Tennessee
The best place to have a heart attack

James G. Jollis, MD, FACC
Duke University
Emergency Cardiac Care

2013

Vision for US and Tennessee

James G. Jollis, MD, FACC

President

North Carolina Chapter of the American College of Cardiology
Tennessee vs. North Carolina

Population
- 6,403,353
- 9,656,401

Size (sq. miles)
- 42,146
- 48,843

Highway / total road miles
- 3,229 / 87,419
- 3,757 / 99,813
Tennessee vs. North Carolina
Tennessee vs. North Carolina

Hospitals

~ 120 hospitals
25 24/7 PCI hospitals

~111 hospitals
21 24/7 PCI hospitals
Tennessee Acute Care Hospitals and STEMI Treatment Capabilities by EMS Region

LEGEND
Hospitals
- Meet All ML Criteria
- Cath Lab 24/7
- No Cath Lab
- Cath Lab not 24/7

EMS Regions
- Northeast
- East Tennessee
- Southeast
- Upland Cumberland
- Mid-Cumberland
- South Central
- West Tennessee
- Memphis-Delta

Distance to Hospital that Meets all ML Criteria
- 15 Miles
- 30 Miles

Per capita health care spending

- $6,411
- $6,444

Heart disease deaths (per 100,000)

- 210 (#7)
- 178 (#25)

http://kff.org/other/state-indicator
Tennessee vs. North Carolina
Emergency cardiac care 2013

- Case
- Guidelines
- Where we are
- What we need
45 year old man C.F.

- Severe chest heaviness in shower while getting ready for work.
- Wife called EMS
45 year old man C.F.

- Severe chest heaviness in shower while getting ready for work.
- Wife called EMS
45 year old man C.F.
45 year old man C.F.

2012
- ED confirms paramedic read
- Cath lab called
- Patient arrests in ED / unable to resuscitate

2013
- Paramedics activate cath lab 21 minutes out
- Directly to lab and arrests
- ACLS / LAD PCI
120+ minutes to device
“Cardiac cripple” or shock and death

< 60 minutes to device
Home in 3 days
Normal life
2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction

Developed in Collaboration with American College of Emergency Physicians and Society for Cardiovascular Angiography and Interventions

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Primary PCI should be performed in patients with STEMI presenting to a hospital with PCI capability within 90 minutes of first medical contact as a systems goal.
Primary PCI should be performed in patients with STEMI presenting to a hospital without PCI capability within 120 minutes of first medical contact as a systems goal.
Fibrinolytic Therapy When There Is an Anticipated Delay to Performing Primary PCI Within 120 Minutes of FMC
Emergency cardiac care 2013

• Case (arrest in ED – death vs. arrest in lab, resusc. and LAD PCI

• Guidelines

• Where we are

• What we need
STEMI Door-to-Balloon Times
Median Times for Transfer In and Non-Transfer In Patients

ACTION Registry-GWTG DATA: July 1, 2010 – June 30, 2011
First medical contact (EMS) to device

Median time 91 Minutes

Q3 2011

- S/S Onset-FMC
- FMC-ECG
- ECG-ED
- LOS ED
- ED-C-Lab
- C-Lab-Device
How patients present
How patients present

- Call 911 EMS (~50%)
- Walk-in (~50%)
- Hospital transfer
  - Walk in or EMS to 1\textsuperscript{st} hospital (~60% of PCI hospital)
How patients present

Treatment goals in minutes

<table>
<thead>
<tr>
<th></th>
<th>EMS</th>
<th>Walk-in</th>
<th>Hospital transfer</th>
</tr>
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<tbody>
<tr>
<td><strong>Current</strong></td>
<td>90</td>
<td>90</td>
<td>120 - 180</td>
</tr>
<tr>
<td><strong>Potential</strong></td>
<td>&lt;60</td>
<td>&lt;90</td>
<td>&lt;120</td>
</tr>
</tbody>
</table>
Death according to treatment within guideline goal time

\[ P < 0.001 \]

Emergency cardiac care 2013

- Case
- Guidelines
- Where we are
- What we need
Levels of organization

Individual hospital

Hub and spoke model

Regional system

Journal of Invasive Cardiology 2011; 23 A:8-12
A system that includes all hospitals within a region, establishes common hospital and EMS protocols, and shares common data.
Regional system
Advantages

- Patients walk in to every hospital and call every EMS agency… all need a plan.
- Regional leadership involving all major hospitals is more effective at influencing referring hospitals and EMS agencies.
  - If all leading professionals and institutions in a region agree, recommendations more likely to be adopted.
- Single approach enhances rapid treatment.
  - everyone knows their role, no hesitation to find out who is on call....
Regional system

Advantages

• Fill in the existing gaps / chasm in healthcare
  – Competing hospitals
  – Loose EMS – hospital affiliations

• Only possible way to overcome the “longest breath hold”… two hour transfer device times
Regional system Barriers / Opportunities

• Competition
  – most commonly cited barrier to system organization

• Apathy in Leadership

• Conflicting management plans
  – “5 doctors will give you 6 different plans”

• Resources
  – “Feet on the street” system coordinators

• Lack of comparable regional data for ongoing quality improvement and immediate feedback loop for all members of the team

Lessons from Regional System Models
45 STEMI Receiving Centers: Ventura, Los Angeles, & Orange Counties (California)

64 in So. Cal: 19 more SRCs San Diego, Riverside, San Bernardino Counties.
PCI Centers
15 & 30 minute drive times (PCI centers = Pink)
AHA Dallas Caruth Initiative

“Texas Sized”

STEMI System of Care

Russell Griffin BS, LP, FP-C
Director – Dallas Caruth Grant
ACS Signs & Symptoms
Chest pain or discomfort that is non-traumatic, located anywhere between the jaw & umbilicus, and lasts for more than 1 minute. It may be described as a "pressing," "tightening," "crushing," or "stabbing" feeling.

EMS Chest Pain / ACS Guidelines

STEMI Criteria
ST segment elevation of ≥ 1 mm in 2 contiguous leads with or without signs & symptoms of ACS

ACS Patients > 30 years old experiencing any ACS signs & symptoms OR
Any age patient with ACS signs & symptoms AND a history of:
- HTN
- Cardiac disease
- Smoking
- Diabetes mellitus
- Severe Obesity
- High Cholesterol
- Recent recreational drug use

When in doubt, obtain an ECG.
The Individual Challenge – Education vs. Culture

• 4,032 – Certified EMS Personnel
• 875 – ED RN’s
• 398 – ED Physicians
• 404 – ED Technicians
• 85 – Cath Lab Technicians
• 90 – Cath Lab RN’s
• 112 - House Supervisors
• 187 - ICU Charge Nurses
• 82 – Interventional Cardiologists
Education Plan

Dallas Caruth
EMS Education
STEMI Workbook

Dallas Caruth
Hospital Education
STEMI Workbook

EMS Education Workbook Endorsed by:

Dr. Ray Fowler M.D.
Dr. Robert Simonson D.O.
Dr. Suresh Chavda M.D.

Dallas Caruth Initiative
Presented on behalf of the American Heart Association and the Communities Foundation of Texas
First medical contact to device
EMS (median time minutes)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>2010</th>
<th>2011</th>
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<tbody>
<tr>
<td>Q4</td>
<td>133</td>
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<tr>
<td>Q1</td>
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<td>Q2</td>
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<td>Q3</td>
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<tr>
<td>Q4</td>
<td>93</td>
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</tbody>
</table>
Prehospital Tweaks

Pre-Hospital
Activation of STEMI Call Team (Cardiology and Cath Lab Staff) from EMS ECG
12 Lead Obtained before Other interventions
Utilization of Pit Crew Concept for STEMI

Results

- 911 activation to Balloon: 64 minutes
- EMS FMC to Balloon: 54 minutes
- Door to Balloon: 38 minutes

*Dec 2011-present
RACE R eperfusion in AMI in Carolina E mergency Departments
Expansion of a Regional ST-Segment Elevation Myocardial Infarction System to an Entire State

Circulation. published online June 4, 2012;
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2012 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

Implementation of a Statewide System for Coronary Reperfusion for ST-Segment Elevation Myocardial Infarction
James G. Jollis; Mayme L. Roettig; Akinyele O. Aluko; et al.
http://jama.ama-assn.org/cgi/content/full/298/20/2371
“Most of the important decisions that impact patient outcomes occur long before the patients reaches the cardiologist”
Move care forward…

- EMS does emergency department job
- Emergency department does cardiology job
- Cardiology lives in the cath. lab / intensive care unit
Diagnose quickly

Reperfuse quickly

ST Elevation Myocardial Infarction
21 primary PCI labs

5,240 paramedics

18,000 EMTs

540 EMS systems

121 emergency departments
Building regional system Process

1) Develop leadership, funding, data structure

2) Establish REGIONAL PCI CENTERS (primary, lytic ineligible, rescue)

3a) HOSPITAL by hospital establishment of STEMI plan (review, consensus, training)

3b) EMS by EMS establishment of STEMI plan (review, consensus, training)

5) Improve system
Regional Coordinators

- Directed by regional leadership to implement emergency care plans.
- Lead establishment of STEMI plan in every hospital and EMS agency.
- Day to day oversight and coordination of system.
- Training of EMS, ED, catheterization lab, and QI personnel.
- Regular data feedback to hospitals, EMS agencies, and regional meetings.
Establish a STEMI plan
RACE Centers and Regions

119 hospitals (21 PCI, 98 non PCI)

Western NC

Triad

Triangle

Metro Charlotte

Coastal Plains

PCI centers
Transfer for PCI
Lytics
Mixed
Develop a Regional Plan

- Optimal system specifications by point of care
  - EMS
  - ED
  - Transfer
  - Receiving hospital
  - Cath. Lab
  - Other system issues – payers, regulations

# Develop a Regional Plan

## Non-PCI hospital lab activation protocol

- Symptoms of acute coronary syndrome greater than 15 minutes - less than 12 hours.
- ECG diagnosis
  - ST segment elevation in two contiguous leads
  - Machine interpretation of definite STEMI
- No contraindications to acute catheterization
  - Active severe bleeding
  - Patient inappropriate for procedure (patient or family refusal, DNR, severe dementia)
- Emergency physician activates Primary PCI hospital as soon as STEMI is identified using term “code STEMI”
- Pre-arranged critical care transport or EMS dispatch notified of “code STEMI” for 911 transfer
- Aspirin 325 mg
- Heparin bolus 60 u/kg, no drip
- Limit continuous infusions
- Fax records while patient in transport

## EMS lab activation protocol

- Symptoms of acute coronary syndrome greater than 15 minutes - less than 12 hours.
- ECG diagnosis
  - ST segment elevation in two contiguous leads
  - Machine interpretation of definite STEMI
- No contraindications to acute catheterization
  - Active severe bleeding
  - Patient inappropriate for procedure (patient or family refusal, DNR, severe dementia)
- Trained paramedic activates Primary PCI hospital as soon as STEMI is identified using term “code STEMI”
- Aspirin 325 mg
- Heparin bolus 60 u/kg, no drip
- Limit continuous infusions
- Fax records while patient in transport

Available @

https://see.deri.duke.edu/regional-systems/ACCELERATOR%20OPS%20Manual%20Final.pdf/view
PCI Hospitals RACE Criteria

- Single number cath. lab activation
- Accept all STEMI patients regardless of bed availability
- 30 minute lab availability 24/7
- On site surgery
- Ongoing QI and data feedback—AR-G database
- Partial support of a Regional Coordinator
Emergency departments

- Establish a STEMI plan
- Nurse first triage
- 10 minutes to ECG
  - Typical symptoms, over age 30
  - Atypical symptoms, over age 50
- Emergency physician makes reperfusion decision
  
  Activate lab or initiate fibrinolysis
Emergency departments

Transfer Regimen

- Aspirin
- Heparin bolus, no drip
Transport Time and Care Processes for Patients Transferred With ST-Segment–Elevation Myocardial Infarction

The Reperfusion in Acute Myocardial Infarction in Carolina Emergency Rooms Experience

Daniel Muñoz, MD, MPA; Mayme L. Roettig, RN, MSN; Lisa Monk, RN, MSN; Hussain AL Khalidi, PhD; James C. Jollis, MD; Christopher B. Granger, MD

Circ Cardiovasc Interv. 2012;5:555-562
EMS

- Establish a STEMI plan
- ECG for all possible STEMI patients
  - Typical symptoms, over age 30
  - Atypical symptoms, over age 50
- Paramedic interpretation and cath. lab activation
  - Paramedic read, machine read, or transmission.
- Diversion plan to PCI hospital
  - Lytic ineligible
  - Hospital within 30 to 40 minutes
Pre-Hospital ECG

- ACTION registry - 2007
- 1,941 of 7,098 EMS transported patients had pre-hospital ECG
- Trend for lower mortality 0.85 (0.63-1.01)

4 ways to activate
1) Paramedic read
2) Machine read
3) ECG transmission
4) Walk in with ECG
Universal Care Protocol

1. Aspirin 162-325 mg p.o. (Unless documented aspirin allergy)
2. 12-Lead ECG
3. Nitroglycerin 0.4 mg SL q 5 minutes If SBP > 90
4. Apply 1" Nitroglycerin Paste to skin If SBP > 90

Continued pain?
5. Morphine 2-5 mg slow IV up to 10 mg Or Fentanyl 50 mcg IV up to 150 mcg
6. Nitroglycerin 0.4 mg SL q 5 mins If SBP > 90

Interventional Facility Diversion for STEMI

Acute MI with ≥ 1 mm ST Segment Elevation in 2 Contiguous Leads

- Notify Emergency Interventional Cardiac Catheterization Laboratory Facility and Transport Within 15 Minutes of Arriving on Scene. Consider ECG Transmission if Capable.
- Consider Fluid Bolus for Inferior MIs with hypotension
- Hypotension / Dysrhythmias Treat per Protocol
EMS

EMS Regimen

- Aspirin
- Load and go
Building regional system Process

1) Develop leadership, funding, data structure

2) Establish REGIONAL PCI CENTERS (primary, lytic ineligible, rescue)

3a) HOSPITAL by hospital establishment of STEMI plan (review, consensus, training)

3b) EMS by EMS establishment of STEMI plan (review, consensus, training)

5) Improve system
Mission: Lifeline Regional Hospital Report
System ID: 0010
Quarter 3, 2012
*Confidential Information*

0010: 2012 Q3
First Medical Contact to Device
Median Time (minutes)
Direct Presentation, Arriving via EMS

![Graph showing time in minutes for different stages of heart attack care.]

- SYS (98): 77 minutes, 30 minutes, 27 minutes
- A (3): 68 minutes, 48 minutes, 24 minutes
- B (5): 86 minutes, 36 minutes, 15 minutes
- C (19): 67 minutes, 37 minutes, 16 minutes
- D (6): 87 minutes, 37 minutes, 18 minutes
- E (8): 67 minutes, 76 minutes, 17 minutes
- F (9): 74 minutes, 32 minutes, 21 minutes
- G (10): 87 minutes, 36 minutes, 30 minutes
- H (7): 81 minutes, 32 minutes, 27 minutes
- I (11): 84 minutes, 29 minutes, 27 minutes
- L (7): 87 minutes, 29 minutes, 24 minutes

1. FMC to Door
2. Door to Arrival at Cath Lab
3. Arrival at Cath Lab to Device Activation

Nation Med: 92
High Point girl saves teammate’s life by performing CPR

Posted on: 11:34 am, April 19, 2013, by Web Staff, updated on: 11:44am, April 19, 2013

8th graders save student
• Wesleyan Academy softball practice.
• Paris White collapsed
• Taylor Bisbee just completed mandatory 8th grade CPR training
• Chest compression only CPR
• AED
• Hypothermia
• Goal directed ICU care

• Paris made full recovery.
Improving SCA Survival by 50% in 5 years in North Carolina

1: Bystander 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

HeartRescue Project
1st chain: Bystander Response
2nd chain: Pre-hospital Response
3rd chain: Hospital Response
Emergency cardiac care 2013

- Case
- Guidelines
- Where we are
- What we need
US and Tennessee Vision

• Continue leadership at state, regional, hospital, and agency level
• STEMI plan for every ED and EMS
• Paramedic ECG / activation
• If cath. lab nearby / ready, don’t stay in ED
US and Tennessee Vision

- Without data, there is no system... regional data
- In 5 years, death from STEMI should be rare... 2%.
“Where you live should not determine whether you live”
Critical Success Factors for Regionalization

- Place patient first, not competition or $$
- Have a “neutral” party coordinate competitive regions (Keep > funding the neutral body)
- Cardiology, ED Medicine, Nursing, EMS leadership, CV Administration & QI
- Empower ED Medicine and EMS to be decision makers & activate the reperfusion plan
- Keep Reperfusion plan simple, parallel processing
- Data drives change- > both immediate and QI quarterly monitoring important
- Nurse or paramedic / Mission:Lifeline coordinators essential to success
Methodist University Hospital presents the First Annual Regional Stroke and STEMI Collaborative Symposium

Saturday, April 20, 2013
7:00 a.m. - 3:00 p.m.

FedEx Institute of Technology
University of Memphis
Memphis, Tennessee
What we need

• Regional care
• Leadership
• Data
• EMS presenting
  – 12 lead on scene
  – Interpret
  – Paramedic activate cath. lab
• ED walk in
• Cardiac arrest