SYSTEMS BASED APPROACH TO OUT-OF-HOSPITAL CARDIAC ARREST

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Chief Medical Officer
Palm Beach County Fire Rescue
State EMS Medical Director
Florida Department of Health
CASE REPORT

42 y/o married male and father of two returns home after exercising and collapses

Chain of Survival enacted with every link in the chain utilized
EFFECT OF SYSTEM CHANGES ON ROSC

- Florida 2011: ROSC 6
- Florida 2013: ROSC 16.7, Neuro Intact Survival 17.9
- Florida 2014: ROSC 16, Neuro Intact Survival 17.9
- PBCFR 2014: ROSC 16, Neuro Intact Survival 17.9
- PBCFR 2015 - 2016 Average: ROSC 34.2, Neuro Intact Survival 41.5
- Bat 10 Before RICH Trial: ROSC 7.3, Neuro Intact Survival 5
- RICH Trial 2018: ROSC 58.5, Neuro Intact Survival 12
EFFECT OF SYSTEM CHANGES ON ROSC 2011 TO 2018

- Florida 2011: 6%
- PBCFR RICH Protocol 2018: 58.5%
RICH TRIAL EFFECT ON NEURO INTACT SURVIVAL

65% increase in Neurologically Intact Survival
FIXING THE BUNDLE OF CARE

Recognition and activation of the emergency response system
Immediate high-quality CPR
Rapid defibrillation
Basic and advanced emergency medical services
Advanced life support and postarrest care

Lay rescuers
EMS
ED
Cath lab
ICU
PRE-PRE-HOSPITAL PROJECTS

Goals:
- Develop an army of CPR trained laypersons
- Teach them to use the PulsePoint App
- Do this perpetually and for free
Fear of Pushing on an alive persons chest converted to fear of failing to push on a dead persons chest

No No GO Dispatcher Life Support
ACD CPR WITH ITD
RICH TRIAL CARDIAC NON-TRAUMA ARREST
(ADULT ONLY) (Rescue Pump, I-Gel, Continuous Chest Compression, Head Up)

**ESTABLISH RESPONSIVENESS**
No respirations/palpable pulse

- Insert OPA/NPA & ventilate
- 1 breath every 6 seconds via a BVM
- If patient requires ventilatory support for more than 2 minutes the patient should receive an advanced airway

**FBAO**

**CHECK PULSE**
Absent

- Begin Chest Compressions
- Attempt to remove FBAO w/laryngoscope & Magill forceps
- If unable to remove FBAO perform a cricothyrotomy

**TIMELINE**

<table>
<thead>
<tr>
<th>Continuously</th>
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<tbody>
<tr>
<td>Perform Chest Compressions</td>
</tr>
<tr>
<td>Minimize interruptions to no longer than 5 seconds</td>
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<table>
<thead>
<tr>
<th>Every 2 minutes</th>
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<tbody>
<tr>
<td>Rhythm checks, Defibrillations prn</td>
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<tr>
<td>Rotate person performing chest compressions</td>
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<table>
<thead>
<tr>
<th>After 4 minutes</th>
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<tr>
<td>IV/IO &amp; Drugs can be administered</td>
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<tr>
<td>After 6 minutes</td>
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<tr>
<td>Apply LUCAS (if available) prior to moving patient</td>
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<tr>
<td>After 8 minutes</td>
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<tr>
<td>Elevate head of patient 15 degrees</td>
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<tr>
<td>Transport if patient was in a Ventricular Dysrhythmia</td>
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<tr>
<td>After 20 minutes</td>
</tr>
<tr>
<td>Transport decision if patient in Asystole/PEA</td>
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**ASYSTOLE/PEA**

**ELECTRICAL THERAPY** (as needed)

**DRUG THERAPY** after 4 minutes
- EPI (1-10,000) 1mg IV/IO every 3-5 minutes prn, max total 5 doses
- Amiodarone:
  - 1st Dose – 300mg IV/IO
  - 2nd Dose – 150mg IV/IO
- For Tachy:
  - Mag Sulfate – 2g IV/IO
  - Dobut – 20μg, 30μg, 100μg

**RESUSCITATE**

**v-FIB/v-TACH**

**DETECTION**

**DEFIBRILLATE** (as needed)

Minimize pauses in compressions to no longer than 5 seconds

**Revision**
06/18
PRE-HOSPITAL EMS PROJECTS: THE RICH TRIAL

- Rescue Pump
- iGel with ResQPod
- Continuous Compressions
- Head Up position

Flow Oriented Therapy
SOME OF OUR RESCUERS MIGHT BE PULLING UP A LITTLE TOO HARD
HICKY OF HOPE
RESUSCITATION CENTERS
Total Number of Out of Hospital Cardiac Arrest Patients Resuscitated by EMS (by Year)

- 2014
- 2015
- 2016

Palm Beach County Fire Rescue
Cardiac Arrest Centers

- Karl Sporer
- Almeda County EMS Agency
Improving Cardiac Arrest Outcomes

- Pulsepoint
- CPR 7- train 10,000 seventh graders each year
- Dispatch CPR
- Universal Mechanical CPR Device
- Pit Crew
- Impedance Threshold Device
- CARES Registry
- Cardiac Arrest Centers in 2013
ORIGINAL CONTRIBUTIONS

CONTINUOUS QUALITY IMPROVEMENT EFFORTS INCREASE SURVIVAL WITH FAVORABLE NEUROLOGIC OUTCOME AFTER OUT-OF-HOSPITAL CARDIAC ARREST

Karl Sporer, MD, Michael Jacobs, BS, Leo Derevin, BS, Sue Duval, PhD, James Pointer, MD

ABSTRACT

Objective: To assess system-wide implementation of specific therapies focused on perfusion during cardiopulmonary resuscitation (CPR) and cerebral recovery after Return of Spontaneous Circulation (ROSC). Methods: Before and after retrospective analysis of an out-of-hospital cardiac arrest database. Implementation trial in the urban/suburban community of Alameda County, California, USA, population 3.6 million, from November 2009–December 2012. Adult patients with non-traumatic out-of-hospital cardiac arrest (OHCA) who received CPR and/or defibrillation. The impedance threshold device was used throughout the study and there was an increased use of mechanical CPR (mCPR) and in-hospital therapeutic hypothermia (HTH). Results: Rates of ROSC, survival to hospital discharge and Cerebral Performance Category (CPC) scores were compared using univariate and multivariable analyses. A total of 2,926 adult non-traumatic patients with OHCA received CPR during the study period. From 2009–2011 to 2012, there was an increase in ROSC from 29.0% to 34.4% (p = 0.003) and a non-significant increase in hospital discharge from 10.2% to 12.0% (p = 0.16). There was a 76% relative increase in survival with favorable neurologic function between the two periods, as determined by CPC ≤ 2, from 4.5% to 7.9% (unadjusted OR = 1.80; CI = 1.31, 2.48; p < 0.001). After adjusting for witnessed arrest, bystander CPR, initial rhythm (VT/VF vs. others), placement of an advanced airway, EMS response time, drugs administered, and age, the OR was 1.61 (1.10, 2.36; p = 0.015). Using a stepwise multivariable logistic regression model, the independent predictors of CPC ≤ 2 were 2012 (vs. 2009–2011; p = 0.022), witnessed arrest (p < 0.001), initial rhythm VT/VF (p < 0.001), and advanced airway (inverse association p < 0.001). Additional analyses of the three prescribed therapies separately and in combination, demonstrated that for those patients admitted to the hospital, mCPR with HTH had the biggest impact on survival to hospital discharge with CPC ≤ 2. Conclusions: Specific therapies within a system of care (mCPR, HTH), developed to enhance circulation during CPR and cerebral recovery after ROSC, significantly improved survival by 74% with favorable neurologic function following OHCA. Keywords: emergency Service; hospital/statistics & numerical data; out-of-hospital cardiac arrest/complications; out-of-hospital cardiac arrest/therapy; hypothermia; induced/methods; ventricular fibrillation/etiology; out-of-hospital cardiac arrest/mortality

PREHOSPITAL EMERGENCY CARE 2017;21:1–6

INTRODUCTION

Annually, non-traumatic cardiac arrest results in...
Cardiac Arrest Centers

- Directed all SCA patients with ROSC to our STEMI/Cardiac Arrest Centers in 2013
- Memorandum of Understanding
  - CARES participation
  - Internal Therapeutic Hypothermia Policy
  - Internal STEMI after ROSC Policy
    - Process data and outcomes
- Two LUCAS Devices - ED and Cath Lab
- Quarterly Meetings
Cardiac Arrest Centers

- Improvements
  - Increased incidence of Cath during Cardiac Arrest
  - Champions of mechanical CPR devices
  - Variation of TH and Cardiac Catherization after ROSC
  - Combining Hospital Code Blue QI with the prehospital cardiac arrest QI
Progressive Systemwide Collaboration

Alameda County (Calif.) EMS coordinates with clinical stakeholders to improve cardiac arrest survival

By Michael J Jacobs, EMT-P
& Karl A Sporer, MD, FACEP, FACP

Every year, more than 400,000 people suffer near cardiac arrest and the resulting improvement in cardiac arrest resuscitation. The endorsed system of care for OHCA by ALCO
ORIGINAL RESEARCH

Variations in Cardiac Arrest Regionalization in California

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Introduction: The development of cardiac arrest centers and regionalization of systems of care may improve outcomes with formalized coordination (CQI). This study describes the field of cardiac arrest regionalization in California.
ORIGINAL RESEARCH

Variations in Cardiac Arrest Regionalization in California

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Introduction: The development of cardiac arrest centers and regionalization of systems of care may improve survival of patients with out-of-hospital cardiac arrest (OHCA). This survey of the local EMS agencies (LEMSA) in California was intended to determine current practices regarding the treatment
Cardiac Arrest Centers

- Survey of California EMS Agency
- Formal Regionalized Cardiac Arrest Care
  - Los Angeles County
  - Alameda County
  - Twenty Counties
- Direct all ROSC patients to STEMI Center
- Only 36% of EMS Agencies have survival outcomes available
San Antonio-
Resuscitation Centers-
Cardiac Arrest Management-
A New Vision for Care
The Office of the Medical Director Serves SAFD 1.4 Million ++ Population
3+ Cardiac arrests a day
CUTTING EDGE APPROACH TO IMPROVE CARDIAC ARREST SURVIVAL
651-403-5636
www.TakeHeartAmerica.org
We are Stuck in a RUT......need to get better

We need more CPR and Community Engagement

93/1102 Arrests  50/1102 Arrests

SAFD CARES Survival Percentages

- Cardiac
- Bystander Witnessed
- Unwitnessed
- Utstein (Witness/Unshockable)
- Utstein with Bystander Involved
Resuscitation Centers

- STEMI PCI center with adequate volume
- CP Center Accreditation
- Hemodynamic support such as Impella/ECMO
- Pacer and AICD capability
- Robust Pulmonary-Critical Care
- Neuro, GI, Nephro, ID, PMR (EEG)
- FTE’s for Medical Direction, QA and oversight
Resuscitation Centers

• Targeted Temperature Management:
  • Cooling all ROSC, ALL rhythms if no purposeful movement to command on arrival for 24 hrs after reaching TTM Temp (33 or 36 degrees)
  • After 24 hrs at Temp allow gradual rewarming 0.25 °C per hour passively

• Hyperglycemic Control

• Seizure monitoring and Myoclonus Control
Resuscitation Centers

• Multi-disciplinary Rounds
• Physical Therapy, PMR, and Nutrition on admission
• Family – Social and Pastoral Support
• Need a Nurse Program manager “Attack Nurse”
• Track and Report Outcomes
• Survivor Support and Family Engagement after discharge
• In House Cardiac Arrest Program
Resuscitation Centers

• Key Drivers:
  • ROSC with STEMI direct to cath lab - cooled
  • ROSC no stemi to cath lab within 2 hours and cooled
  • Comprehensive Resuscitation Center
    Persistent V-Fib/Vtach to cath lab
    (also Cardiogenic Shock)
    • Witnessed with bystander CPR or TCPR
    • NO significant co- morbid conditions age < 70
    • Load Early and Head to ECMO center with LUCAS 3.1
Thank You

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CASE REPORT

• 911 Called No, No Go Dispatcher CPR Started

• 14 y/o Son just learned CPR in School program

• Medics perform Pit Crew CPR and transport in head up position to Resuscitation Center

• Resuscitation Center takes patient to cath lab, places impella, starts ecmo and cools patient.

42 y/o married male and father of two returns home after exercising and collapses