

From CAR to ES[©]

Angelo Salvucci, MD

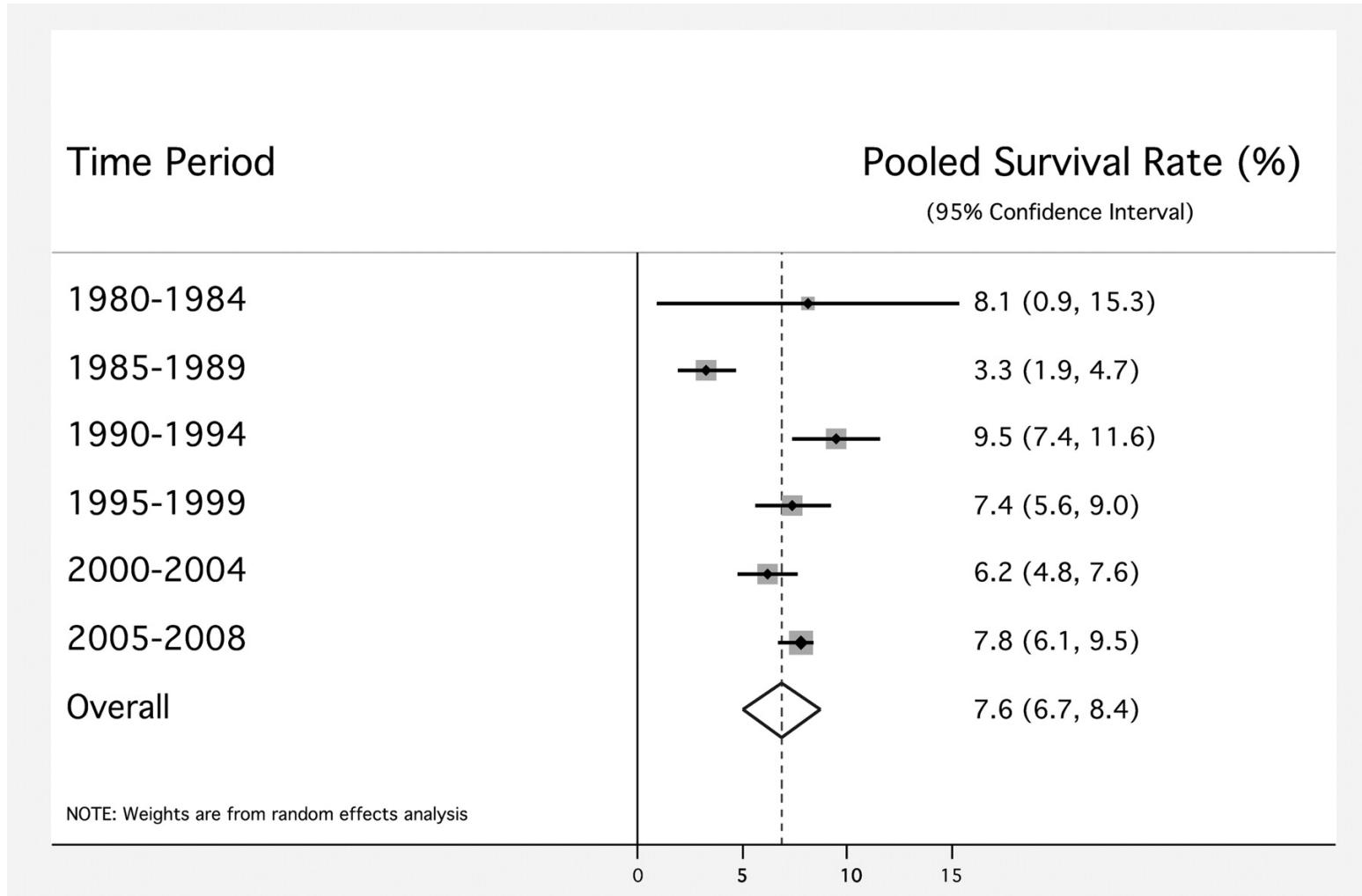
Santa Barbara County and Ventura County EMS

Disclosures

- None



OHCA Survival - USA - 1980-2008



Surviving Cardiac Arrest

Location, Location, Location

- ROC: 12,000, OHCAs 10 systems
- Overall survival 3.0% - 16.3%, median 8.4%
- VF survival 7.7% - 39.9%, median 22.0%
- Increase from median - max would prevent 15,000 deaths

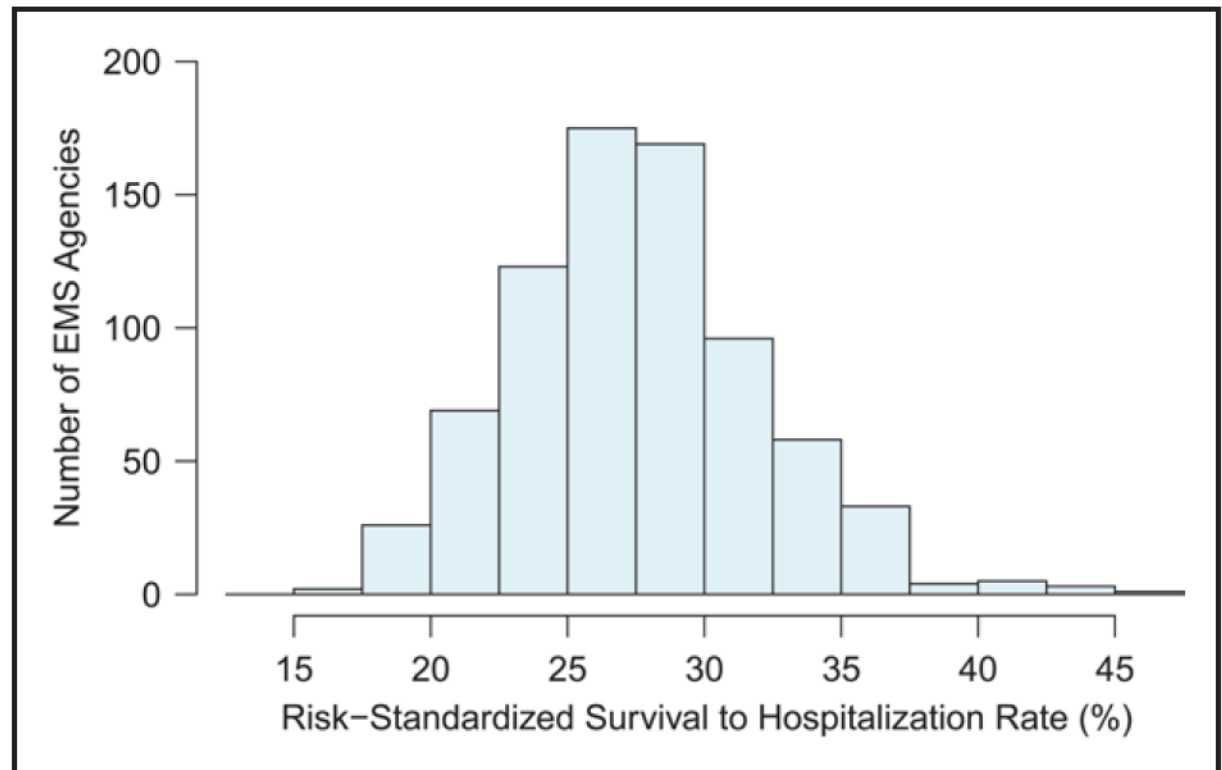
Nichol: JAMA. 2008;300(12):1423-1431.

ORIGINAL ARTICLE

Variation in Out-of-Hospital Cardiac Arrest Survival Across Emergency Medical Service Agencies

Raul A. Garcia¹, DO; Saket Girotra², MD, SM; Philip G. Jones³, MS; Bryan McNally⁴, MD, MPH; John A. Spertus⁵, MD, MPH; Paul S. Chan⁶, MD, MSc; on behalf of the CARES Surveillance Group

- Shorter response times and evidence-based TOR protocols associated with better outcomes



LAKE WOBEGON[®]

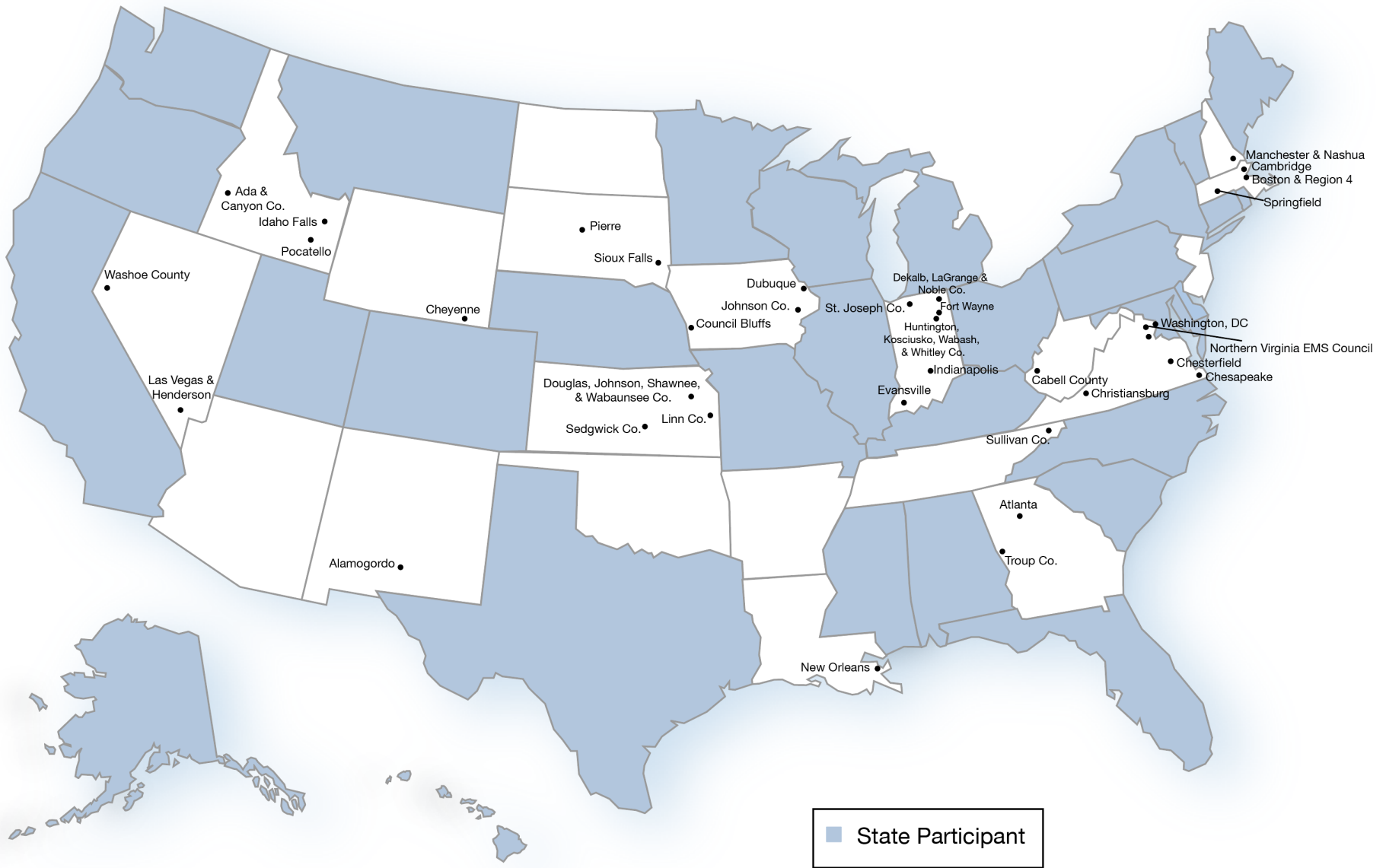
U. S. A.



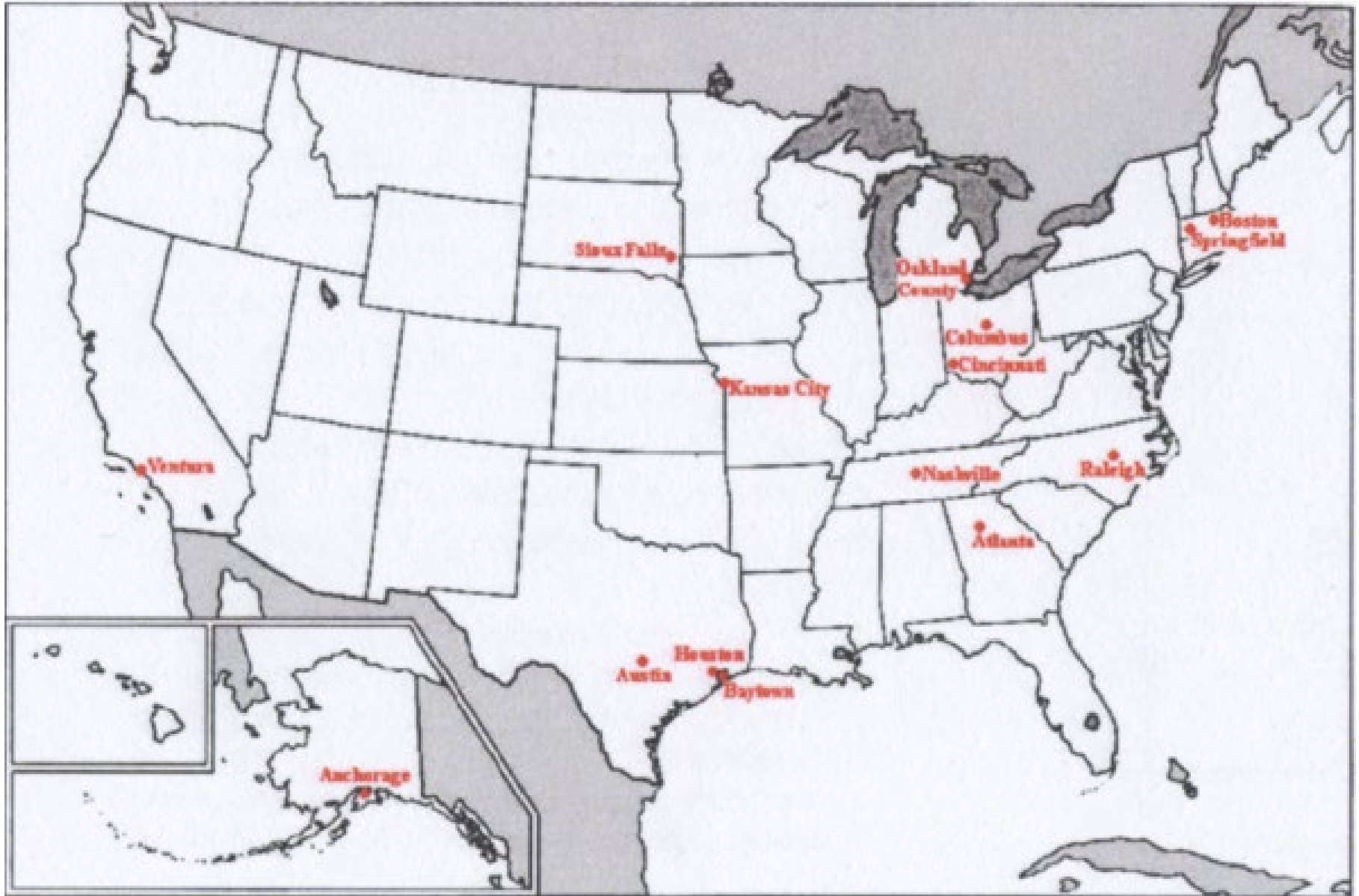
BY GARRISON KEILLOR

CONTAINS 4 COMPACT DISCS

CARES 2022



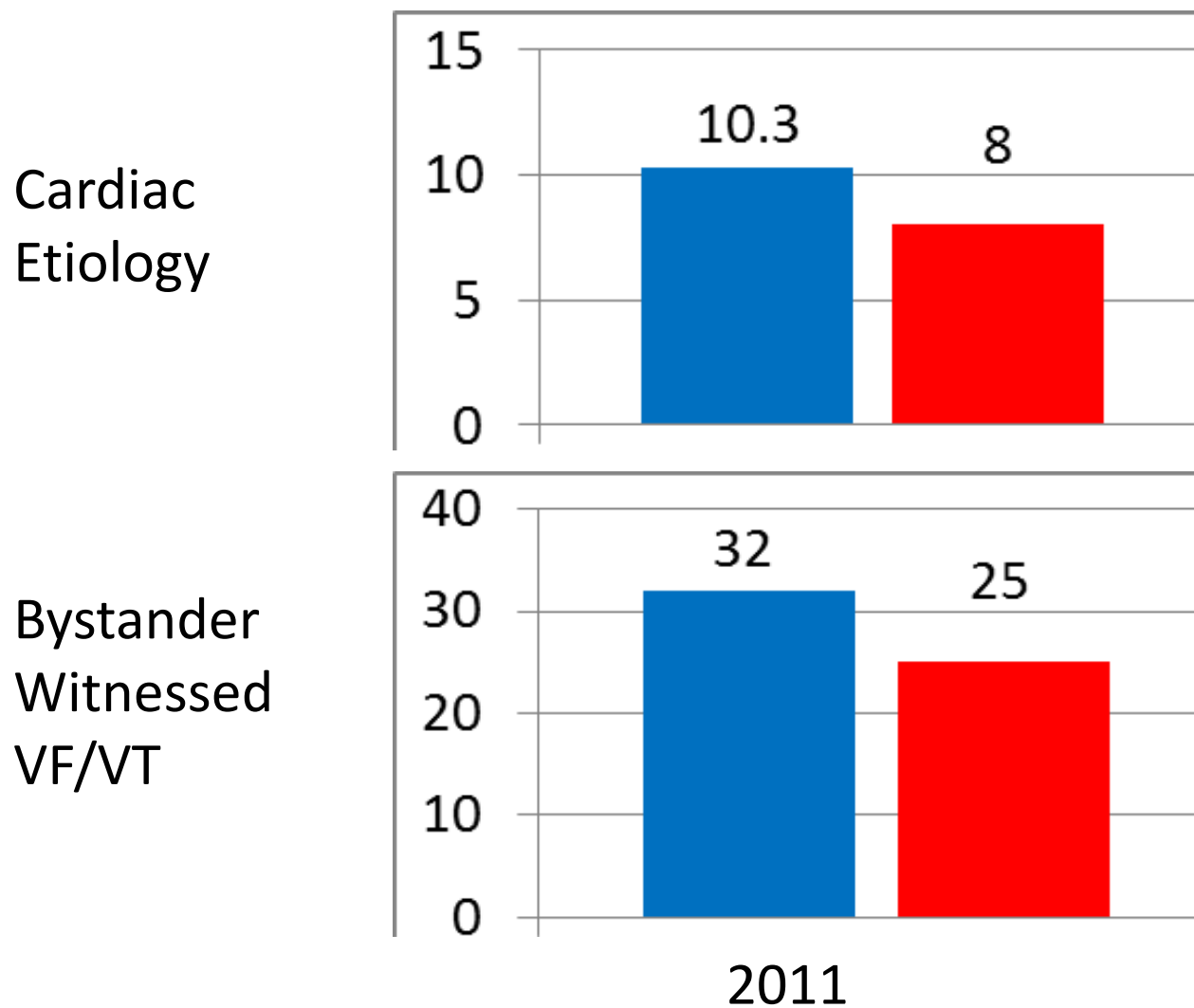
CARES 2008



Santa Barbara County

Survival to Hospital Discharge (%)

National CARES ■ Santa Barbara ■



What vs. How

- Community Response
 - AED
 - CPR
 - Training
 - EMD
- Rapid assessment
- “High Quality” CC
 - Rate/Depth/Recoil
 - Continuous
- Airway
- Ventilation
- Defibrillation
- Vascular Access
 - Epinephrine
 - Antiarrhythmic
- ID ROSC
- Post-ROSC
- Transport

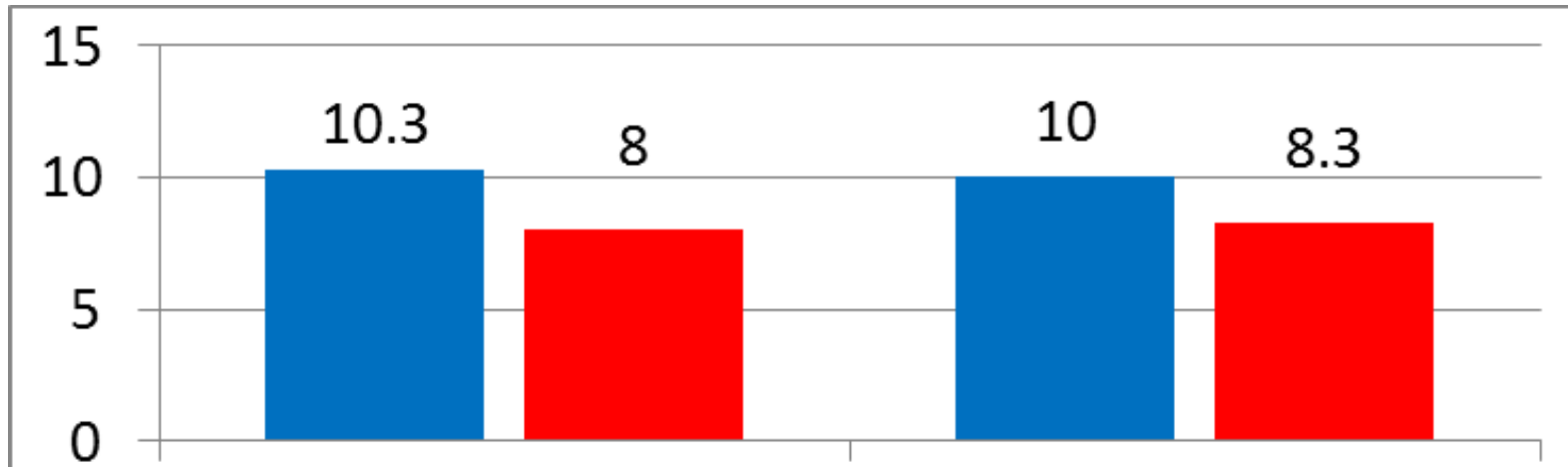
Santa Barbara County

Survival to Hospital Discharge (%)

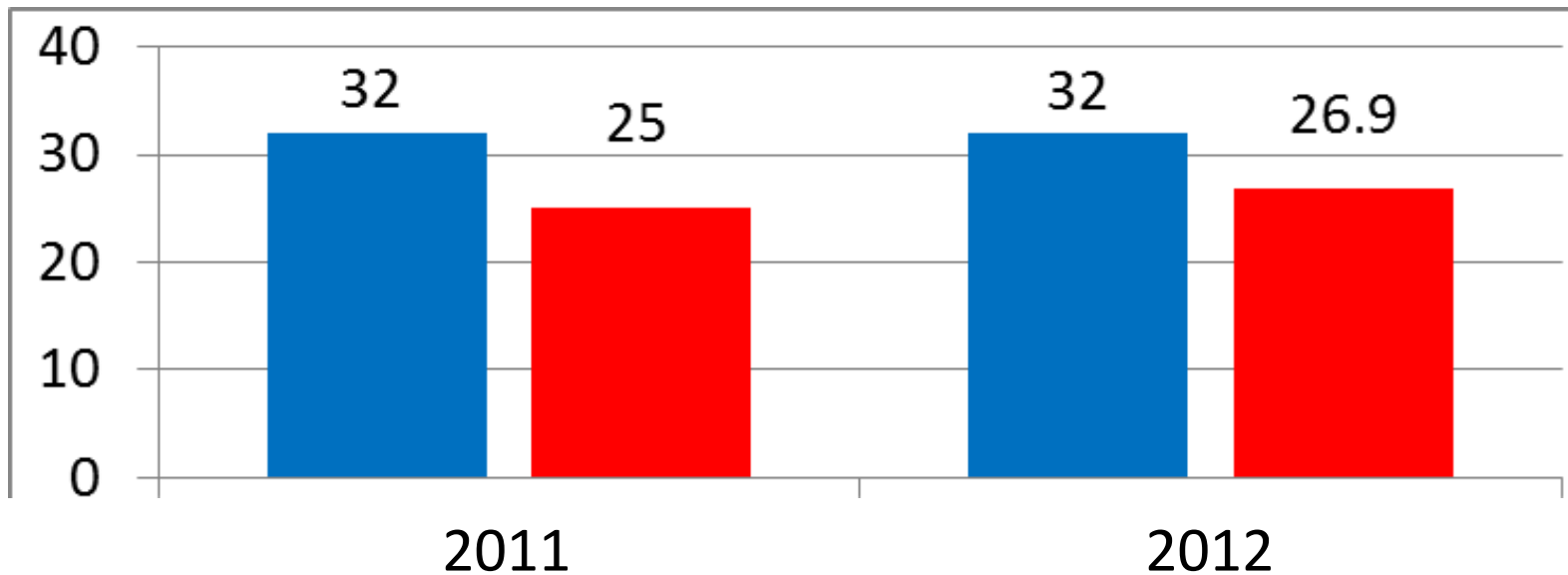
■ National CARES

■ Santa Barbara

Cardiac Etiology



Bystander Witnessed VF/VT



Cardiac Arrest Management

Objective

To determine if a comprehensive system of education, training, treatment protocols and quality improvement would affect survival of patients in sudden cardiac arrest.

CAM Components

System of care:

- Commitment of all participants
- Evidence-based treatment protocols
 - Continuous high-quality chest compressions
 - BLS airway preferred
 - 10:1 compression/ventilation
- Targeted, goal-directed education
 - 60 minutes didactic
 - Teamwork, Positioning, CPR (CC, BMV), ALS, ROSC
- Individual and team training: 120 minutes
 - Mandatory minimum proficiency thresholds
 - Organized explicit system of rescuer roles
- QI program with process and outcome measures

GOAL

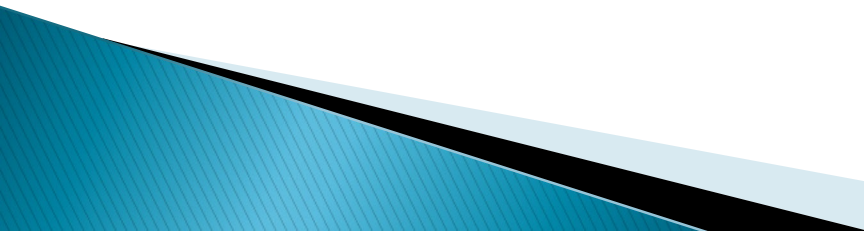
To maximize the number of cardiac arrest patients that return home to their families neurologically intact

BACK TO BASICS

▶ **Cornerstones of treatment:**

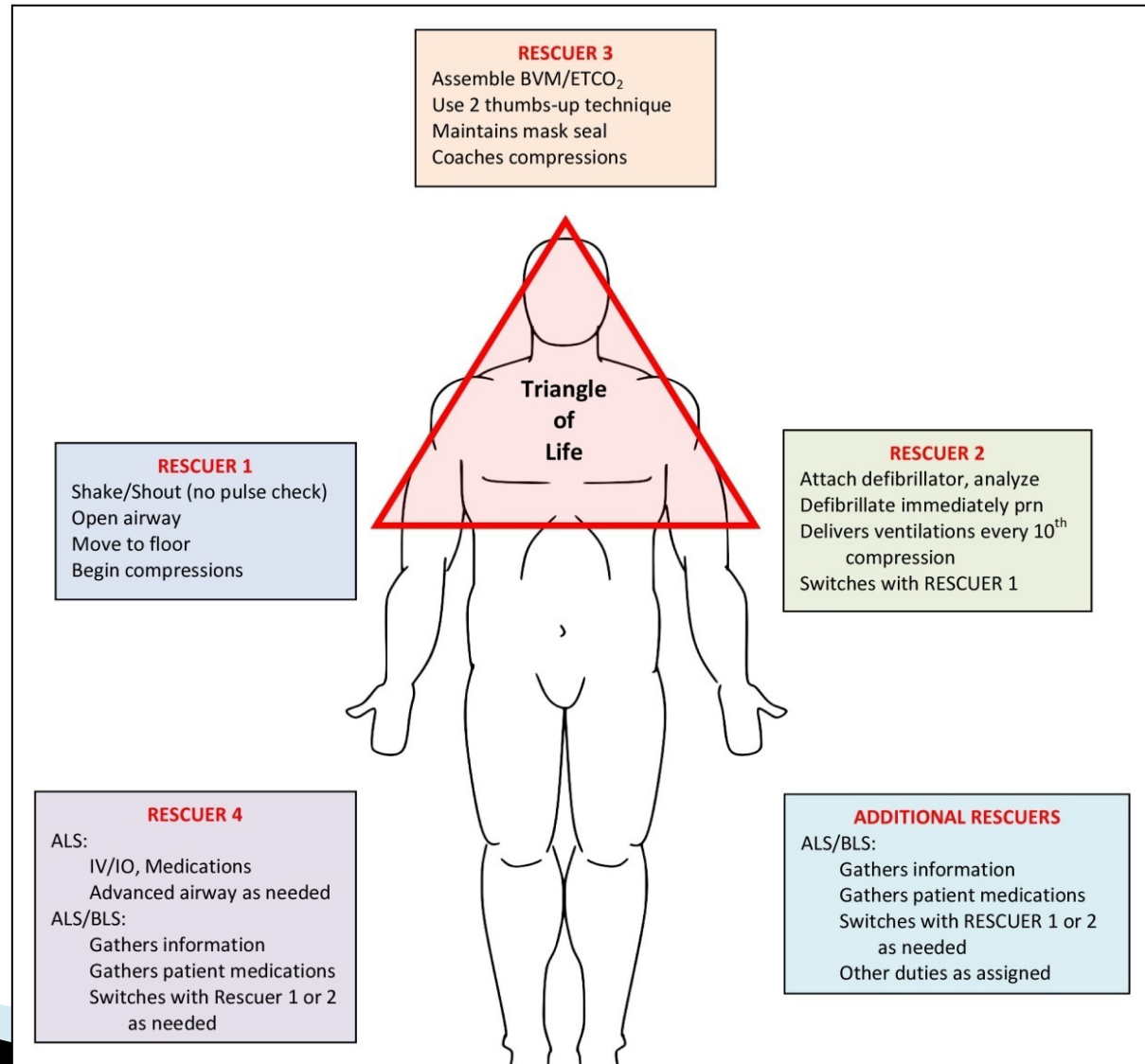
- Assessment
- Patient Positioning
- CPR
 - Continuous Chest Compressions
 - Airway/Ventilation/Oxygenation
- Defibrillation

▶ **Possible, but unproven value:**

- Intubation
 - Vascular access (IV/IO)
 - Pressors (epinephrine)
 - Antiarrhythmics (amiodarone)
- 

STRATEGY 1: Assigned Roles

TRIANGLE OF LIFE



STRATEGY #4: Continuous High Quality Chest Compressions

- Rate 100–120/Minute
 - Depth 2+ Inches
 - Full Recoil
-
- Increases likelihood of successful defibrillation
 - Maintains brain viability

STRATEGY #5: Airway With Synchronized Ventilations

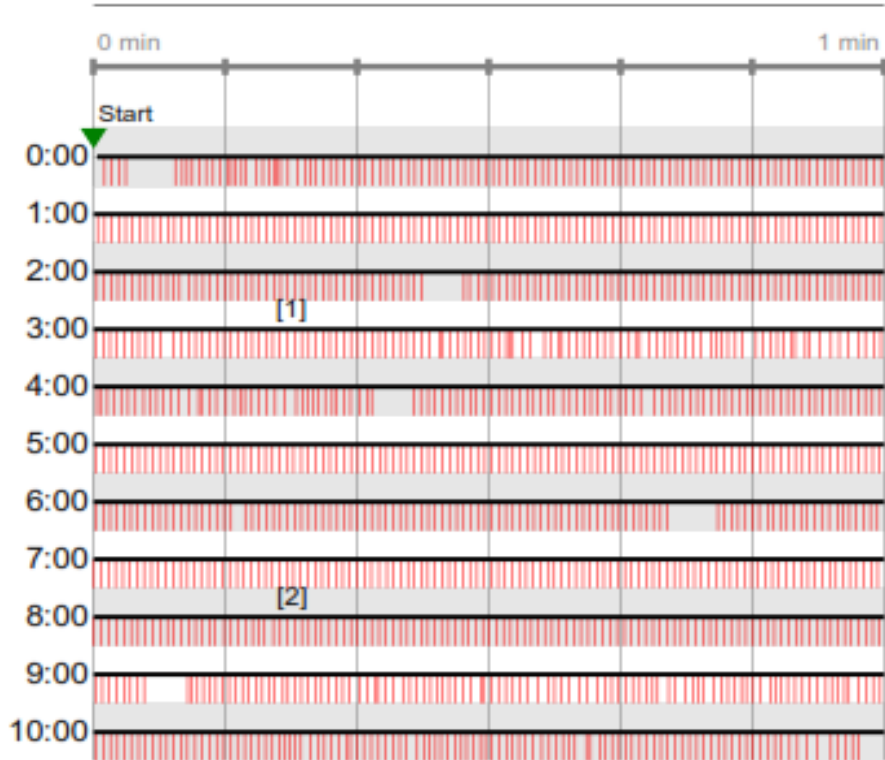


- ▶ 300 ml
 - 200 ml from “sucking” of chest recoil
 - 100 ml from positive pressure
- ▶ 0.3 sec (upstroke time)
 - 110 compressions in 60 seconds
- ▶ On the upstroke of the 10th compression

Competency-Based Training



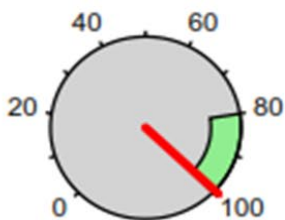
CPR QUIK-VIEW



Interval Statistics

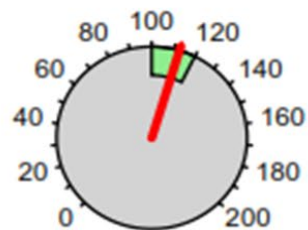
Compr. Ratio, %	Compr. Rate	Compr. /min
100	112	109
100	112	112
100	112	107
100	112	108
100	112	106
100	113	112
100	112	105
100	112	112
100	112	112
100	114	107
100	112	109

Compressions Ratio
(/total time)



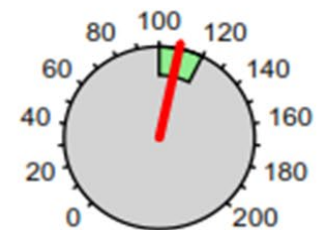
16:51 / 16:57 = 99 %

Compression Rate



113/minute

Compressions/minute

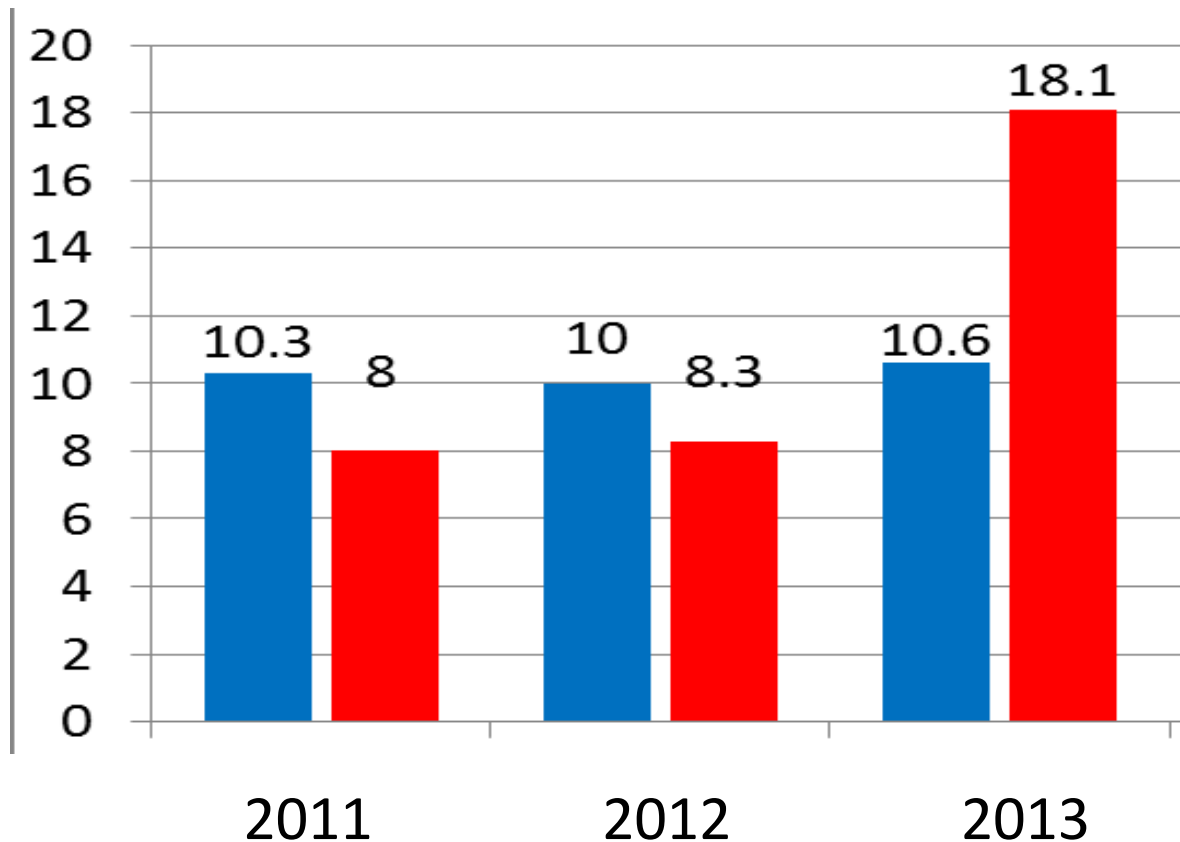


109/minute

Santa Barbara County Survival to Hospital Discharge (%)

Cardiac Etiology – All Rhythms

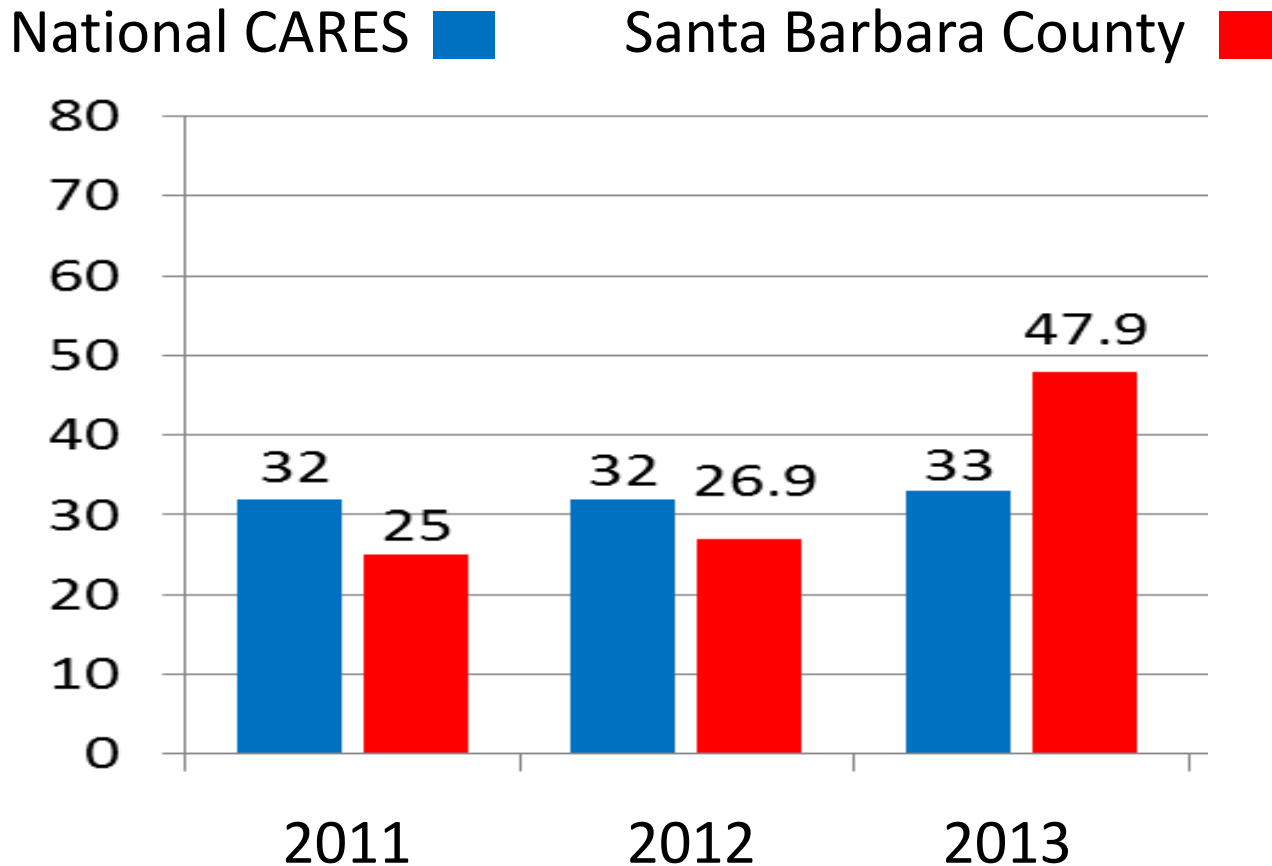
National CARES ■ Santa Barbara County ■



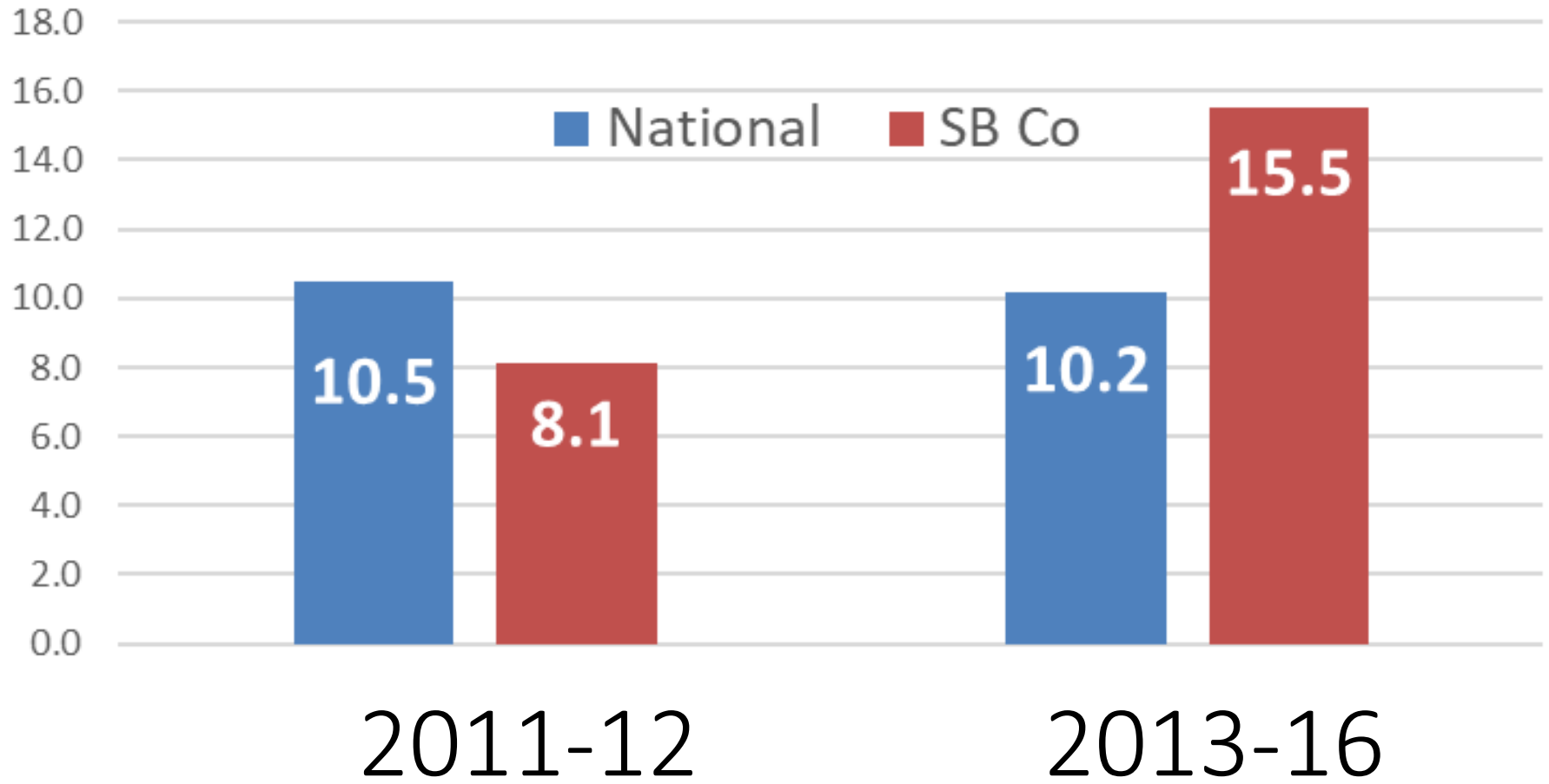
Santa Barbara County

Survival to Hospital Discharge (%)

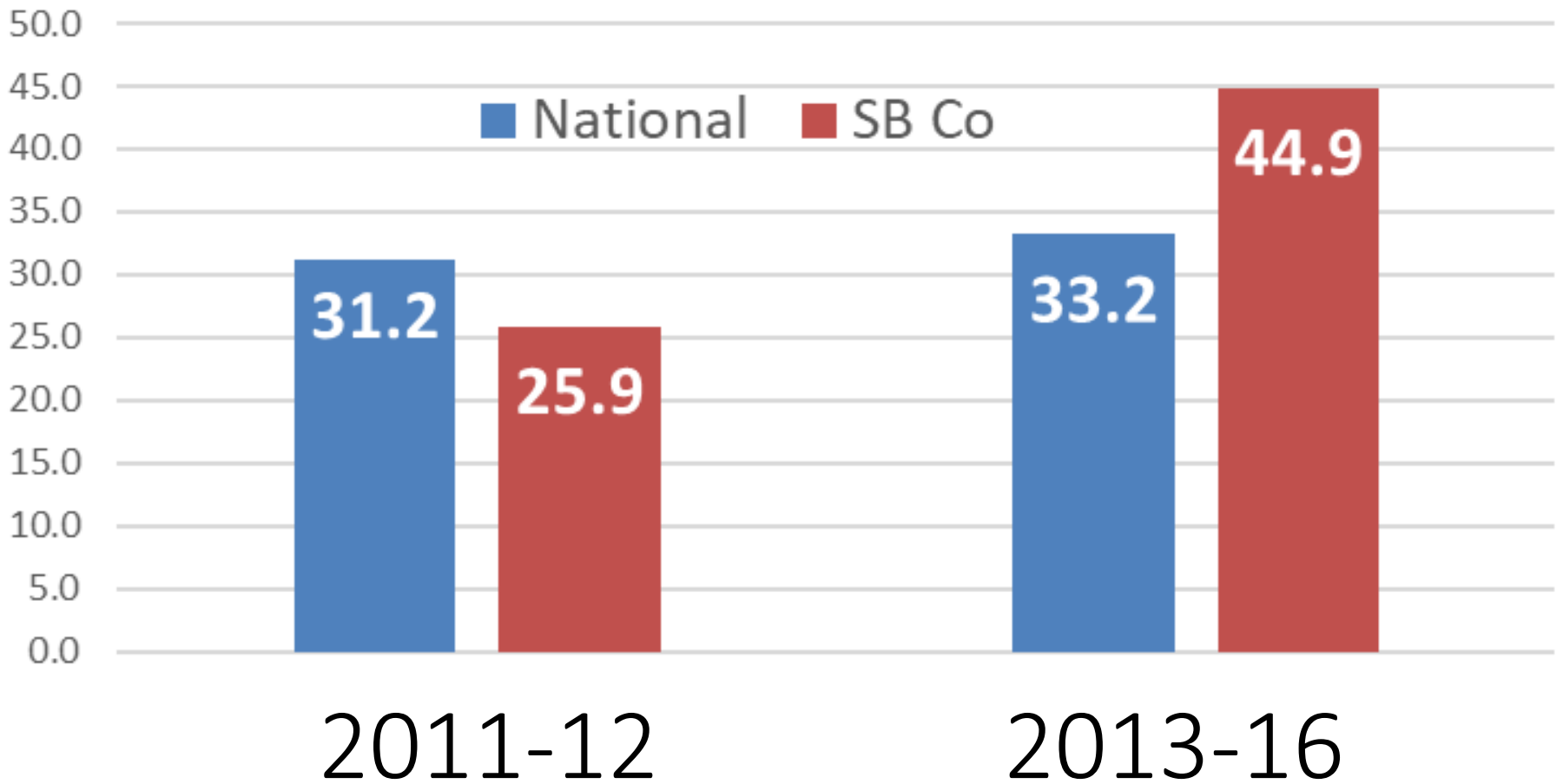
Bystander-Witnessed, Shockable 1st Rhythm



Overall Survival



Bystander Witnessed Shockable Survival



Cardiac Etiology – All Rhythms Survival to Hospital Discharge (%)

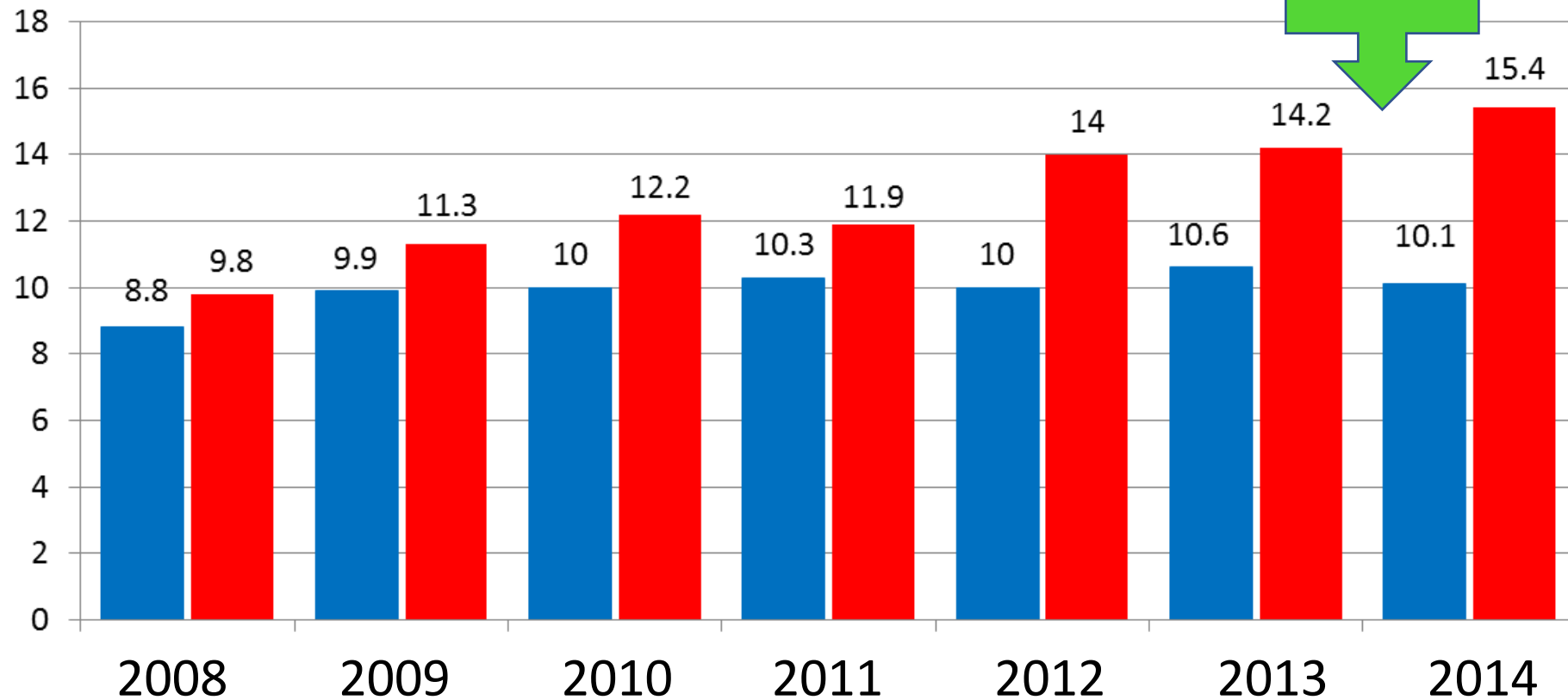
National CARES



Ventura County



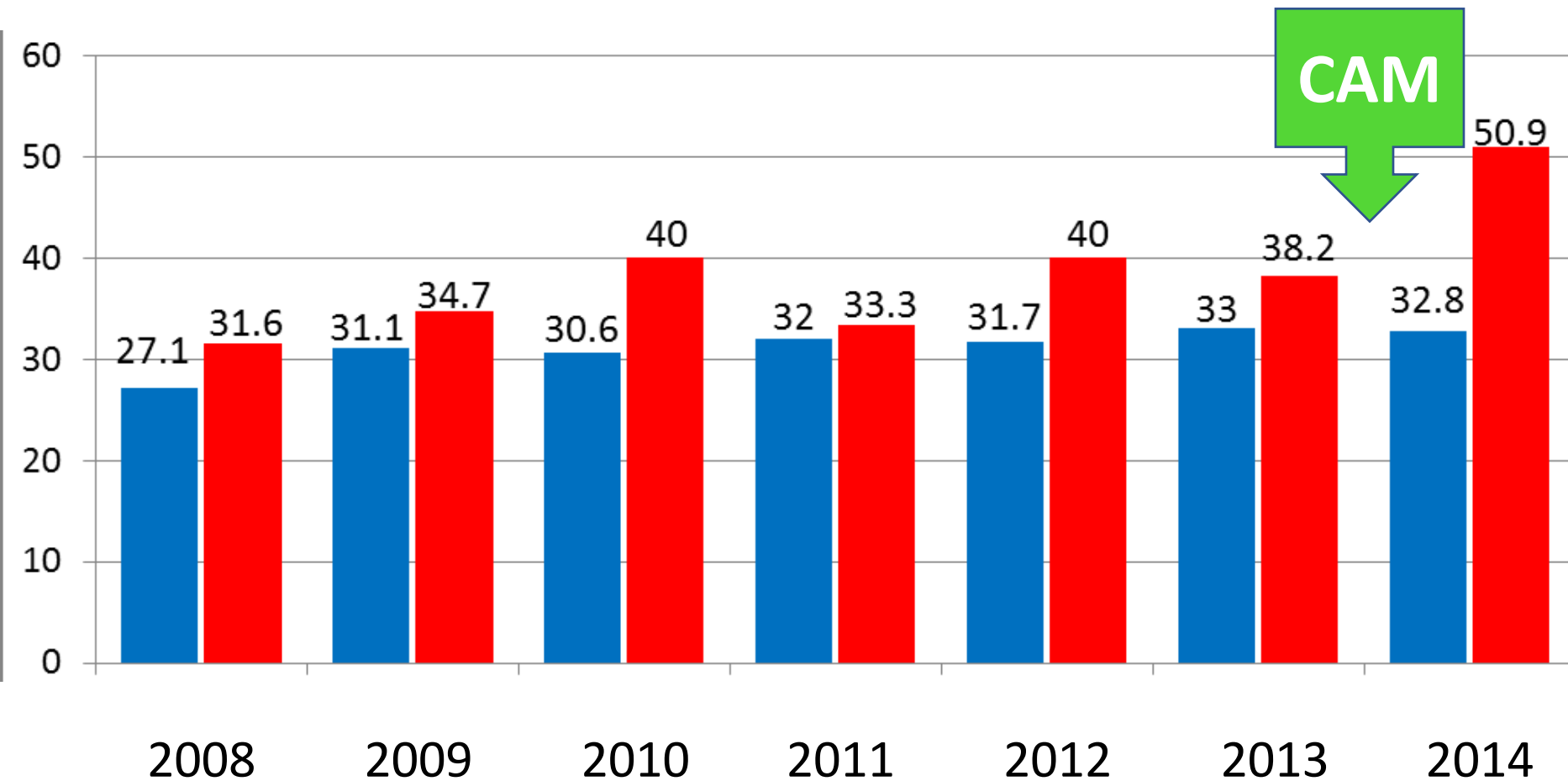
CAM



Bystander Witnessed, Shockable 1st Rhythm Survival to Hospital Discharge (%)

National CARES 

Ventura County 



A Comprehensive System of Care Improves Neurologically-favorable Cardiac Arrest Survival



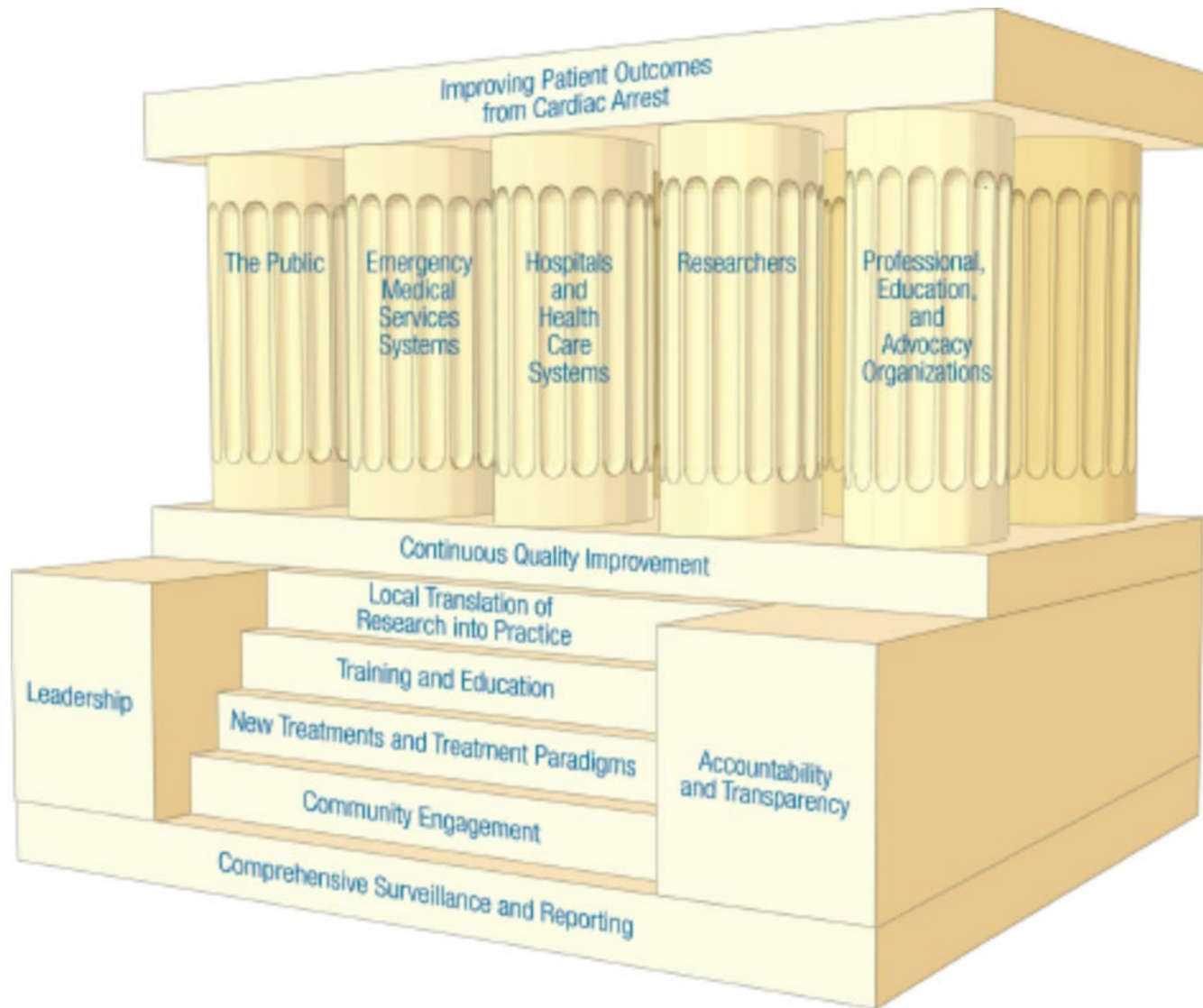
Angelo A. Salvucci,¹ Lynn J. White,² Raghav A Ravuri¹
Santa Barbara County Emergency Medical Services
California, USA; ² Global Medical Response;
HeartRescue Project, Colorado, USA.



Objective: To evaluate the immediate and long-term results of introducing a comprehensive cardiac arrest management (CAM) system in a U.S. emergency medical services (EMS) jurisdiction according to structural description and outcome measures recommended by the U.S. Institute of Medicine.

Conclusion: Introduction of CAM involving the elements described in the IOM report resulted in an immediate and sustained improvement in percentage of neurologically-favorable survival after sudden cardiac arrest. This provides further evidence for, and a roadmap to achieve, improved cardiac arrest outcomes.

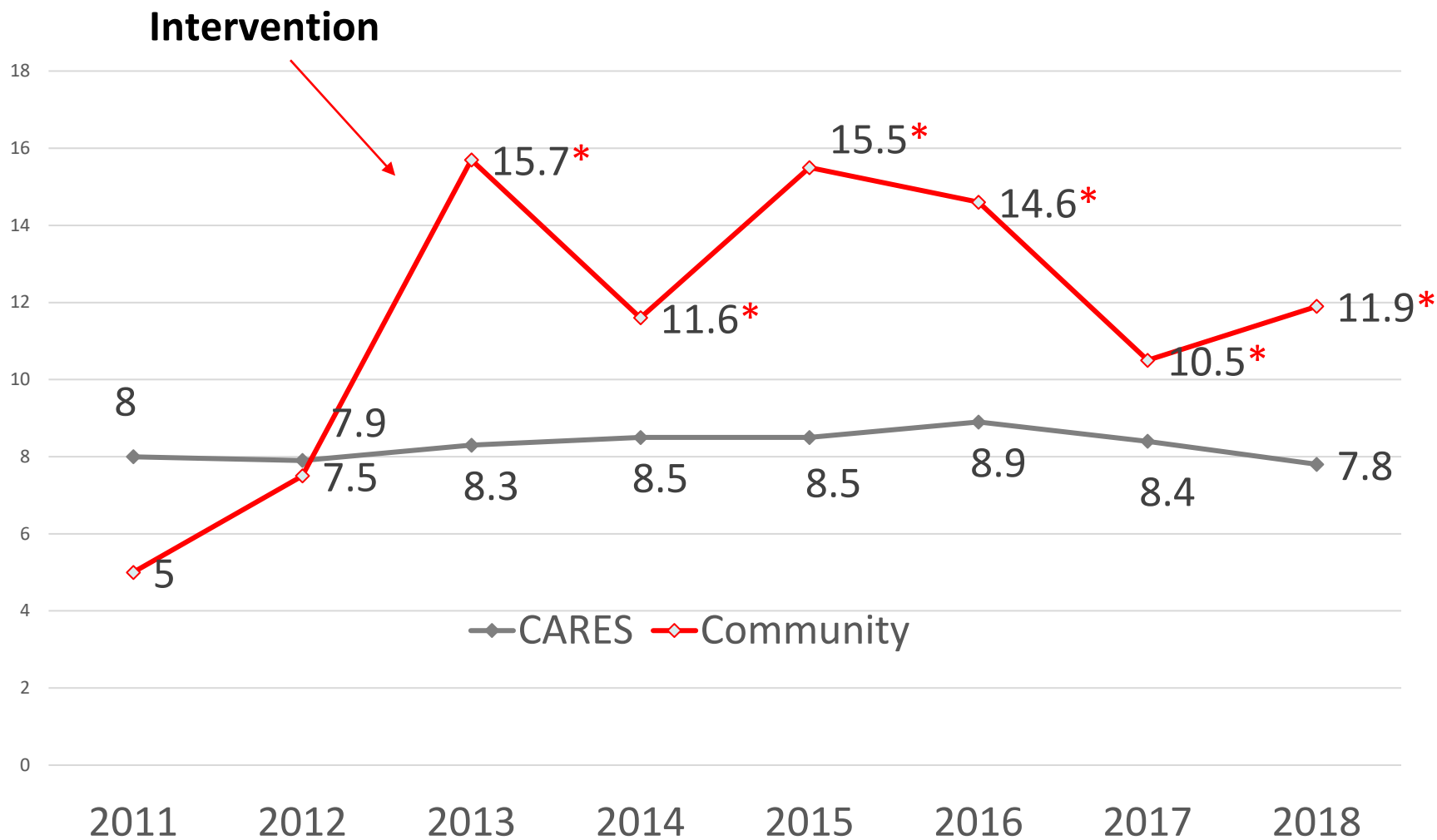
European Resuscitation Council September 2019



IOM 2015: Strategies to Improve Cardiac Arrest Survival: A Time to Act

IOM Report	Cardiac Arrest Management (CAM)
Comprehensive Surveillance and Reporting	<ul style="list-style-type: none"> • CARES Registry
Community Engagement	<ul style="list-style-type: none"> • Hands-Only CPR Training • Public Access AED Program
New Treatments and Treatment Paradigms	<ul style="list-style-type: none"> • Continuous Chest Compressions • Low-Volume Bag-Mask Ventilations
Training and Education	<ul style="list-style-type: none"> • Feedback-Enhanced CPR Training & Testing • Choreographed EMS Treatment Protocols
Local Translation of Research into Practice	<ul style="list-style-type: none"> • Minimizing Pre/Post Defibrillation Intervals • Post-ROSC Protocols
Continuous Quality Improvement Programs	<ul style="list-style-type: none"> • 100% case review • CPR quality metrics
Leadership	<ul style="list-style-type: none"> • Coordinated System-wide oversight • Multi-agency participation
Accountability and Transparency	<ul style="list-style-type: none"> • Presentation of results to oversight committee of all stakeholders

% Neurologically Intact Survival (CPC 1&2)



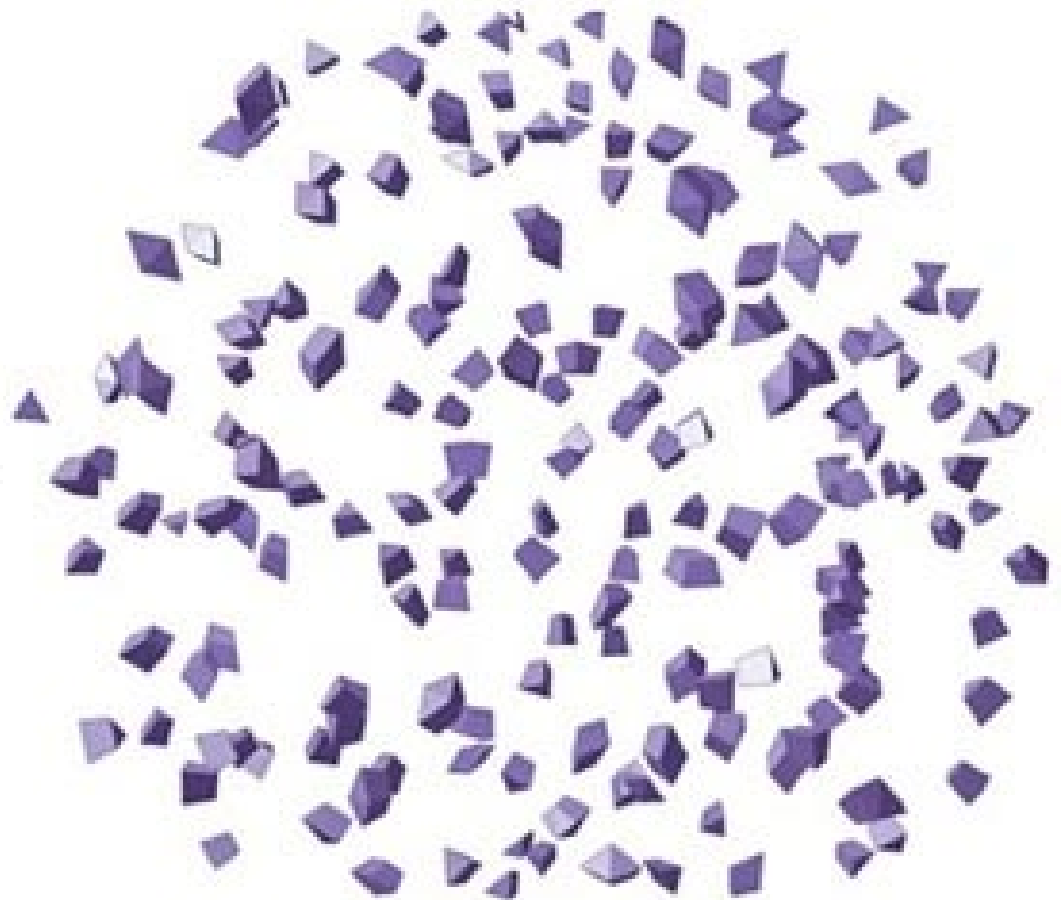
SET IT

AND FORGET IT



Highly
ordered

Increase
in entropy



More disordered

tl;dr (dl)

- OOHCA survival CAN improve.
- CARES provides information – not answers.
- Engage entire system.
- Build interest – success feeds on itself.
- Costs are modest.
- Maintain oversight.



