Regional Approach to Cardiovascular Emergencies

Cardiac Arrest Resuscitation System

A Regional Approach:
Developing Continuity From Scene to CCU

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Wake Forest Baptist Health

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2013
Objectives

• Discuss paradigm of care regionalization
• Highlight importance of protocols to success
• Discuss example of regionalization in NC
• Elements of success / strategies to regionalize care in your community
NO ONE SURVIVES CARDIAC ARREST, EXCEPT ON TV
SURVIVAL AFTER ADMISSION

- 40 Years of EMS and no improvement
- Those resuscitated in field show large survival variability after admission
  - Controlled for patient characteristics
  - ROC study
1. Immediate recognition of cardiac arrest and activation of the emergency response system
2. Early CPR with an emphasis on chest compressions
3. Rapid defibrillation
4. Effective advanced life support
5. Integrated post–cardiac arrest care
1: **Community Response**
- Recognize SCA
- Early 911
- Effective bystander CPR
- Public access to AED

2: **Pre-hospital Response**
- Enhanced dispatch
- Enhanced CPR
- Appropriate defibrillation therapy
- Early Advanced Care

3: **Hospital Response**
- Patient triage to Resus. Center of Excellence
- Hypothermia
- 24/7 Cath Lab
- ICDs
- Post-survival patient education & support
Center Hub of Regionalization

Post-ROSC Integrated Care Facility

- Patient triage to Resus. Center of Excellence
- Hypothermia
- 24/7 Cath Lab
- ICDs
- Post-survival patient education & support
Time Dependent Conditions

- 1. Respiratory distress
- 2. STEMI
- 3. Stroke
- 4. Trauma
- 5. Out-of-Hospital-Cardiac Arrest
Hospital / EMS cardiac arrest programs 2010
PROBLEMS

- OHCH Public Health
- Regional variation
- EMS / Hospital variation
- Barriers
  - Lack of knowledge
  - Experience
  - Personnel
  - Resources
  - Infrastructure

Regional Systems of Care for Out-of-Hospital Cardiac Arrest, Circ. 2010; 121 709
AHA Policy Statement 2010

• SOLUTIONS

• Time-dependent conditions

• Increased Volumes
  – Providers / Hospitals
  – Better outcomes

• Regional Systems
  – Improved STEMI
  – Trauma

Regional Systems of Care for Out-of-Hospital Cardiac Arrest, Circ. 2010; 121 709
DO THIS TOMORROW

• Teach every person to perform CPR
• Public Access Defibrillation
• 911 Recognizes Cardiac Arrest
• 911 Provides PAI
• First Responders
  – AED
• EMS
  – ACLS
  – Therapeutic Hypothermia
• Tertiary Medical Center
  – Therapeutic Hypothermia
  – Cardiology, Pulmonologist, Neurologist
  – PTCI / ICD
<table>
<thead>
<tr>
<th>Department</th>
<th>Yes (%</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Care (n=33)</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td>Cardiology (n=64)</td>
<td>11%</td>
<td>89%</td>
</tr>
<tr>
<td>Emergency Medicine (n=109)</td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td>All respondents (n=263)</td>
<td>13%</td>
<td>87%</td>
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Figure 3. Overall survival to hospital discharge and neurologic status* of survivors of out-of-hospital cardiac arrest between baseline (N=425) and full implementation (N=410) of 2005 AHA guidelines (phase 3).
Regionalization Rationale

- IOM 2006 & AHA 2010 endorse regionalized systems of care
- Increase utilization of proven, complex interventions
- Specialized resources and expertise at certain centers
- Correlation between case volume and patient outcome

WHERE DO WE START?

REGIONALIZATION BEGINS?
Complete Interdependency

Community

Hospital

Pre-hospital EMS
Community Training

Objective: To improve the rate of bystander CPR

Education

- Identify leaders and interested community members
- Survey the community (what exists now)
- Seek funding from local businesses, partnerships or grants
- Use RACE CARS material and/or AHA materials
Community Training
Objective: To improve the rate of bystander CPR Education
Train the Trainer

- Participate in existing offerings
- Advertise: send emails, ask to post signs, talk to local TV/radio stations, be creative
- Count how many are trained at each event:
  - send event name
  - location-city and county
  - and how many trained
- We will be tracking bystander CPR rates and survival rates in every community across NC
Community Training
Objective: To improve the rate of bystander CPR Education

Public Access Defibrillation Program

- Identify leaders and interested community members
- Survey the community to identify locations of AED’s
- Obtain contact information for the responsible party for each AED
- Work with local EMS to input AED locations into CAD
- Seek funding from local businesses partnerships or
  - AED’s for locations with >250 people

American Heart Association and American Red Cross CPR Training
- Identify AHA and ARC classes for communities
Because dispatcher CPR instructions substantially increase the likelihood of bystander CPR performance and improve survival from cardiac arrest, **ALL** dispatchers should be appropriately trained to provide telephone CPR instructions (Class I, LOE B).

2010 AHA Guidelines for CPR & ECC
How to drive behavior and ensure consistency

PROTOCOLS
<table>
<thead>
<tr>
<th>Resuscitation Capable Hospital</th>
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<td><strong>Goal:</strong> To improve survival from cardiac arrest by 50%</td>
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- Standard and well executed ACLS protocols
- Baseline neurologic examination
- 2 large bore IV's
- ECG: If new LBBB or STEMI: Activate STEMI Plan
- Early notification of the receiving hospital
- Early activation of the transport plan
- Implement treatment protocols for STEMI and cardiac arrest
- Send medical records including EMS information, ECG, record of treatment with times, and EMTALA form (can fax records if need time to complete, EMTALA forms must go with patient)
- Optimize BP to MAP>65mmHg
- Titrate EtCO2 for 35–40
- Consider CT of brain, do not delay cooling for scan or extensive testing before transfer unless clinically indicated
- Pressure infuse 2L of cold saline if candidate for hypothermia (if EMS started cooling do not stop) - continue cooling in transport
- Sedation and possibly paralysis
- Train family in recognition of cardiac emergency and compression only CPR prior to patient discharge
- Family and staff support
- Data measurement and feedback
Resuscitation Capable Hospital Pre-Transfer Guidelines

**Inclusion Criteria**
- Adults (age ≥ 18 years)
- Return of Spontaneous Circulation (ROSC) within 60 minutes of arrest
- Persistent Coma: Inability to follow commands and/or GCS < 9

**Exclusion Criteria**
- Severe or terminal illness with anticipated non-aggressive care
- Active hemorrhage
- Systemic infection/sepsis
- Severe refractory shock

**Resuscitation Priorities**
- Airway: Intubation
- Breathing
  - Avoid hyperventilation (goal PaCO2 of 38 – 42mmHg)
  - Avoid hyperoxia (rapidly decrease FiO2 to maintain SpO2>95%)
- Circulation
  - Goal MAP>65
  - Anticipate and avoid hypotension
  - Norepinephrine is the preferred vasopressor
  - ECG screen for STEMI

**Cooling Induction**
- Initiate cooling as soon as possible after ROSC
- Refrigerated (4°C) NS 30 cc/kg IV bolus as tolerated
- Ice packs to groin, axilla and neck
- Shivering control with Propofol 10 mcg/kg/min
- Paralyze patient with Vecuronium 0.1mg/kg q1hr
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- Standard and well executed ACLS protocols
- Baseline neurologic examination
- 2 large bore IV's
- ECG: If new LBBB or STEMI to cath lab
- Optimize BP to MAP > 65mmHG
- Titrate EtCO2 for 35–40
- Consider CT of brain, do not delay cooling for scan or extensive testing before transfer unless clinically indicated
- Pressure infuse 2L of cold saline if candidate for hypothermia (if EMS started cooling do not stop)-continue cooling in transport
- Continue therapeutic hypothermia for 24 hours
- Sedation and possibly paralysis
- On-going neurological assessment and care
- 24/7 Cath lab availability for STEMI
- Early coronary angiography if not a STEMI
- ICD Evaluation
- Rehabilitation plan
- Train family in recognition of cardiac emergency and compression only CPR prior to patient discharge
- Family and staff support
- Data measurement and feedback
AHA 2010: Post-Arrest Guidelines

- Optimize perfusion
- Identify & treat precipitating cause
- Transport to comprehensive post-cardiac arrest treatment system
  - Acute coronary interventions
  - Goal-directed critical care
  - Hypothermia

PUTTING IN PERSPECTIVE

NORTH CAROLINA EXAMPLE OF REGIONALIZATION
CMC CODE COOL OVERVIEW

- Started November 2007
- Total patients to date: 228
- Transfers: 41%
- In-hospital arrests: 5%
- STEMIs: 12%
CMC CODE COOL

Code Cool Implementation Timeline

Nov-07
Code Cool Pathway Activation

Sep-08 - Jun-10
Regional Outreach Campaign

Nov-06 - Jul-07
Preparation and Planning
CMC CODE COOL
Regional System for Therapeutic Hypothermia: Arrest Characteristics

- Witnessed: 82%
- Bystander CPR: 66%
- VT/VF 76%
- PEA / Asystole 24%
- STEMI 49%
- Shock 44%
- Downtime 22 minutes
Regional System for Therapeutic Hypothermia: Outcomes

- 56% survived
- 51% good neurological outcome
- 20% increased risk of death with every hour delay in initiation of cooling
- Time to goal temperature not significantly associated with survival

### Neurologic Outcomes

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>Good Neurologic Outcomes</th>
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<tbody>
<tr>
<td>Local (n=99)</td>
<td>43%</td>
</tr>
<tr>
<td>Referred (n=67)</td>
<td>34%</td>
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CMC CODE COOL Time Line

2010
Organize
Assessment

2011
Logistics and Data
Pilot

2012
10 Centers

2013
15 Centers
Expansion

2014
21 Centers
State-side implementation

2015
Add bordering states
Consolidation
CMC CODE COOL Take Home

• Establish protocols
• Establish protocols
• Establish protocols

• Cardiac arrest centers
• Resuscitation center
• Aggressively resuscitate post-arrest patients
WHAT IT TAKES TO START: THE BIG PICTURE

SUMMARIZING ELEMENTS

AHA 2010 POLICY STATEMENT
EMS ESSENTIAL ELEMENTS

- Medical director works with hospitals
- External certification / verification
- Triage of ROSC to Resuscitation Center
- Plan and treat re-arrest
- Therapeutic Hypothermia
- Performance Improvement Initiative
HOSPITAL ESSENTIAL ELEMENTS

• Resuscitation Capable Center
  – Works with EMS Medical Director
  – External certification / verification
  – Initiates / continues Hypothermia
  – Early transport to Cardiac Center
  – Plan and treat re-arrest

  – Provide CPR training for lay public
  – Provide BLS and ACLS training for employees
  – Performance Improvement Initiative
HOSPITAL ESSENTIAL ELEMENTS

• Cardiac Arrest Center
  – Works with EMS Medical Director
  – External certification / verification
    • Align with STEMI centers
    – Initiates / continues Hypothermia
  • Plan and treat re-arrest
  • No prognostication before 72 hours

• Center Characteristics
  – High volume, 40 arrests per year
  – Meets ACC / AHA STEMI Guidelines for PTCI
  – EP Testing and ICD Implantation

• Provide CPR training for lay public
• Provide BLS and ACLS training for employees
• Performance Improvement Initiative
  – Multidisciplinary
Does Project Planning Feel Like Herding Cats?

Herding Cats

It CAN be done