Take Heart

Sudden Cardiac Arrest Survival Initiative

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Allina EMS
Disclosures

- Take Heart America
- Minnesota Resuscitation Consortium
- Arrest Pac
• Take Heart America
• Thoracic Pump
• CPR Update
It began with a four-city demonstration project to dramatically improve survival from sudden cardiac arrest.
Take Heart America coordinates what the AHA recommends and what SCA victims need...

- Bystander CPR
- Quality CPR and new circulation enhancement devices by rescuers
- AED
- Improved drug delivery
- After resuscitation: specialized care including cooling, blockage removal and implantable defibrillator
Systems Based Approach

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

- Lay Public
- First Responder
- Survival
- Hospital
- EMS

- Rapid Response
- Start CPR immediately
- High Performance CPR
- Impedance Threshold Device
- Rapid AED placement

Resuscitation Centers of Excellence
- Hypothermia
- 24/7 Revascularization
- ICDs & Electrophysiology
- Track Outcomes

- High Performance CPR
- Advanced Airways
- Intra-osseous drug delivery prn
- Impedance Threshold Device
- Automated CPR Devices (LUCAS)
### Intervention Outcome Relationships in Take Heart America

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Effect</th>
<th>Survival rate ↑ over baseline</th>
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</table>
| **Bystander CPR:** in schools, homes & public meeting places                 | ▪ Rapid EMS notification  
▪ Start circulation                                                             | 2 - 5%                        |
| **AED Use:** Widespread strategic AED deployment                             | ▪ Reduce time to 1st shock in VF patients                              | 4 - 6%                        |
| **Improved CPR Quality**  
Prevent hyperventilation, continuous chest compressions, CPR pre/post shock, intra-osseous drug delivery | ▪ Increase circulation to heart & brain  
▪ Increase $O_2$ & drug delivery                                             | 4 - 6%                        |
| **Impedance Threshold Device (ITD): BLS & ALS deployment**                  | ▪ Increase circulation to heart & brain  
▪ Increase $O_2$ & drug delivery                                             | 5%                            |
| **Cooling, ICU, Cardiology**  
Standard hypothermia protocols, cardiac angiography (including during CPR) & EP | ▪ Revascularization  
▪ Prevent sudden cardiac death                                               | 10 - 15%                     |
Widespread CPR

• Increase the percentage of SCA victims who receive effective bystander CPR
  - AHA’s CPR Anytime for Family & Friends
  - High school & college students & their families
  - Communities at large
  - Survivor network participation
  - CPR Goes to College
First Responders

- Decrease response times
- Immediate, high performance CPR
- Airway with ITD
- Rapid AED
High Performance CPR

- Immediate compressions ~ Hard & Fast ~ “Stayin’ Alive”
- CPR before & after shock
- Hand position and full chest recoil

All 911 responders (including police) carry an AED and ITD and have continuous retraining
High Performance CPR

- Airway Management
  - Oral Airway
  - Bag Valve Mask (BVM) with ITD
  - 2-handed continuous seal throughout CPR
  - No hyperventilation
High Performance CPR

Continuous compressions

• Remove ITD if ROSC returns
High Performance CPR

- Apply AED and follow AED prompts
  - After 2 min of continuous chest compressions, analyze, shock and immediately resume chest compressions for another 2 minutes
- Check pulse, if absent, switch compressors and resume CPR
- After 10 minutes, consider advanced airway with King, CombiTube, or ET tube
AHA Recommended Therapies for Increasing Circulation during adult CPR and Improving Resuscitation Rates

**Class I**
- CPR, AED & PAD

**Class Ila**
- Impedance Threshold Device

**Class Ilib**
- Epinephrine
- Amiodarone
- ACD CPR Device
- Vest CPR Device
- Mechanical Piston CPR Device

**Indeterminate**
- Vasopression
- Lidocaine
- Atropine
EMS

- High Performance CPR
- Advanced airway with ITD
- IO Drug Delivery
- Automated CPR device
Why Level 1 Cardiac Arrest Centers?

Mission/Care

• Cooling – active protocol for rapid cooling
• Cardiac Catheterization – 7/24 availability
• Optimal care for re-arrests – New CPR,
• ITD & automated CPR device
• Critical Care – Boarded intensivists 7/24
• EPS and ICDs – 7/24 rhythm
• management
• Rehabilitation – PT/OT teams
• CPR Training for family/friends – spread the word
• Organ donation – shown to save additional lives
Nothing new after all these years....
It’s time to finally move ahead

The Use of Hypothermia after Cardiac Arrest

Donald W. Benson, M.D.
G. Rainey Williams, Jr., M.D.
Frank C. Spencer, M.D.
Adolph J. Yates, M.D.

Baltimore, Maryland
The Use of Hypothermia After Cardiac Arrest 50 years ago!

- Comatose survivors
- Asystole or VF
- Cooled rapidly to 31-32°C
- Cooling until neurologic recovery (3 hours to 8 days)
- Water-filled blanket

Data Collection 1.877.476.2185

Data collection is important for:

• Improving the quality of care for your patients
• Proving the systems-based approach works
• Encouraging other sites to participate in the program
• Gaining recognition for the work you and your service do
No $$
No Mission
## Money Mechanics of Resuscitation Center Survival

<table>
<thead>
<tr>
<th></th>
<th>Average Revenue per Pt.</th>
<th>Average Direct Cost per Pt.</th>
<th>Average Direct Margin per Pt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharged Alive</td>
<td>$57,783</td>
<td>$37,099</td>
<td>$20,684</td>
</tr>
<tr>
<td>Expired in Hospital</td>
<td>$12,014</td>
<td>$8,686</td>
<td>$3,329</td>
</tr>
</tbody>
</table>

Findings replicated in Wm Beaumont Hospital MI
Data published in Circulation from AHA 2008
Take Heart St. Cloud and Anoka Outcomes (Critical Care Medicine 2010)

- Survival increase 8 to 19%
Bystander CPR

ITD

ICD

Angiography

Therapeutic hypothermia

Automated CPR device
Keeping Families Whole
<5 percent survival
30 percent survival
Town of Colonie (NY) EMS Experience

- Population 80,000
- EMS shift supervisors respond to all arrests to monitor resuscitation quality
- 2005: Baseline survival to hospital discharge - 4%
- 2006:
  - Implemented new CPR guidelines
  - Expanded bystander CPR training (CPR Anytime)
- 2007:
  - + ITD
  - More rapid deployment of mechanical CPR
- 2008:
  - Dispatch improvements to reduce response times
  - 2 min CPR prior to defib
  - Delayed advanced airway placement & IV in favor of a period of high quality CPR
- 2009:
  - Three Level One Cardiac Arrest Centers w/ hypothermia capabilities
- 2010: Awarded Heart Safe Community Award for efforts
New Orleans (LA) EMS Experience

- Population 275,000 (post Katrina)
- Baseline (year prior): Stable ROSC upon arrival at ED - 21%
- Intervention Group (Dec 2009):
  - + ITD to ambulances (first responders rec’d in Mar 2009)
  - + Mechanical CPR in sprint car
  - Meds delivered IV or IO (EZ-IO)
  - Prehospital therapeutic hypothermia (cold packs and chilled saline)
  - Baseline and peak ETCO2 values also assessed
New Orleans (LA) EMS Experience

- **ROSC**: 75% improvement
- **ETCO2**
  - Measured in 84 subjects
  - 69% had an increase
  - Increase was > 10 mmHg in 36% of pts
- **Prehospital Cooling**
  - 38% of ROSC pts cooled

P=0.01

Stable ROSC (%)
Improved Out-of-Hospital Cardiac Arrest Survival After the Sequential Implementation of 2005 AHA Guidelines for Compressions, Ventilations, and Induced Hypothermia: The Wake County Experience

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Ryan Lewis, MS, EMT-P
Valerie J. De Maio, MD, MSc
Eric Reyer, MSN, ACNP
Daniel Licatese, RN
Joseph Zalkin, BSHS
Graham Snyder, MD
For the Capital County Research Consortium

From WakeMed Health and Hospitals (Hinchey, Myers, De Maio, Reyer, Snyder); the Clinical Research Unit, Emergency Services Institute (Hinchey, De Maio); Wake County EMS (Hinchey, Myers, Lewis, Zalkin); and Rex Healthcare (Licatese), Raleigh, NC.

Study objective: We assess survival from out-of-hospital cardiac arrest after community-wide implementation of 2005 American Heart Association guidelines.

Methods: This was an observational multiphase before-after cohort in an urban/suburban community (population 840,000) with existing advanced life support. Included were all adults treated for cardiac arrest by emergency responders. Excluded were patients younger than 16 years and trauma patients. Intervention phases in months were baseline 16; phase 1, new cardiopulmonary resuscitation 12; phase 2, impedance threshold device 6; and phase 3, full implementation including out-of-hospital-induced hypothermia 12. Primary outcome was survival to discharge. Other survival and neurologic outcomes were compared between study phases, and adjusted odds ratios with 95% confidence intervals (CIs) for survival by phase were determined by multivariate regression.

Results: One thousand three hundred sixty-five cardiac arrest patients were eligible for inclusion: baseline n=425, phase 1 n=369, phase 2 n=161, phase 3 n=410. Across phases, patients had similar demographic, clinical, and emergency medical services characteristics. Overall and witnessed ventricular fibrillation and ventricular tachycardia survival improved throughout the study phases: respectively, baseline 4.2% and 13.8%, phase 1 7.3% and 23.9%, phase 2 8.1% and 34.6%, and phase 3 11.5% and 40.8%. The absolute increase for overall survival from baseline to full implementation was 7.3% (95% CI 3.7% to 10.9%); witnessed ventricular fibrillation/ventricular tachycardia survival was 27.0% (95% CI 13.6% to 40.4%), representing an additional 25 lives saved annually in this community.

Conclusion: In the context of a community-wide focus on resuscitation, the sequential implementation of 2005 American Heart Association guidelines for compressions, ventilations, and induced hypothermia significantly improved survival after cardiac arrest. Further study is required to clarify the relative contribution of each intervention to improved survival outcomes. [Ann Emerg Med. 2010;xx:xxx.]
Wake Co. (NC) EMS Experience

- Population 840,000
- Baseline (01/2004 – 04/2005): Survival to hospital discharge - 4.2%
- Phase 1 (04/2005 – 04/2006):
  - Implemented new CPR guidelines; emphasis on minimal CPR interruptions for both EMS & bystanders, and avoiding hyperventilation
  - Moved from stacked shocks to single shock
- Phase 2 (04/2006 – 10/2006):
  - + ITD
  - Emphasized that high quality CPR at scene was preferred over transport
  - + Prehospital therapeutic hypothermia (cold packs and chilled saline)
  - Transport to Level One Cardiac Arrest Centers w/ hypothermia capabilities

Wake Co. (NC) EMS Experience

P<0.01

- Baseline; n= 425
- Phase I: n=369
- Phase 2; n=161
- Phase 3; n=410

ROSC (%)

- 24.7
- 40.1
- 43.4

Survival to Discharge (%)

- 4.2
- 7.3
- 8.1
- 11.5

Systems of Care

- **Cancer**
  - Surgery, chemo, radiation

- **ASCVD**
  - PCI, CABG, lipids, HTN, smoking, obesity, meds
Celebrate the Saves