



# Field Considerations for AMI

The good and the challenges!

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# Med-Trans, Inc.



# Cool pictures.....



# One of the first ECMO transfers



# Professional Disclosures

- ▶ Chair of the MARCER TCD Committee
- ▶ STEMI Chair for Mission Lifeline
- ▶ Nothing else to disclose

# Our mission is....

- ▶ Discuss the challenges and opportunities for EMS agencies experience in the care of the ACS patient. We will discuss:
  - ▶ System design, training and competence, public education, telemetry and technology, access to care, Missouri TCD regulation, follow up and QA/QI.

# An integral part of the team

- ▶ EMS is an integral part of the team!
  - ▶ We know DTB's are far better when EMS is involved in the care of a STEMI patient.
- ▶ BUT when you have seen one EMS system you have seen one EMS system
  - ▶ All have challenges



# Benchmark Data

- ▶ **Action Registry NCDR data**
- ▶ **First Medical Contact to Primary PCI**
- ▶ **The 50% performing facility gets this in 71.9 min**
- ▶ **The 90% performing facility gets this in 61.5 min**





# Training and Competence!

# Competence and Confidence

- ▶ EMS agencies should train and validate personnel on 12 lead interpretation reliability.
- ▶ Competence and confidence.
- ▶ Outreach opportunity for hospitals.



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# Afraid to pull the trigger?

	Q2 2017	Impact
Total Stemi activations cancelled	<b>107</b>	
Total cancelled stemis originally activated by EMS	<b>55</b>	<b>51%</b> <b>Down from 57% in 2016</b>
Total cancelled Stemi activated non EMS	<b>52</b>	<b>49%</b>

# What were the causes of cancelled stemi?

Top reason for cancelled Stemi	Total cases cancelled
No ST Elevation	<b>18</b>
Left Bundle Branch Block	<b>6</b>
A-Fib RVR	<b>5</b>
Withdraw Care/ Palliative	<b>4</b>
Left Ventricular Hypertrophy	<b>4</b>
Right Bundle Branch Block	<b>3</b>
ST segment resolved	<b>3</b>
Pacemaker	<b>3</b>
Alternative Diagnosis (sepsis, PE, etc)	<b>3</b>
Tied for 17 various causes	<b>1</b>

# Physician Accuracy

## Physician Accuracy in Interpreting Potential ST-Segment Elevation Myocardial Infarction Electrocardiograms

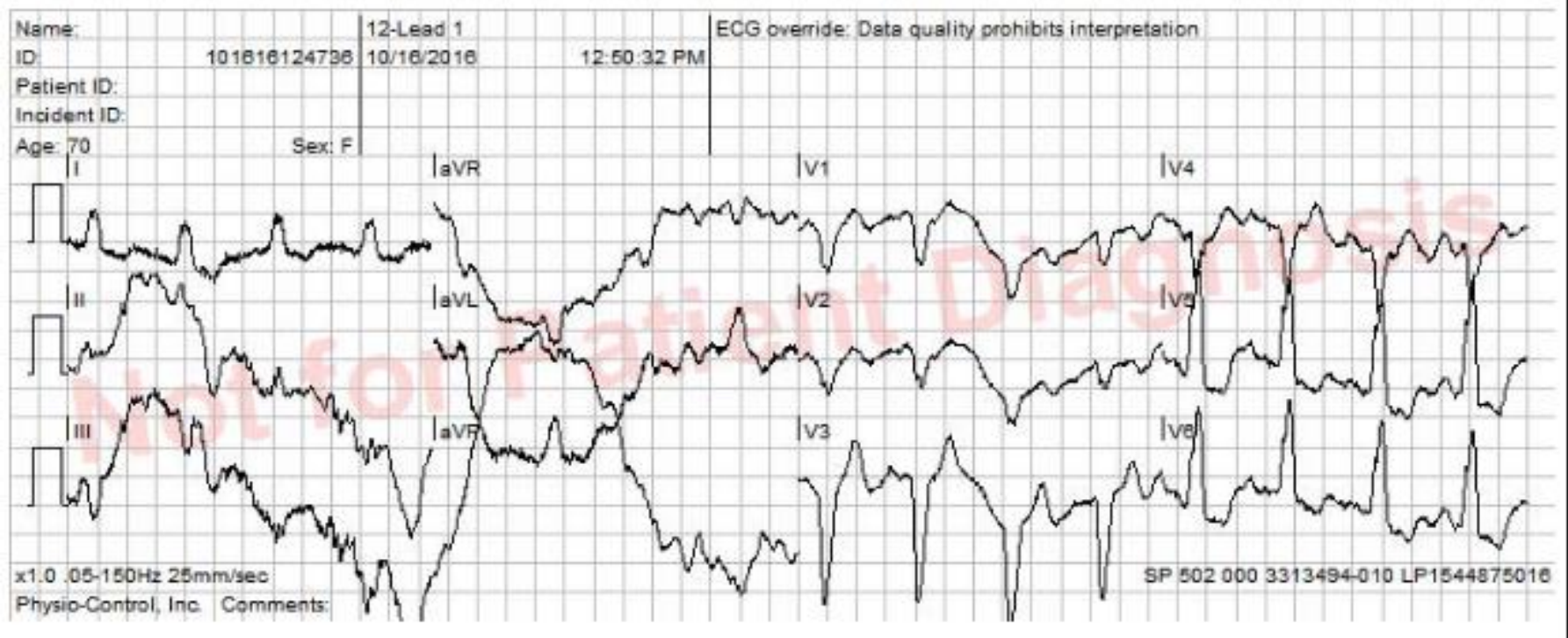
James M. McCabe, MD; Ehrin J. Armstrong, MSc, MD; Ivy Ku, MD; Ameya Kulkarni, MD; Kurt S. Hoffmayer, PharmD, MD; Prashant D. Bhave, MD; Stephen W. Waldo, MD; Priscilla Hsue, MD; John C. Stein, MD; Gregory M. Marcus, MSc, MD; Scott Kinlay, MBBS, PhD; Peter Ganz, MD

**Background**—With adoption of telemedicine, physicians are increasingly asked to diagnose ST-segment elevation myocardial infarctions (STEMIs) based on electrocardiograms (ECGs) with minimal associated clinical information. We sought to determine physicians' diagnostic agreement and accuracy when interpreting potential STEMI ECGs.

**Methods and Results**—A cross-sectional survey was performed consisting of 36 deidentified ECGs that had previously resulted in putative STEMI diagnoses. Emergency physicians, cardiologists, and interventional cardiologists participated in the survey. For each ECG, physicians were asked, "based on the ECG above, is there a blocked coronary artery present causing a STEMI?" The reference standard for ascertaining the STEMI diagnosis was subsequent emergent coronary arteriography. Responses were analyzed with generalized estimating equations to account for nested and repeated measures. One hundred twenty-four physicians interpreted a total of 4392 ECGs. Among all physicians, interreader agreement (kappa) for ECG interpretation was 0.33, reflecting poor agreement. The sensitivity to identify "true" STEMIs was 65% (95% CI: 63 to 67) and the specificity was 79% (95% CI: 77 to 81). There was a 6% increase in the odds of accurate ECG interpretation for every 5 years of experience since medical school graduation (OR 1.06, 95% CI: 1.02 to 1.10,  $P=0.01$ ). After adjusting for experience, there was no significant difference in the odds of accurate interpretation by specialty—Emergency Medicine (reference), General Cardiology (AOR 0.97, 95% CI: 0.79 to 1.2,  $P=0.80$ ), or Interventional Cardiology physicians (AOR 1.24, 95% CI: 0.93 to 1.7,  $P=0.15$ ).

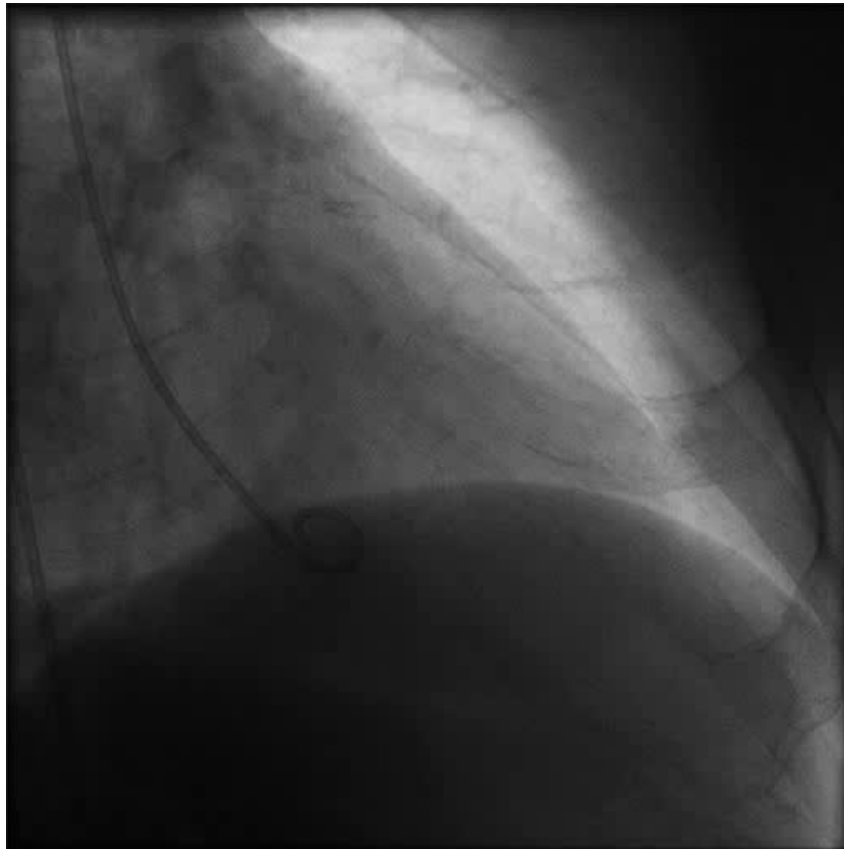
**Conclusions**—There is significant physician disagreement in interpreting ECGs with features concerning for STEMI. Such ECGs lack the necessary sensitivity and specificity to act as a suitable "stand-alone" diagnostic test. (*J Am Heart Assoc.* 2013;2:e000268 doi: 10.1161/JAHA.113.000268)

# But we need to be better than this STEMI activation



False activations should be considered learning opportunities!

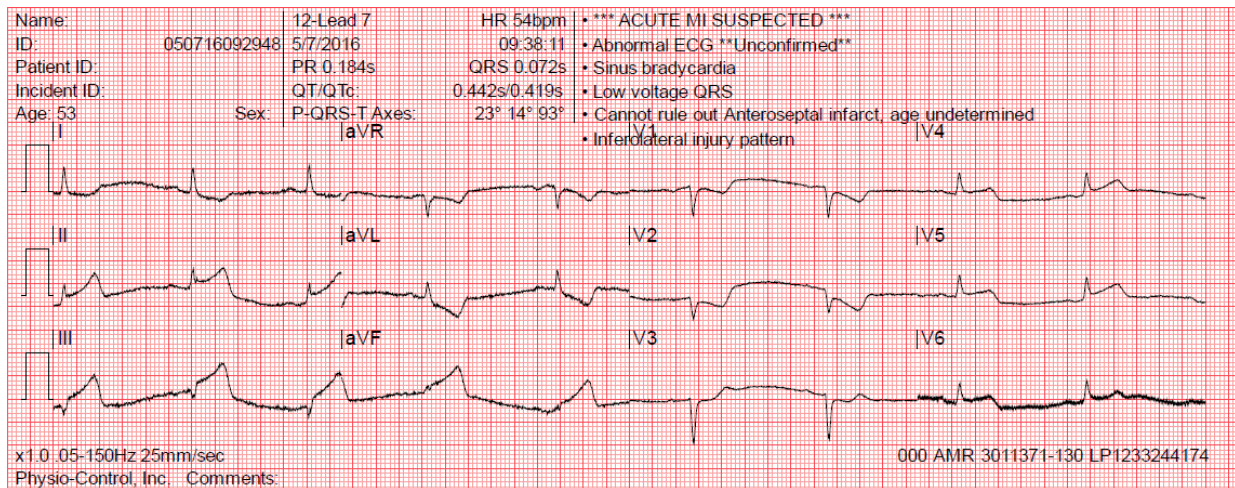
Time is pump performance!





# STEMI recognition is one thing...

- ▶ Recognize and localize AMI on the 12 lead.
- ▶ Early notification of “STEMI Alert”



# Recognition of STEMI imitators is another....

- ▶ Elevation on the 12 lead is more often caused by other mimics. Commonly missed are:
  - ▶ LBBB, LVH, early repolarization, pericarditis, ventricular rhythms

[Emerg Med Clin North Am](#), 2015 Aug;33(3):529-37. doi: 10.1016/j.emc.2015.04.004. Epub 2015 Jun 4.

## **Chameleons: Electrocardiogram Imitators of ST-Segment Elevation Myocardial Infarction.**

[Nable JV](#)<sup>1</sup>, [Lawner BJ](#)<sup>2</sup>.

### ⊕ **Author information**

#### **Abstract**

The imperative for timely reperfusion therapy for patients presenting with ST-segment elevation myocardial infarction (STEMI) underscores the need for clinicians to have an understanding of how to distinguish patterns of STEMI from its imitators. These imitating diagnoses may confound an evaluation, potentially delaying necessary therapy. Although numerous diagnoses may mimic STEMI, several morphologic clues may allow the physician to determine if the pattern is concerning for either STEMI or a mimicking diagnosis. Furthermore, obtaining a satisfactory history, comparing previous electrocardiograms, and assessing serial tests may provide valuable clues.

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# Complications with Anterior and Lateral Wall AMI

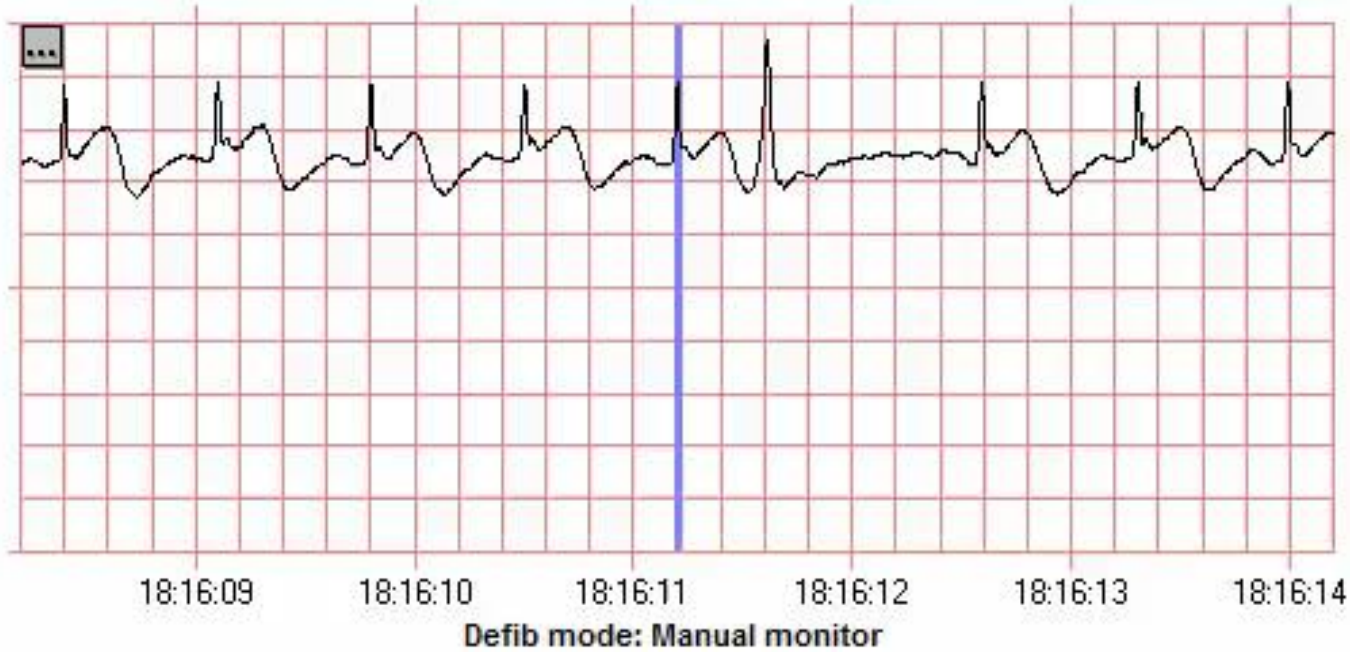
- ▶ Cardiogenic Shock
- ▶ Congestive Heart Failure
- ▶ Ventricular Fibrillation
- ▶ Ventricular Tachycardia
- ▶ High Degree Blocks





# BE PREPARED!

Grid size is 0.20 s x 0.25 mV at Gain x1



# Sometimes you just don't know

- ▶ If it looks like a dog it probably is.
- ▶ Patient advocates.





# Public Education

# Does this bother anyone?

- ▶ In a 2005 survey:
  - ▶ 92% recognized chest pain as a symptom of a heart attack.
  - ▶ 27% were aware of all major symptoms
    - ▶ Knew to call 9-1-1 when someone was having a heart attack.
- ▶ 47% of sudden cardiac deaths occur outside a hospital.
  - ▶ This suggests that many people with heart disease don't act on early warning signs.



# How about these facts?

- ▶ More patients drive themselves to the hospital rather than calling EMS.







# Telemetry and Technology

They could do it!



# Why can't we?

- ▶ Sending
  - ▶ Geography challenges
    - ▶ Lack of signal
  - ▶ Technology and equipment
    - ▶ Lack of funding
- ▶ Receiving
  - ▶ What do you need to receive?
    - ▶ Manufacturer specific
    - ▶ Open platform

**ZOLL**<sup>®</sup>

**PHYSIO  
CONTROL**

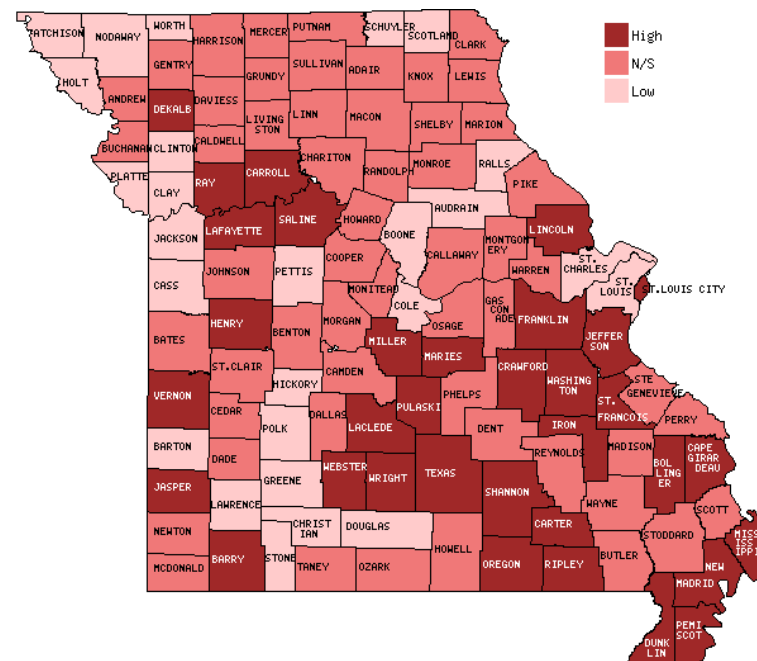
**PHILIPS**



# Access to Care Issues

# Here are the real facts.....

- ▶ Untimely reperfusion in STEMI is common.
- ▶ Timely reperfusion is more important than the method used.



# Access?

This map illustrates 60-minute drive times surrounding percutaneous coronary intervention (PCI) programs at US hospitals and shows state-by-state data sources that were used to estimate PCI capability.



Concannon T W et al. *Circ Cardiovasc Qual Outcomes* 2012;5:14-20

2001-2006  
44% increase

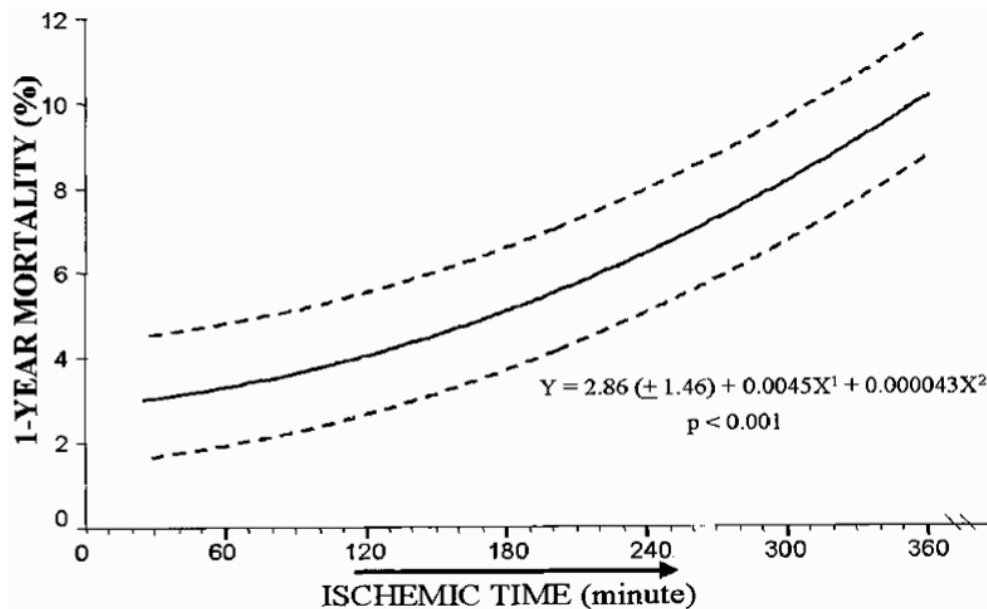
1% increase  
in timely  
care

This map illustrates 60-minute drive times surrounding percutaneous coronary intervention (PCI) programs at US hospitals and shows state-by-state data sources that were used to estimate PCI capability.



Concannon T W et al. *Circ Cardiovasc Qual Outcomes* 2012;5:14-20

# The Direct Relationship Between DBT and Mortality



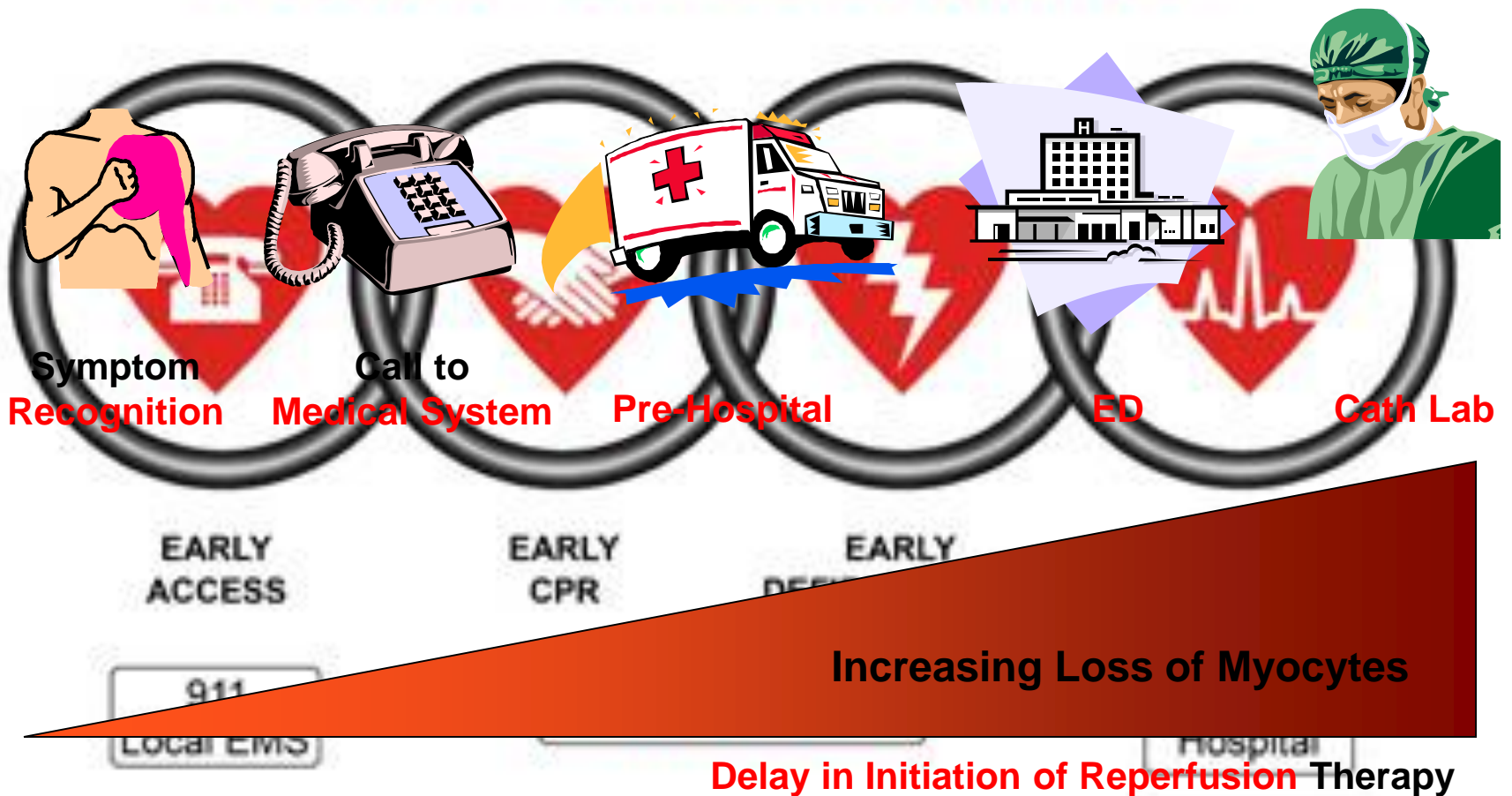
Relationship between time to treatment and 1-year mortality, as continuous function, was assessed with quadratic regression model. Dotted lines represent 95% CIs of predicted mortality.





# Critical Timeline

## CHAIN OF SURVIVAL





Missouri TCD

# Dr. Bill Jermyn

- ▶ “It’s the right thing to do for Missouri. Let’s get’er done!”
- ▶ White paper, early 2000’s, (not sure if it was published)
  - ▶ “Need for major change”
- ▶ Missouri General Assembly passed the first TCD legislation one day after the death of Dr. Jermyn.



# The Missouri TCD System

- ▶ Improve health outcomes for all Missourians who suffer a STEMI or Stroke.
- ▶ Establish a functional system to improve transport, diagnosis, and treatment.
  - ▶ Eliminations of the barriers to reperfusion
- ▶ Protocols, practices and infrastructure will evolve for continuing improvement in outcomes.
- ▶ TCD Continuum of Care

*Time Critical Diagnosis System, Recommendations to Advance EMS Care for Stroke and STEMI in Missouri, Task Force Report, August 2008.*

# Missouri TCD



# EMS Challenges

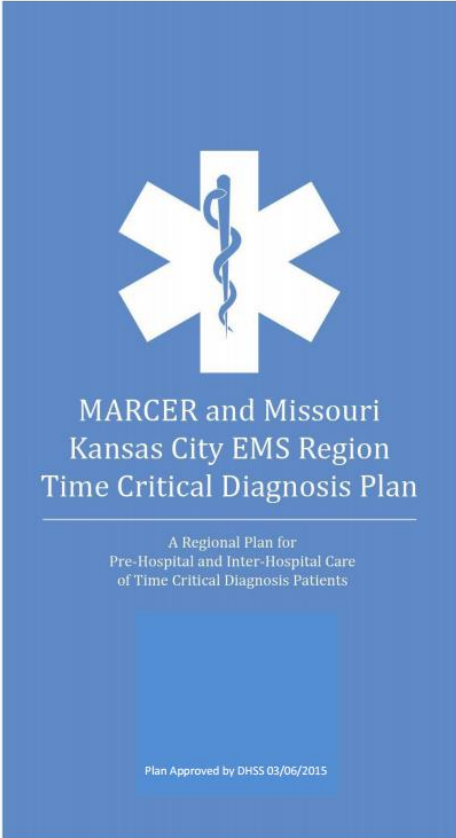
- ▶ Voluntary for hospitals to participate.
- ▶ Mandatory for EMS personnel and agencies.
  - ▶ Regulatory action for non-compliance
- ▶ March, 2015 Stroke Designations were released.
  - ▶ Immediate gaps in stroke care apparent.
    - ▶ Immediate KC area, North KC and Liberty not designated
      - ▶ Routing issues for EMS agencies who service that area.
    - ▶ DHSS opened application period again.
- ▶ STEMI centers are being reviewed now.
  - ▶ Will we have gaps in our area again?

# Other challenges...

- ▶ Reperfusion centers with banker hours.
- ▶ Paramedic shortage.
- ▶ Dis-engaged leadership.

# Community Plans

- ▶ Community Plans must be approved by DHSS
- ▶ Education of agencies who fall under EMS Regions need to be educated on the community plan.
  - ▶ A challenge!




MARCER and Missouri  
Kansas City EMS Region  
Time Critical Diagnosis Plan

A Regional Plan for  
Pre-Hospital and Inter-Hospital Care  
of Time Critical Diagnosis Patients

Plan Approved by DHSS 03/06/2015

Created by the Mid-America  
Regional Council Emergency  
Rescue (MARCER) Committee



Mid-America Regional Council  
600 Broadway, Suite 200  
Kansas City, MO 64105  
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www.marc.org





Follow Up and QA/QI

# Follow up and QA/QI

- ▶ Follow up with EMS agencies to very important
  - ▶ How do you do follow up?
- ▶ Post DTB times in EMS areas
- ▶ QA/QI can be challenging to EMS agencies due to staffing issues and personnel expertise

**HEALTH MEDICAL CENTER**

EMS Provider: AMR EMS Run #: 53966

Date: 10/10/2015 EMS 911 Call Time: 16:03

EMS EKG Time 16:16

1. EMS/ED Findings: 41 y/o male c/o substernal chest pain and diaphoresis. Also reported being dizzy and lightheaded and that he fell off of his toilet. Onset at 15:50. Patient has a history of CAD; HTN, hyperlipidemia, DM, and is a smoker.

2. STEMI Activated from Field:  YES  NO EMS EKG on Chart  YES  NO

3. Arrival Time at Centerpoint: 16:32 LifeNet Transmission  YES  NO

4. Time of ED 12-lead EKG: 16:34

5. STEMI Page Time: 16:22 6. Cath Start Time: 17:14

7. Cath Findings: 100% Ostial LAD occlusion treated with angioplasty, manual and mechanical aspiration, and one DES stent. Temporary pacemaker placed before mechanical thrombectomy. Swan-Ganz catheter placed at end of case for hemodynamic monitoring.

8. Balloon Time: 17:28

9. Door To Balloon: 56 minutes 10. 911 Call To Balloon: 85 minutes

# EMS Performance Indications

- ▶ Call processing times
- ▶ Chute times
- ▶ Travel times
- ▶ Time to 12 lead
  - ▶ Time and method of notification following STEMI 12 lead
- ▶ Time to ASA
- ▶ Scene time

It's all about relationships!



# Opportunities ahead?

- ▶ Routine routing to cath lab for v-fib arrests following ROSC.
- ▶ Discharge 12 leads



# Mobile Integrated Healthcare

- ▶ AKA “Community Paramedics”





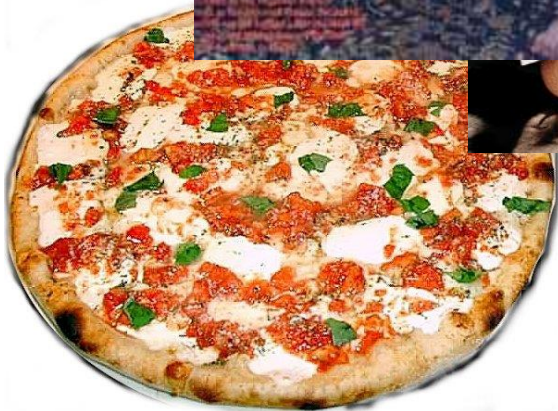
Conclusion

# Some final thoughts

- ▶ If you have seen one EMS system you have seen one EMS system. Each has it's challenges.
  - ▶ Regulatory requirements, staffing and equipment issues.
- ▶ A system of care must involve your EMS agencies.
- ▶ EMS agencies and hospitals should work together to educate the public about AMI and when to call 911.
- ▶ Provide timely feedback to EMS agencies.
- ▶ EMS agencies should develop education programs for their personnel.



Is it going to get any better?



This is what it is all about!



Now, who wants some bacon wrapped pizza?





**Thank You!**