ENHANCING PRE-HOSPITAL OUTCOMES FOR CARDIAC ARREST (EPOC)

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Enhancing Pre-Hospital Outcomes for Cardiac Arrest (EPOC)

- 4-year study funded by the National Heart, Lung, and Blood Institute (NHLBI)

- Partnership between University of Michigan, RAND Corporation, and SaveMiHeart with study team members from other institutions and organizations

- Co-PI: Dr. Brahmajee Nallamothu

- Goal: Identify best practices for improving cardiac arrest survival in the prehospital setting from a system of care perspective

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UNIVERSITY OF MICHIGAN

NIH National Heart, Lung, and Blood Institute

savemiheart
Working to Improve Cardiac Arrest Survival

RAND CORPORATION

Where you experience cardiac arrest should not matter.
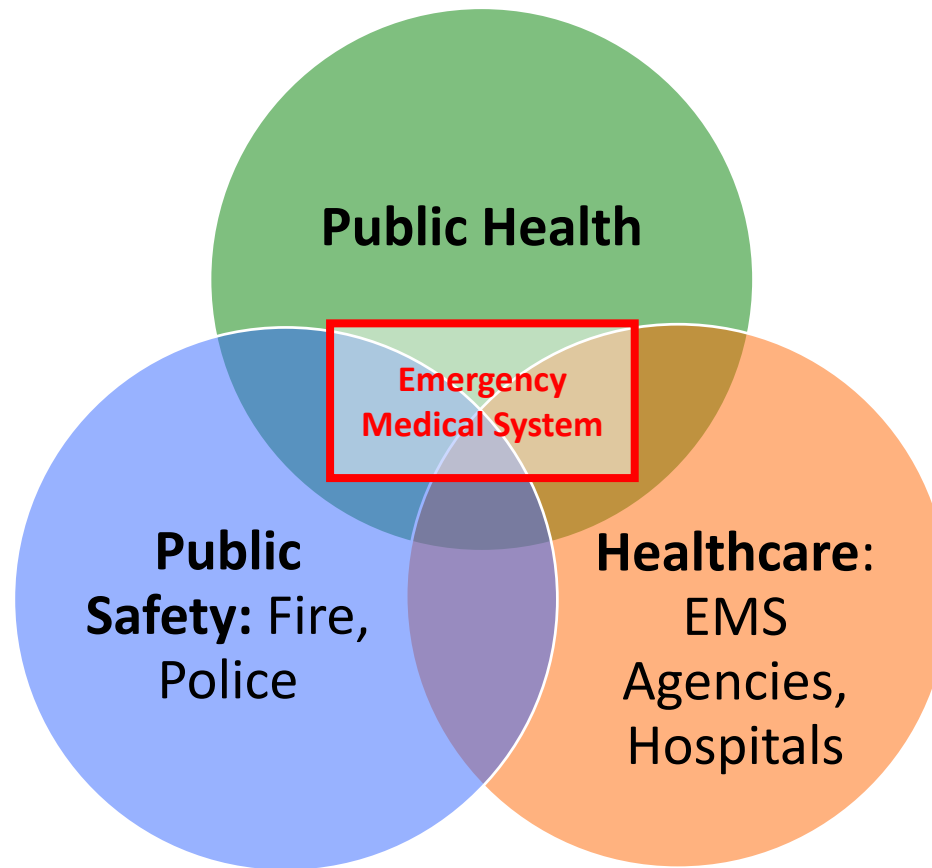
5-15%

variation in OHCA survival to hospital discharge among a sample of MI communities

Based on Cardiac Arrest Registry to Enhance Survival (CARES) data

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EPOC:
Closing the OHCA Survival Gap Using a System of Care Approach in the Prehospital Setting

Public Health

Emergency Medical System

Public Safety: Fire, Police

Healthcare: EMS Agencies, Hospitals

Cardiac Arrest
"Chain of Survival"

EARLY ACCESS | EARLY CPR | EARLY DEFIBRILLATION | EARLY ADVANCED CARE

For every minute CPR is not administered the likelihood of survival from cardiac arrest drops by 10%

EPOC Goals

Goal 1. Identify variation in OHCA survival among EMS agencies in Michigan

Goal 2. Identify "best practices" for OHCA survival among emergency medical systems in the state

Goal 3. Validate & Disseminate best practices for OHCA survival through the "EPOC Toolkit"

Goal 1. Identify variation in OHCA survival among EMS agencies in Michigan

- Calculate 2014-2016 patient-standardized OHCA survival rates across EMS agencies using MI-CARES

  - Primary outcome: ROSC with pulse upon ED arrival

- Inclusion Criteria: EMS agencies with >5 total arrests over the study years

Goal 1: Methods

- Random effects logistic regression

- Model covariates
  - Patient factors
  - Arrest characteristics
  - County-level demographic variables

- Examine the distribution of each agency's random effect to determine the posterior probability of being among the high survival/low survival 25%

  - Sample agencies with > 90% posterior probability of being among the high survival/low survival 25% for Goal 2 site visits

Goal 1: Results - 8-fold variation across EMS agencies in sustained ROSC with pulse upon ED arrival
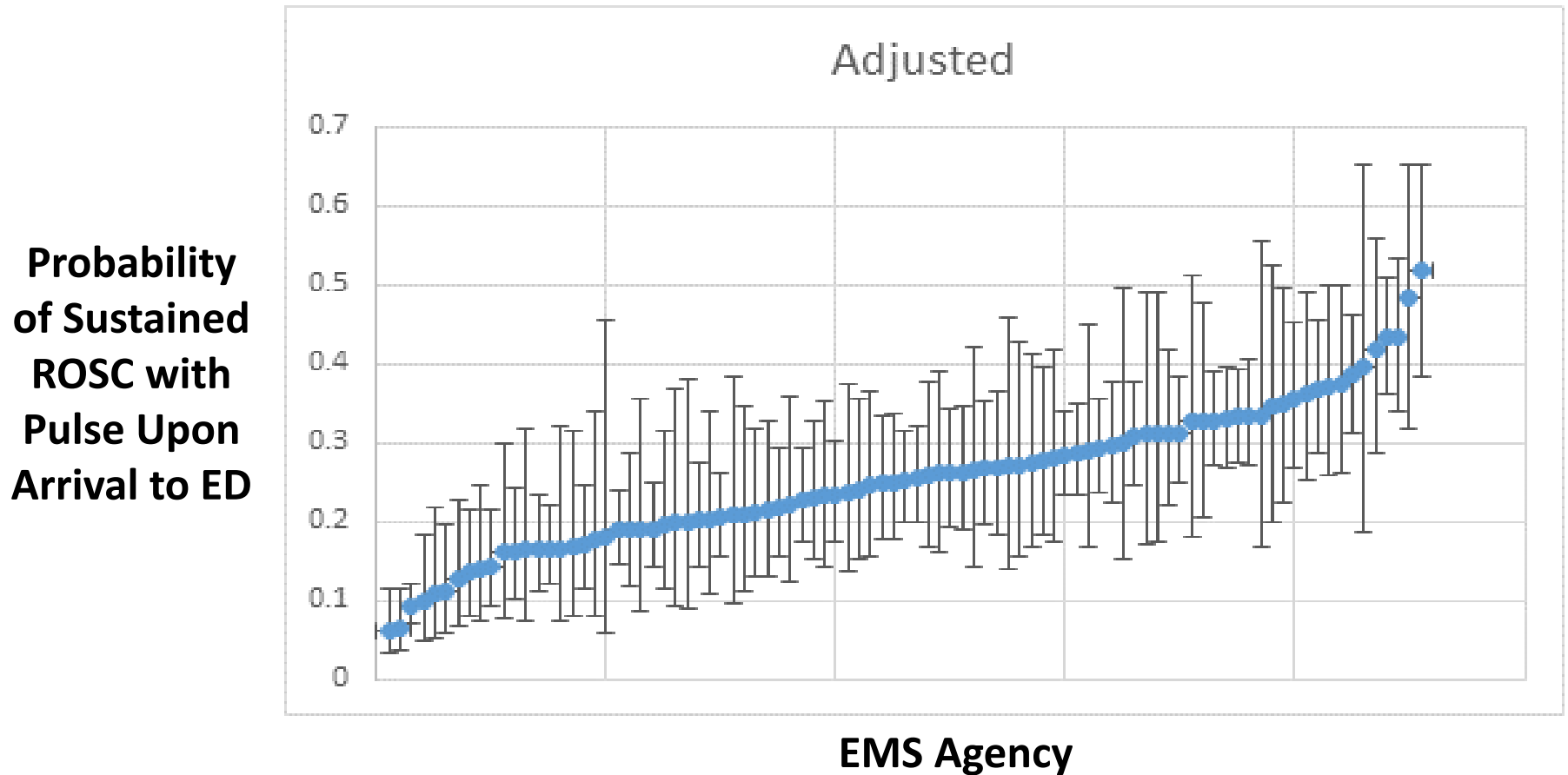
Figure 1. Patient-standardized probability of sustained ROSC with pulse upon ED arrival across 91 EMS agencies covering > 6.8 million lives

Goal 1: Results - Sampling for Aim 2

- Mean patient-standardized rate of sustained ROSC with pulse upon ED arrival: 25.3% (range 6.1%-51.9%)

  - 7 high OHCA survival agencies

    - ROSC with pulse upon ED arrival: 40.0% (95%CI: 36.5%-43.4%)

  - 7 low OHCA survival agencies

    - ROSC with pulse upon ED arrival: 10.8% (95%C: 9.1%-12.5%)

- The identified high and low survival EMS agencies informed the sampling for Goal 2 site visits

Goal 2. Identify "best practices" for OHCA survival among emergency medical systems in the state

Site Visit Blueprint

6-8 site visits to communities in Michigan

- Site Visit
- Focus group and/or key informant interview
- Ride alongs with police, fire, and EMS agency

- EMS Agency
- Hospital
- Fire Department
- Police Department
- Health Department

Methods

- Sampled 9 emergency medical systems based on urbanicity, geography, and EMS agency OHCA survival:
  - 4 high-survival
  - 2 intermediate-survival
  - 3 low-survival

- Each system included 911/dispatch, Police, Fire, EMS and hospitals

- Two-day site visits including interviews and a multi-disciplinary focus group

Goal 2: Methods – Data Analysis

- Within-site and cross-site analysis
- Thematic analysis to identify intra- and inter-organizational barriers, facilitators and innovation to effective OHCA response. The following categories of key factors were identified:
  - Training
  - Quality Improvement
  - Resource Management
  - System-Level Clinical Management
  - Stakeholder Cultural Mindset
  - Time to Arrival
  - On Scene
  - Community Interface

Goal 2: Preliminary Results

- Emerging strategies from three high-, two intermediate-, and three low-survival sites

  - Mix of urban, suburban, and rural emergency medical systems across Michigan

Community & Bystanders

- Conducting community education on:
    - Sudden cardiac arrest
    - Hands-only CPR
    - Interfacing with 911/dispatch
    - First responder roles

Dispatch

- Providing call taker and dispatcher training on cardiac arrest recognition
- Providing continuing education on Telephone CPR (T-CPR) or Dispatch-Assisted CPR
- Streamlining 911 triaging of cardiac arrest
- Conducting audits on all OHCA resuscitations for quality improvement (QI)

Is the person conscious? **No?**

Is the person breathing normally? **No?**

Go, Perform CPR

cardioproof

Police

- Providing training on rapid recognition of sudden cardiac arrest

- Providing training and continuing education on high-quality CPR

- Providing training and access to AEDs

- Promoting a culture that embraces basic medical response

  - Community policing

CAUGHT ON CAMERA
OFFICER SAVES BABY USING CPR
SANDUSKY

Non-Transport Fire

- Providing training on high-quality CPR
- Adopting dual-dispatching model with transporting agencies
- Riding in the ambulance to provide extra hands for CPR

EMS

- Increasing number of responders/staffing for cardiac arrest – Role of mechanical CPR devices
- Adopting evidence-based prehospital practices for cardiac arrest response – role of EMS champion
- Flexibility in evidence-based practice – e.g., "stay and play" vs. "load and go"
- Implementing data-driven, systematic continuous quality improvement programs (CQI)
- Instituting centers to provide simulation-based training and introduction to emerging technologies and therapies
- EMS training of non-transport fire and police

Multidisciplinary

- Standardizing response protocols across the chain for all responders
- Practicing/training for multidisciplinary response
- Multidisciplinary QI/QA
- Spending a day in the other person's shoes

EARLY ACCESS   EARLY CPR   EARLY DEFIBRILLATION   EARLY ADVANCED CARE

Goal 3. Validate and disseminate best practices for OHCA survival through the "EPOC Toolkit"

- Statewide electronic survey of EMS agencies

  - Include facilitators and barriers to effective OHCA response identified in Goal 2

    - Link results from 120 CARES-participating agencies with CARES data to validate factors associated with increased OHCA survival

The EPOC Toolkit

- Results will be used to generate a toolkit of best practices

- Recommendations will be outlined by stakeholder group and links along the chain of survival

EPOC Implications

- Closing the OHCA survival gap through…

    - Identifying best practices for OHCA from a system of care perspective (dispatch, police, fire, EMS, and hospitals)

    - Informing policy around cardiac arrest care in the prehospital setting

QUESTIONS?

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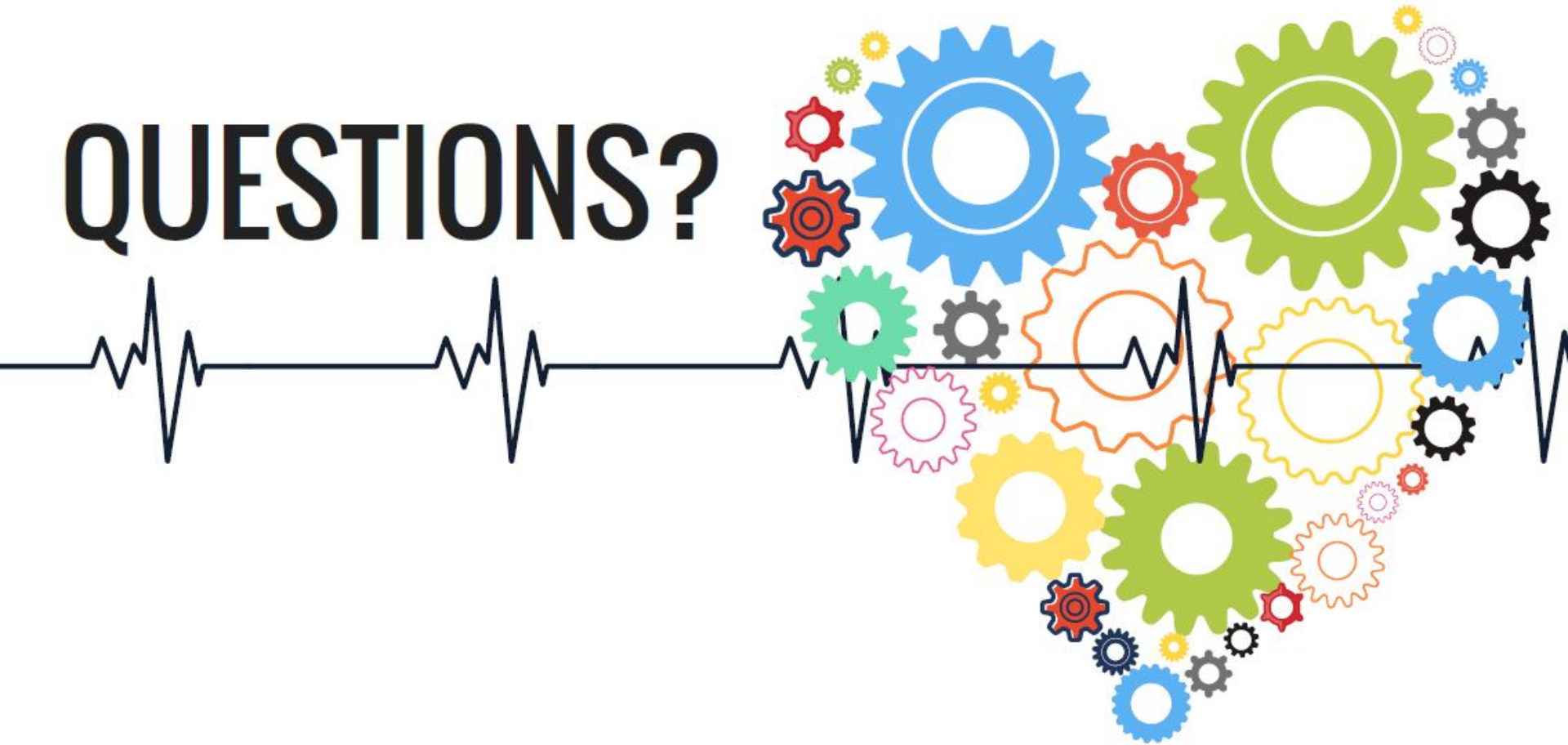
Aim 1: Results – Patient Characteristics

Patient Characteristics (N=14,219)	N (%)
Sustained ROSC to ED	
No	**10,850 (76.3%)**
Yes	3,369 (23.7%)
Age (M, SD)	63 (19.6)
Gender	
Male	8,530 (60.0%)
Female	5,688 (40.0%)
Race	
White	7,127 (50.2%)
Unknown	3,538 (24.9%)
Black/African-American	3,261 (23.0%)
Hispanic/Latino	151 (1.1%)
Asian	65 (0.5%)
American Indian/ Alaskan	48 (0.3%)
Native Hawaiian/Pacific Islander	10 (0.1%)

Aim 1: Results – Arrest Characteristics

Arrest Characteristics (N=14219)		N (%)
Location Type	**Home/Residence**	**10,045 (70.6%)**
	Nursing Home	2,156 (15.2%)
	Public/Commercial Building	781 (5.5%)
	Street/Hwy	480 (3.4%)
	Healthcare Facility	416 (2.9%)
	Place of Recreation	158 (1.1%)
	Industrial Place	95 (0.7%)
	Other	88 (0.6%)
Arrest Witness Status	**Unwitnessed**	**7,729 (54.4%)**
	Bystander Witnessed	4,949 (34.8%)
	911 Responder Witnessed	1,541 (10.8%)
First Monitored Rhythm	Asystole	6,734 (47.4%)
	Idioventricular/PEA	2,524 (17.8%)
	Unknown Unshockable Rhythm	2,368 (16.7%)
	Ventricular Fibrillation	1,650 (11.6%)
	Unknown Shockable Rhythm	806 (5.7%)
	Ventricular Tachycardia	137 (1.0 %)