Responder
- Hospital
- EMS
- AED
- Automated CPR device
- Therapeutic hypothermia
Take Heart St. Cloud and Anoka
Outcomes

• From 2006-2007 in the two MN sites, >12,000 people were trained in CPR, bystander CPR rates increased by ~5%, all CPR interventions and the ResQPOD deployed, three Level One Cardiac Arrest Centers were established.

• Survival in all patients following OHCA improved from 9.3% in 2005 (historical control) to 17% (P=0.03) in 2007 in these two sites.
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ResQGARD Kit Contents
Patient / Inspiration Port
Connects to a mouthpiece or facemask.

Atmospheric Pressure Sensing Valve
Provides therapeutic inspiratory resistance until the patient creates at least -7 cmH₂O pressure with respiratory effort.

Exhalation Port

O₂ Port
Permits administration of up to 15 lpm supplemental oxygen.
Inspiratory Impedance Effect

Inspiration through an ITD → Greater Intrathoracic Vacuum

↑ Preload
↑ Coronary Artery Perfusion
↑ Cardiac Output

↓ Intracranial Pressure
↓ Resistance to Forward Blood Flow
↑ Cerebral Blood Flow

↑ Blood Flow to Vital Organs
Human Data: Blood Pressure

Blood Pressure Response After Simulated Cardiovascular Collapse using LBNP

- Sham (placebo) ResQGARD
- Active (functional) ResQGARD (-7 cmH₂O)

*p < 0.02

n = 9

Rapidly increases circulation non-invasively & without fluids or medications

Can be used concomitantly with other therapies
  - e.g. IV fluids, vasopressors, patient positioning

Easy to discontinue therapy

Compatible with mouthpiece or facemask

Latex free

Single patient use
Examples of Treatment Areas

- **Hospital/Acute Care**
  - Critical care units (e.g. CCU, ICU, SICU, MICU)
  - Dialysis units
  - Emergency department
  - Rapid response teams
  - Post anesthesia areas (e.g. PACU)
  - Cardiac exercise stress labs
  - Anywhere hypotension could present

- **Emergency Medical Services**
  - Basic and advanced life support units (e.g. civilian, military)
  - Critical care transport units (e.g. ground, aeromedical)

- **Home/Other**
  - Patients with orthostatic hypotension
  - Blood banks
Questions?

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