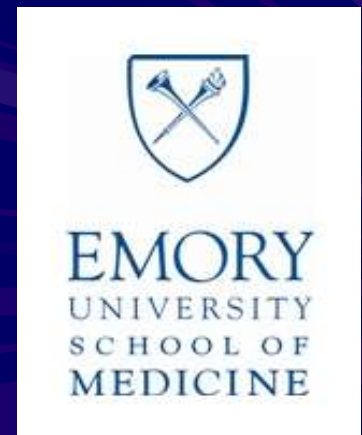


Development of an Out-of-Hospital Cardiac Arrest Surveillance Registry

Bryan McNally, MD, MPH
Executive Director CARES
Associate Professor of Emergency Medicine
Emory University School of Medicine
Rollins School of Public Health
Atlanta, Georgia USA



CARES FUNDING PARTNERS

- American Heart Association
- American Red Cross
- Emory University
- Medtronic Foundation
- Zoll Corporation

Treatment and Performance



Disparate outcomes are almost certainly due to timeliness and quality of treatment



Efficacy vs Effectiveness

Efficacy vs. Effectiveness

Efficacy is the extent to which a treatment has the ability to bring about its intended effect under ideal circumstances, such as in a randomized clinical trial.

Effectiveness is the extent to which a treatment achieves its intended effect in the usual clinical setting.

Efficacy vs. Effectiveness

Efficacy *is not the same as* **effectiveness**.

A treatment is effective if it works in real life in non-ideal circumstances.

Effectiveness cannot be measured in controlled trials, because the act of inclusion into a study is a distortion of usual practice.

Efficacy vs. Effectiveness

“It is an irony that drugs are licensed for use almost exclusively on the results of controlled trials, yet they are withdrawn from use because of observational data that would not be acceptable to licensing authorities.”

John Marley, Professor, Department of General Practice,
University of Adelaide, Adelaide. Australian Prescriber
2000;23:114-5

Treatment Decisions

Guided by:

National Guidelines (AHA ECC)

Local Protocols (Medical Direction)

Randomized Control Trials (ROC)

Observational Studies (CARES)

Performance Decisions

Guided by:

Registry Data (CARES, ROC-Epistry)

Clinical Data (Code Summary)

Benchmarking (Local, State, National Reports)

Quality Improvement/Feedback (Local Efforts)

Domino's vs. EMS



■ Hungry?

- 30 minutes call-to door guaranteed.
- Customer input for QI
- Cost: \$10.95 (plus tip)



■ Cardiac Arrest?

- Call-to-door time rarely tracked
- No performance metrics, no QI
- Cost: ***Priceless***



Can we do better?

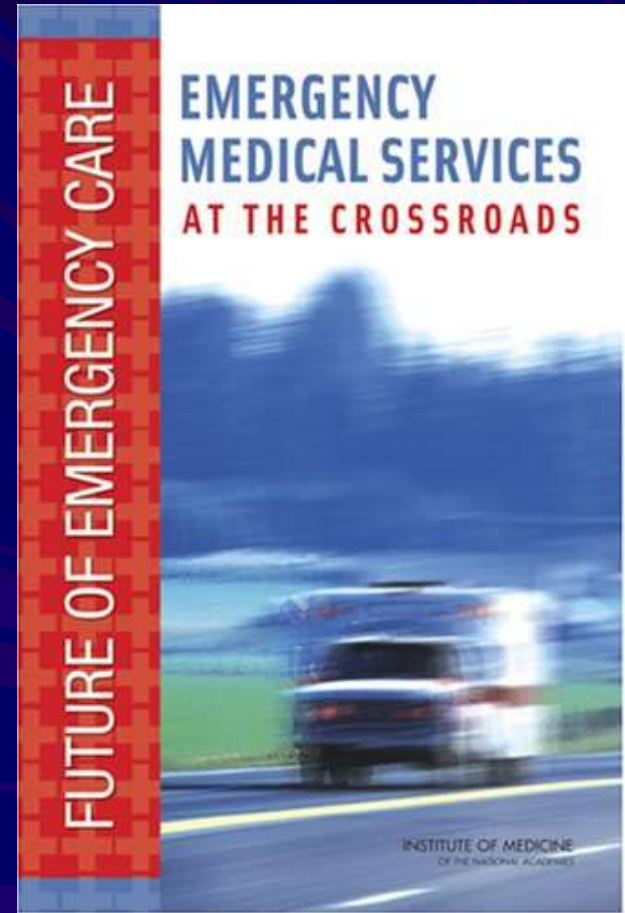


“Most cities don’t measure their performance effectively, if at all. They don’t know how many lives they are losing, so they can’t determine ways to increase survival rates.”

- Bob Davis, “Six Minutes to Live” *USA Today*, 2003

Institute of Medicine Report on EMS

“What is missing is a standard set of measures that can be used to assess the performance of the emergency and trauma care system within each community, as well as the ability to benchmark that performance against statewide and national performance metrics.”

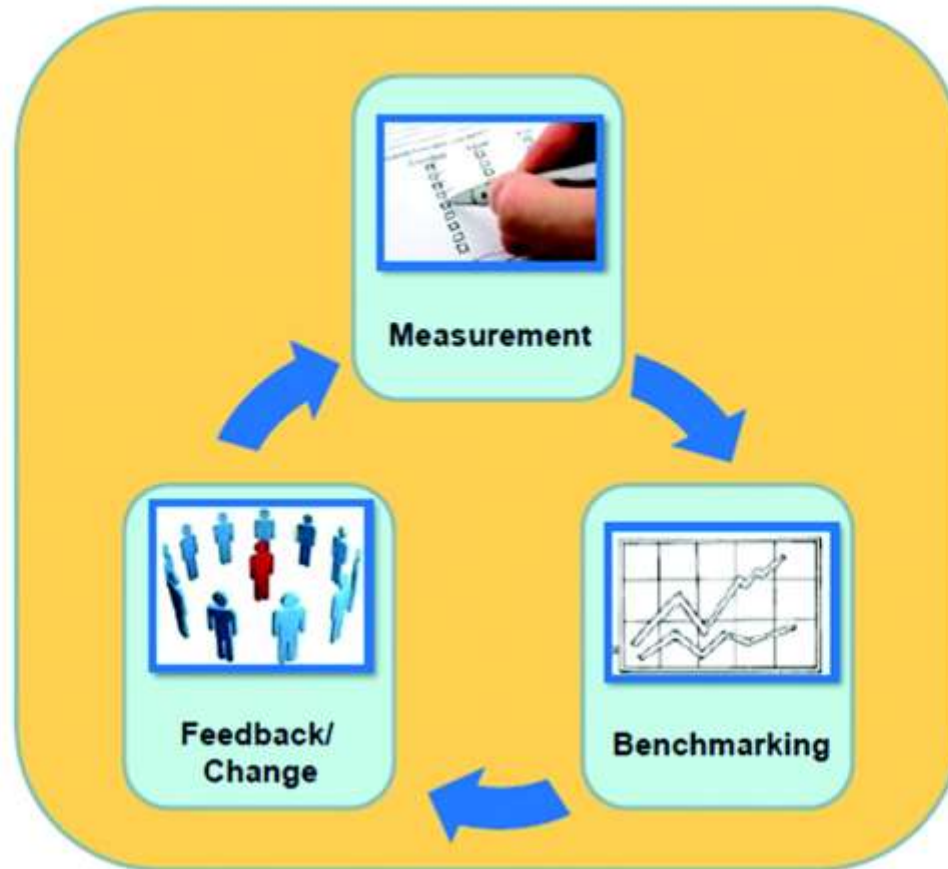


You can't manage what you can't measure!

**The first step to improving survival rates is to begin
collecting data in order to better understand performance**

Quality Improvement Elements of a Resuscitation System

Developing a culture of high quality resuscitation



Travers AH, et al. (2010) *Circulation*;122:S676-S684

Improving Emergency Cardiac Care Saves Lives



CARES Cardiac Arrest Registry to Enhance Survival

National Center for Chronic Disease Prevention and Health Promotion
Division for Heart Disease and Stroke Prevention





Centers for Disease Control and Prevention
CDC 24/7 Saving Lives. Protecting People.™



CARES
Cardiac Arrest Registry
to Enhance Survival



EMORY

WOODRUFF
HEALTH
SCIENCES
CENTER

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The Cardiac Arrest Registry to Enhance Survival

In 2004, the Centers for Disease Control and Prevention (CDC) collaborated with Emory University to develop a registry that could help increase OHCA survival rates.

CARES is a secure, Web-based data management system in which participating communities enter local data and generate their own reports. Communities can compare their EMS system performance to de-identified aggregate statistics at the local, state, or national level and discover practices that could improve emergency cardiac care.

[LEARN MORE](#) →



▶ [REGISTERED USERS LOGIN](#)

Username

Password

Login

» [Click here to learn more about enrollment.](#)

LATEST NEWS

Purus Quam Tellus Egestas Fringilla »

Setus auctor fringilla. Cum sociis na
toque penatibus et magnis dis parturient.

1

2

3



American
Red Cross



ZOLL.

CARES as a uniform data collection system for OHCA

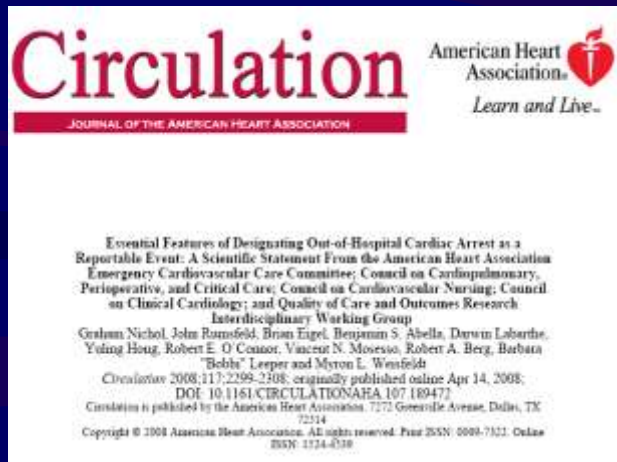
Need for a registry

- Data collection into a registry at the regional, state or national level enables providers or EMS systems to benchmark their outcomes and results with other communities
- Allows for identification of strengths and weaknesses used to improve the quality of care
- Steps toward making cardiac arrest a reportable disease

CARES

Data collection mechanism

- Makes the data collection process more efficient - linkage between EMS, Hospital and CAD outcome
- Benchmarking capabilities
- Measurement tool



CARES software is web based

Allows for the consolidation of three separate silos of data

Sansio

- Mainframe housed in Duluth, MN USA

Internet database system

- <https://mycares.net>
- HIPAA compliant security

Reporting features

- Utstein Survival Reports
- EMS/FR response time reports
- Demographic reports
- Excel Export

Unifies EMS, 911 dispatch, and hospital data

- Any EMS system throughout US



CARES has two methods for EMS data collection

Direct entry online and mobile field entry

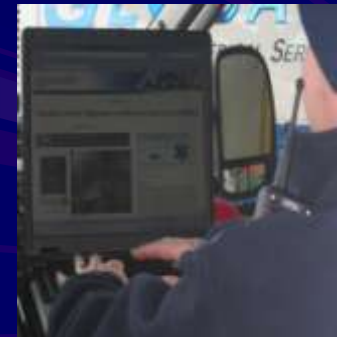
Direct entry online

- Data can be entered directly into the registry wherever there is internet connection by CARES EMS contact or EMS field providers/supervisors



Mobile field entry

- Data can be automatically extracted from the electronic Patient Care Report which then auto-populates the CARES registry.



1 - Street Address (Where Arrest Occurred)

Part B : Run Information

First Responding Agency

Part C: Arrest Information

Resuscitation Information

First Cardiac Arrest Rhythm of Patient and ROSC Information

Part E: Hospital Section

<u>46 - ER Outcome</u> ☐ Resuscitation terminated in ED ☐ Admitted to hospital ☐ Transferred to another acute care facility from the ED	<u>48 - Hospital Outcome</u> ☐ Died in the hospital ☐ Discharged alive ☐ Patient made DNR If yes, choose one of the following: ☐ Died in the hospital ☐ Discharged alive ☐ Transferred to another acute care hospital ☐ Not yet determined ☐ Transferred to another acute care hospital ☐ Not yet determined	<u>49 - Discharge from the Hospital</u> ☐ Home/Residence ☐ Rehabilitation Facility ☐ Skilled Nursing Facility/Hospice
<u>47 - Was hypothermia care initiated or continued in the hospital</u> ☐ Yes ☐ No		<u>50 - Neurological Outcome At Discharge From Hospital</u> ☐ Good Cerebral Performance (CPC 1) ☐ Moderate Cerebral Disability (CPC 2) ☐ Severe Cerebral Disability (CPC 3) ☐ Coma, Vegetative State (CPC 4)

Hospital component



Home Setup ▼ eCares ▼ Reports ▼ Tools ▼ Log Out

Part E: Hospital Section - Please complete the following questions

46 - ER Outcome

- ☐ Resuscitation terminated in ED
- ☐ Admitted to hospital
- ☐ Transferred to another acute care facility from the ED

47 - Was hypothermia care initiated or continued in the hospital

- ☐ Yes
- ☐ No

48 - Hospital Outcome

- ☐ Died in the hospital
- ☐ Discharged alive
- ☐ Patient made DNR

If yes, choose one of the following:

- ☐ Transferred to another acute care hospital
- ☐ Not yet determined

49 - Discharge From The Hospital

- ☐ Home/Residence
- ☐ Rehabilitation facility
- ☐ Skilled Nursing Facility/Hospice

50 - Neurological Outcome At Discharge From Hospital

- ☐ Good Cerebral Performance (CPC 1)
- ☐ Moderate Cerebral Disability (CPC 2)
- ☐ Severe Cerebral Disability (CPC 3)
- ☐ Coma, Vegetative State (CPC 4)

CARES 2012 Site Map

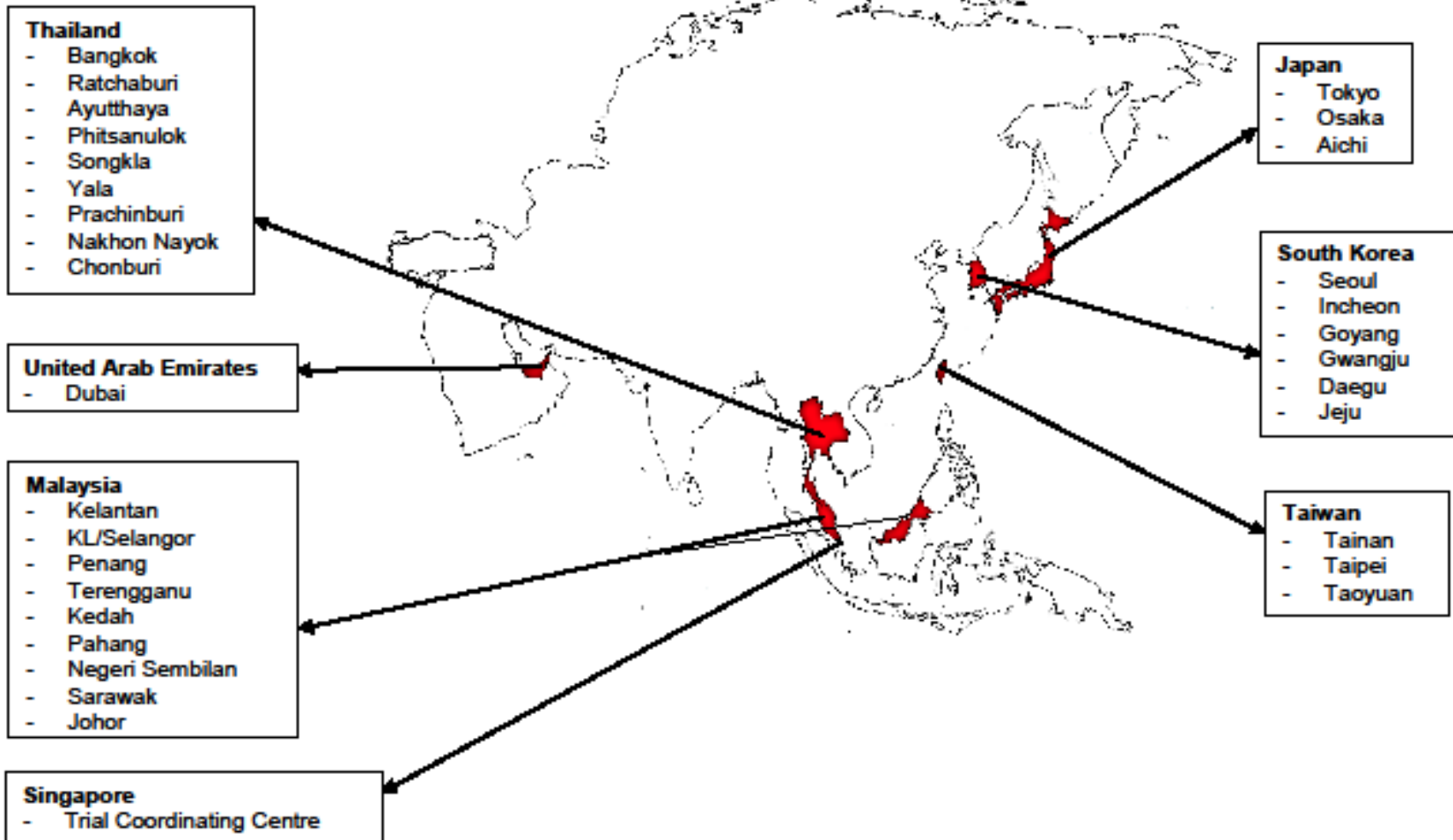


CARES International Collaboration



PAROS

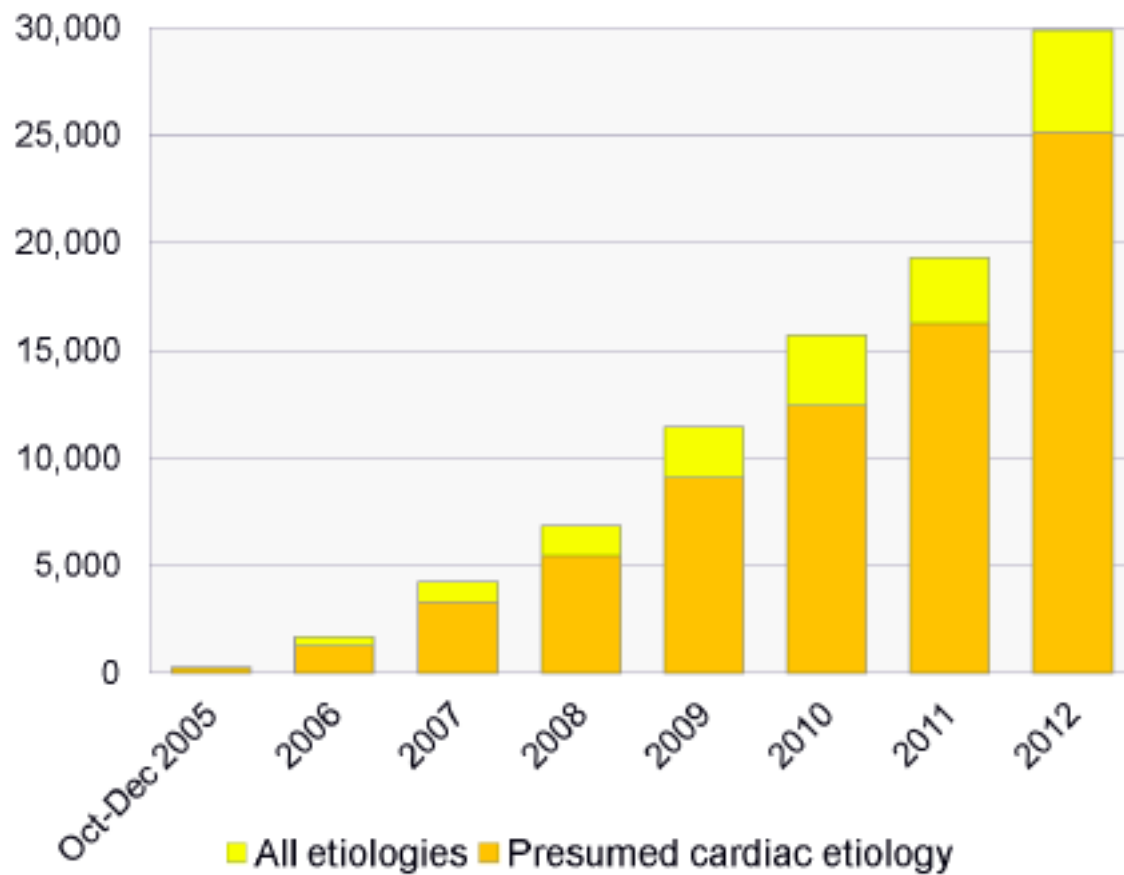
Participating Countries



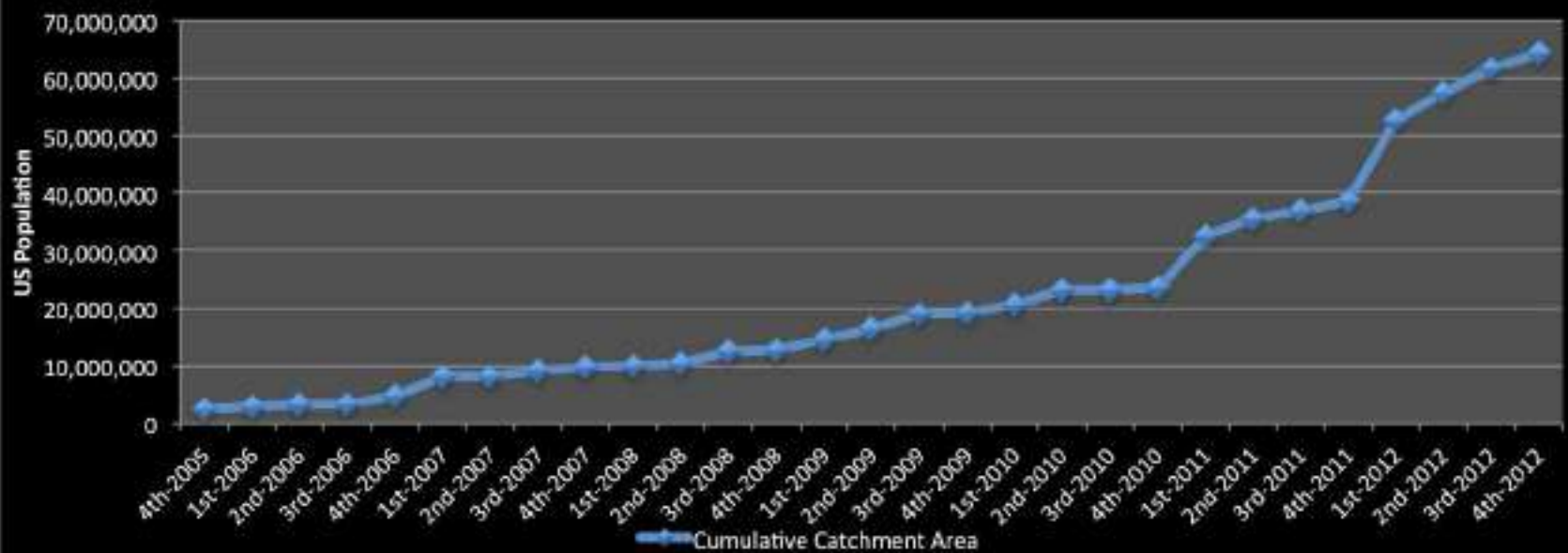
Out-of-Hospital Cardiac Arrest Surveillance — Cardiac Arrest Registry to Enhance Survival (CARES), United States, October 1, 2005–December 31, 2010



CARES Annual Call Volume

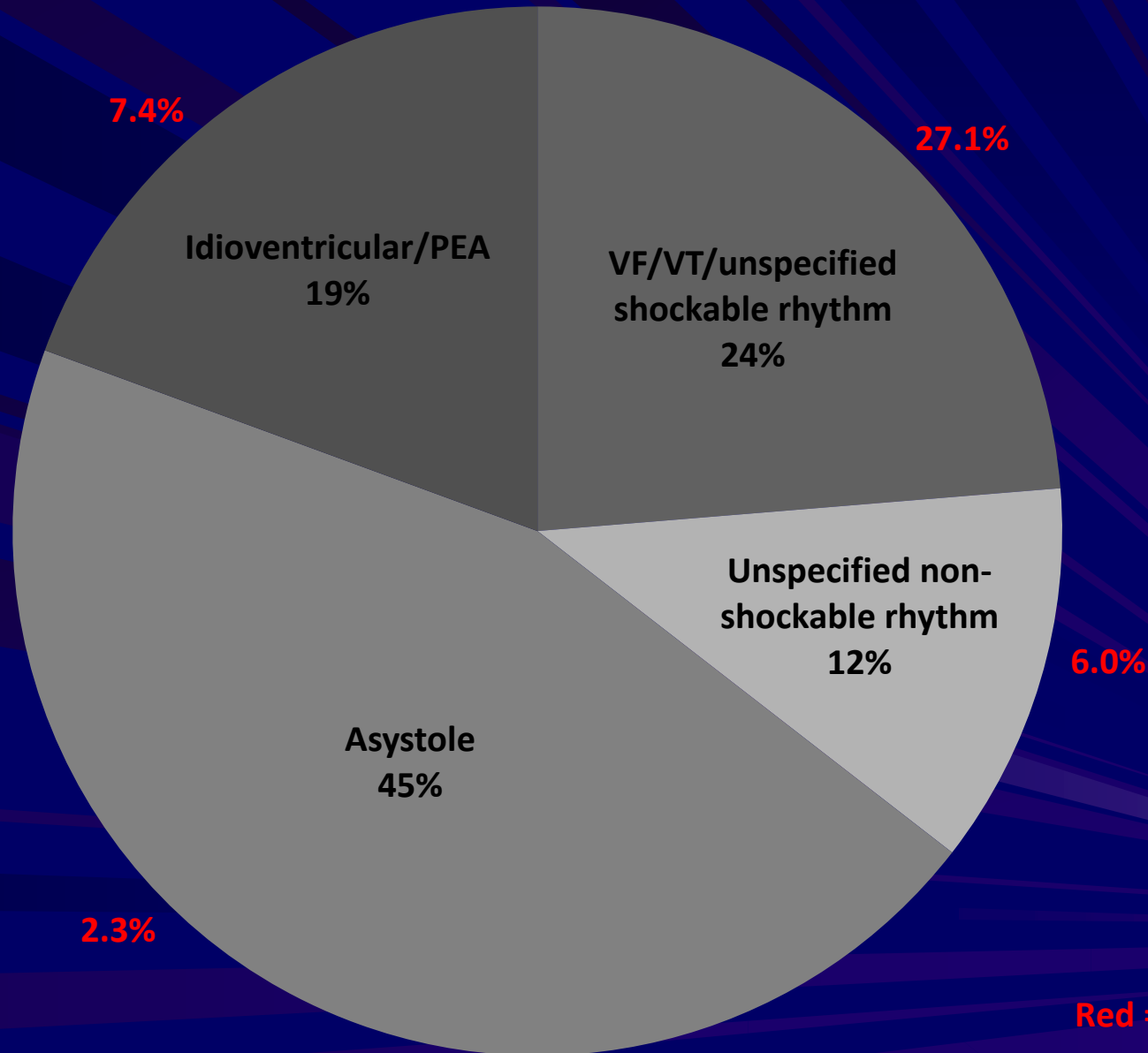


Catchment Area



Presenting Arrest Rhythm

n=31,645



Red = % Survived
n=3,041

Utstein Survival Report

All Agencies/National Data

Service Date: From 1/1/12 Through 12/31/12

Cardiac Etiology Survival Rates

Overall:	10.0% (25116)
Bystander Wit'd:	15.3% (9653)
Unwitnessed:	4.1% (12824)
Utstein:	31.7% (3434)
Utstein Bystander:	37.3% (1922)

Resuscitations Attempted
28404

Non-Cardiac Etiology
3288

Cardiac Etiology
25116

Unwitnessed Arrest
12824
*see page 2

Witnessed by 911 Responder
2639
*see page 3

Witnessed Arrest (Bystanders)
9653

Initial Rhythm Asystole
3296
Sustained ROSC in field = 929

Initial Rhythm VF/VT
3434
Sustained ROSC in field = 1817

Other Initial Rhythm
2923
Sustained ROSC in field = 1172

Expired in Field
798
Expired in ED
1763

Expired in Field
261
Expired in ED
1375

Expired in Field
467
Expired in ED
1494

Admitted to Hospital
735 (16 incomplete)

Admitted to Hospital
1798 (62 incomplete)

Admitted to Hospital
962 (25 incomplete)

Expired In Hospital
625

Expired In Hospital
649

Expired In Hospital
642

Discharged Alive
94

Discharged Alive
1087

Discharged Alive
295

Neurological Status
CPC 1 or 2
47
CPC 3 or 4
37
Unknown = 10

Neurological Status
CPC 1 or 2
952
CPC 3 or 4
95
Unknown = 40

Neurological Status
CPC 1 or 2
203
CPC 3 or 4
74
Unknown = 18

Data		Data	
National N=25116		Washington N=1818	
Pre-hospital Outcome (%)	N=25115	Pre-hospital Outcome (%)	N=1818
Pronounced in the Field	6336 (25.2)	Pronounced in the Field	698 (38.4)
Pronounced in ED	3962 (15.8)	Pronounced in ED	93 (5.1)
Ongoing Resuscitation in ED	14817 (59.0)	Ongoing Resuscitation in ED	1027 (56.5)
Overall Survival (%)	N=25116	Overall Survival (%)	N=1818
Overall Survival to Hospital Admission	6664 (26.5)	Overall Survival to Hospital Admission	609 (33.5)
Overall Survival to Hospital Discharge	2519 (10.0)	Overall Survival to Hospital Discharge	261 (14.4)
With Good or Moderate Cerebral Performance	1986 (7.9)	With Good or Moderate Cerebral Performance	230 (12.7)
Missing hospital outcome	188	Missing hospital outcome	29
Utstein Survival (%)	N=3434	Utstein Survival (%)	N=337
Witnessed by bystander and found in shockable rhythm	31.7%	Witnessed by bystander and found in shockable rhythm	38.6%
Utstein Bystander Survival (%)	N=1922	Utstein Bystander Survival (%)	N=230
Witnessed by bystander, found in shockable rhythm, and received some bystander intervention (CPR by bystander and/or AED applied by bystander)	37.3%	Witnessed by bystander, found in shockable rhythm, and received some bystander intervention (CPR by bystander and/or AED applied by bystander)	38.7%
Who Initiated CPR? (%)	N=25116	Who Initiated CPR? (%)	N=1818
Not Applicable	44 (0.2)	Not Applicable	9 (0.5)
Total Bystanders*	9491 (37.8)	Total Bystanders*	922 (50.7)
First Responder	7136 (28.4)	First Responder	137 (7.5)
Emergency Medical Services (EMS)	8445 (33.6)	Emergency Medical Services (EMS)	750 (41.3)

Hospital Report

Presumed Cardiac Etiology; Resuscitation Attempted by 911 Responder; End of Event = Pronounced in ED or Ongoing Resuscitation in ED Agency: Cares Demo

	Number of Patients (%)
Sustained ROSC in the field	27 (58.7)
Hypothermia care initiated/continued in the hospital (among admitted patients)	13 (65.0)
Discharged with good/moderate CPC	15 (32.6)

Initial Rhythm	Total	Survived to Admission (43.5)	Survived to Discharge (32.6)
Shockable	32(69.6)	13(65.0)	12(80.0)
Unshockable	14(30.4)	7(35.0)	3(20.0)
Asystole	7	3	1
VFib	22	8	7
VTach	6	2	2
Idioventricular/PEA	3	1	1
Unknown Unshockable	4	3	1
Unknown Shockable	4	3	3
	46	20	15

2010 Cohort

Who Initiated CPR?

	2010	2011	2012
Who Initiated CPR? (%)	N=12217	N=12606	N=13453
Not Applicable	14 (0.1)	21 (0.2)	23 (0.2)
Total Bystanders*	4009 (32.8)	4731 (37.5)	5102 (37.9)
First Responder	4561 (37.3)	3520 (27.9)	3907 (29.0)
Emergency Medical Services (EMS)	3633 (29.7)	4334 (34.4)	4421 (32.9)

70 Communities Participating in 2010
Population of 26,688,033

2010 Cohort Survival

	2010	2011	2012	
Overall Survival (%)	N=12219	N=12607	N=13453	
Overall Survival to Hospital Admission	3373 (27.6)	3401 (27.0)	3668 (27.3)	
Overall Survival to Hospital Discharge	1269 (10.4)	1356 (10.8)	1430 (10.6)	0.524
With Good or Moderate Cerebral Performance	958 (7.8)	999 (7.9)	1096 (8.1)	0.366
Missing hospital outcome	101	97	96	
Utstein Survival (%)	N=1681	N=1673	N=1831	
Witnessed by bystander and found in shockable rhythm	31.6%	32.6%	33.5%	0.219
Utstein Bystander Survival (%)	N=803	N=921	N=1001	
Witnessed by bystander, found in shockable rhythm, and received some bystander intervention (CPR by bystander and/or AED applied by bystander)	34.7%	36.5%	40.6%	0.011

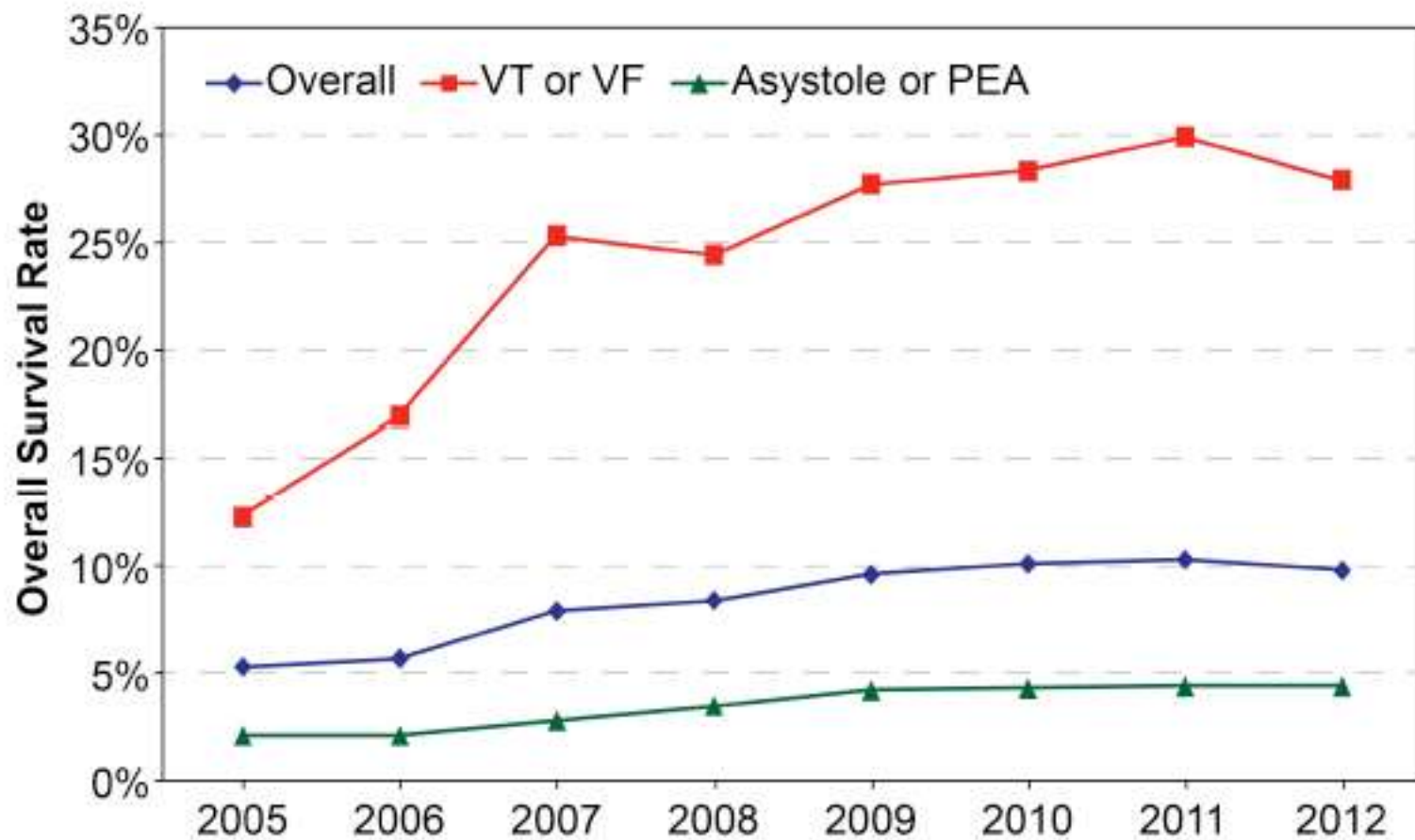
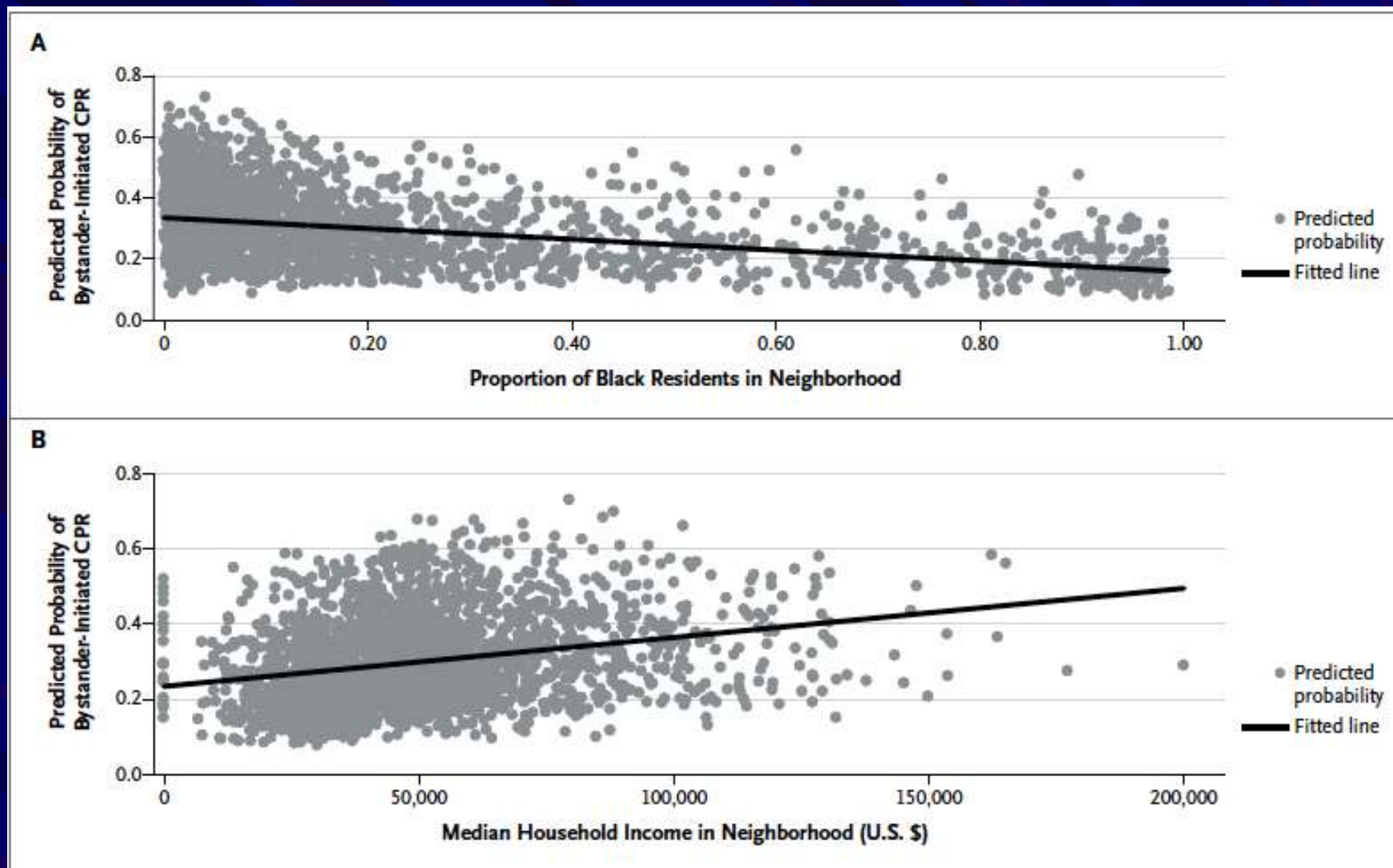


Figure 1. Predicted Probability of Bystander-Initiated Cardiopulmonary Resuscitation (CPR).



CARES

- Allows communities to determine OHCA outcomes & identify high risk groups and neighborhoods
- Enables clinical benchmarking to identify opportunities for improvement and track the diffusion of new therapies
- Promotes accountability to improve the quality and impact of prehospital care

Ultimate Goals of CARES

Create a model national cardiac arrest registry capable of identifying and tracking all cases in a defined geographic area

Helps EMS and the larger community identify:

- Who is affected
- When and where cardiac arrests occur
- Which elements of the system are functioning well and those that are not
- How changes can be made to improve cardiac arrest outcomes

The goal is to help communities improve cardiac arrest survival

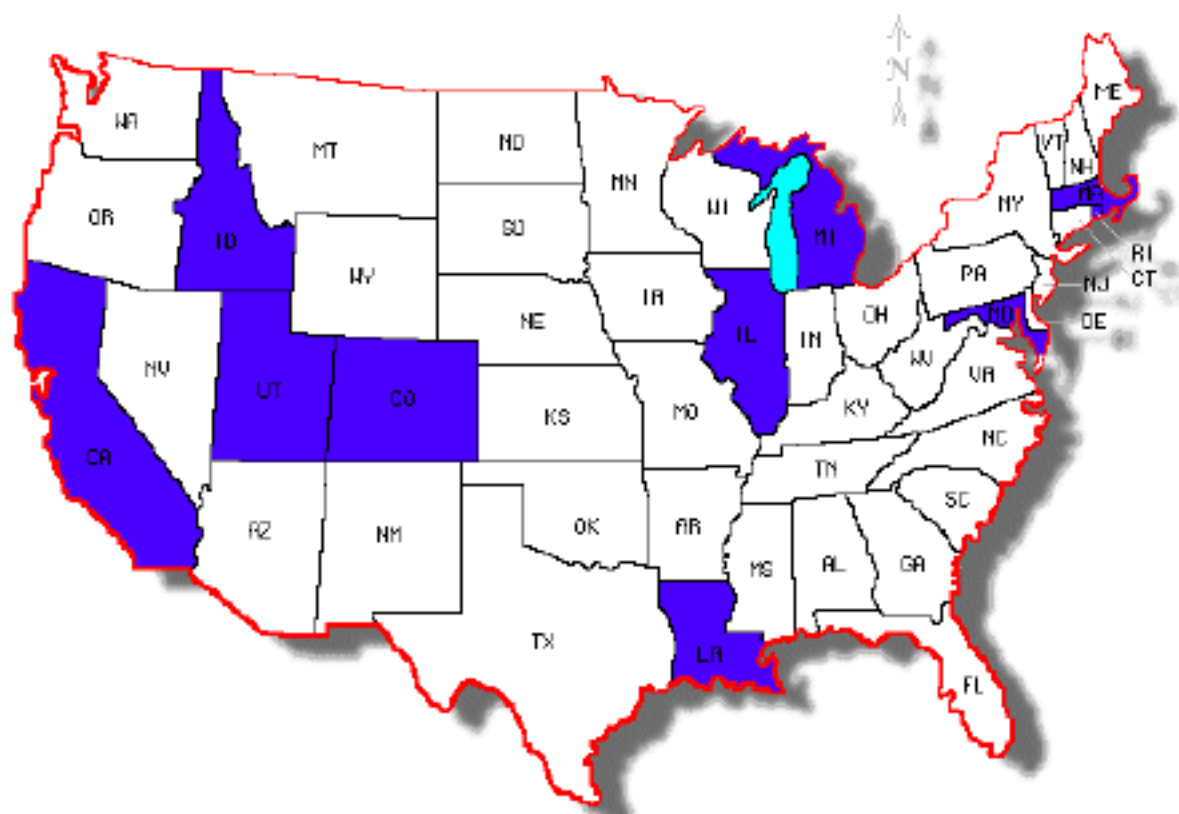
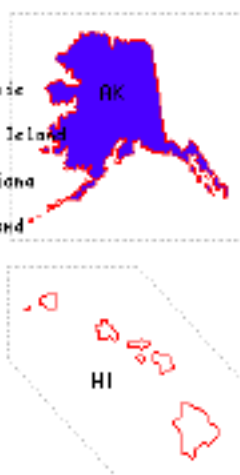
Program Focus and Goals for 2013-2014

Focus States and Sites

The map below identifies the 11 focus CARES states that will be targeted for expansion in 2013-2014.

2013-2014 FOCUS CARES STATES

- - Alaska
- - Massachusetts
- - Michigan
- - Colorado
- - California
- - Idaho
- - Utah
- - Illinois
- - Rhode Island
- - Louisiana
- - Maryland





CARES

Cardiac Arrest Registry
to Enhance Survival



Software Module Update

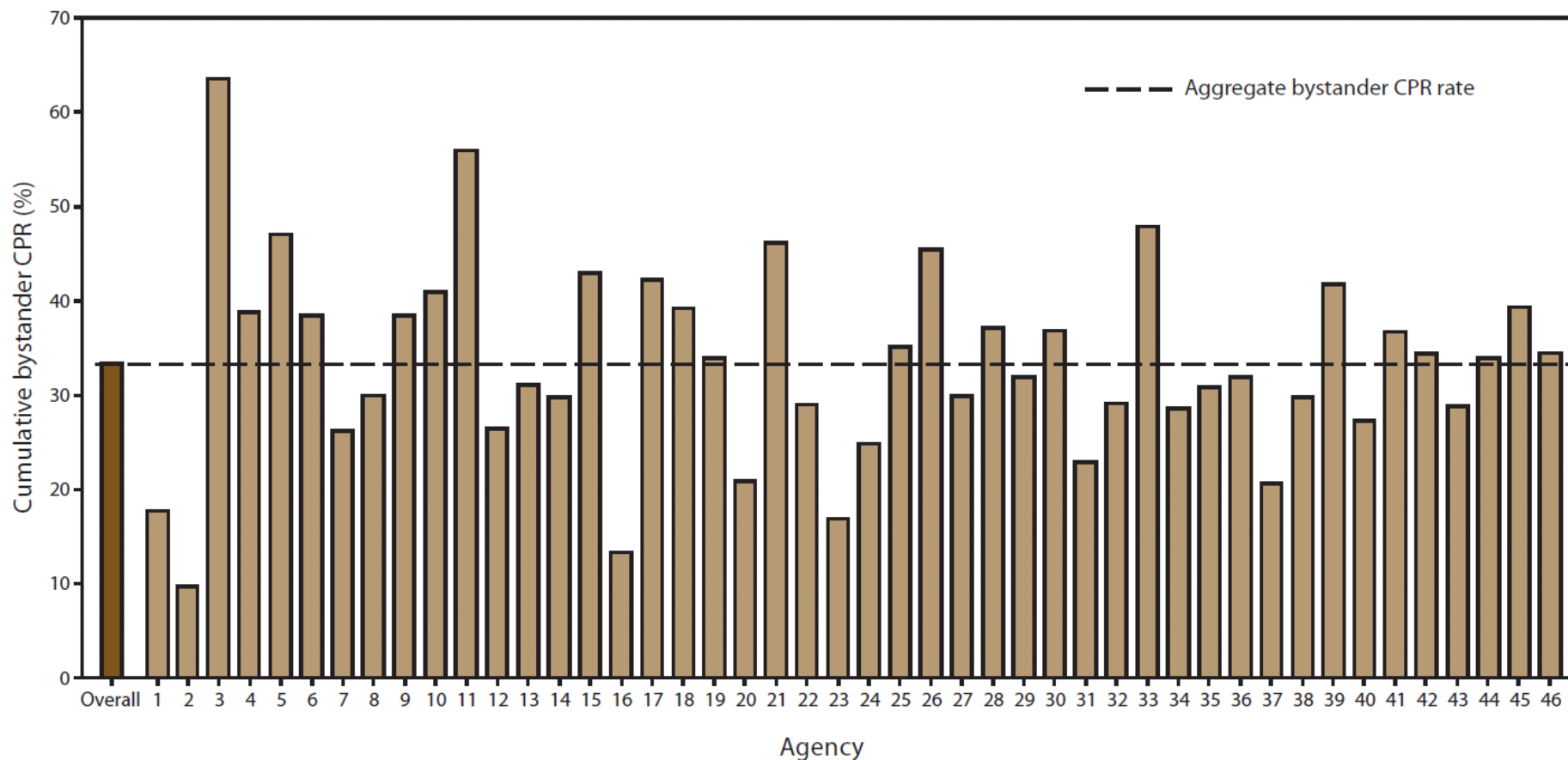
- ★ Dispatcher CPR Module
- ★ AED Module
- Hypothermia Module
- CPR Metrics Module
- Mirror Modules for CARES/PAROS
- ★ Beta testing occurring



CPR started quickly.

National Bystander CPR Data

FIGURE 6. Cumulative bystander cardiopulmonary resuscitation (CPR), by participating emergency medical services agency — Cardiac Arrest Registry to Enhance Survival (CARES), United States, October 1, 2005–December 31, 2010*



Abbreviation: CPR = cardiopulmonary resuscitation.

* Agencies sorted by total number of out-of-hospital cardiac arrest events in CARES (from low to high; range: 18–5,434).

Who First Initiated CPR

Who First Initiated CPR	N	%
Lay Person	3,275	10.4
Lay Person Family Member	3,361	10.6
Lay Person Medical Provider	3,898	12.3
First Responder	11,279	35.7
Responding EMS Personnel	9,812	31.0
	31,625	

For Witnessed VF/VT Cases*

Survival rates by Response time & Bystander CPR status:

Response Time	< 4 minutes	4-8 minutes	> 8 minutes
BCPR YES	44%	35%	31%
BCPR NO	36%	26%	20%

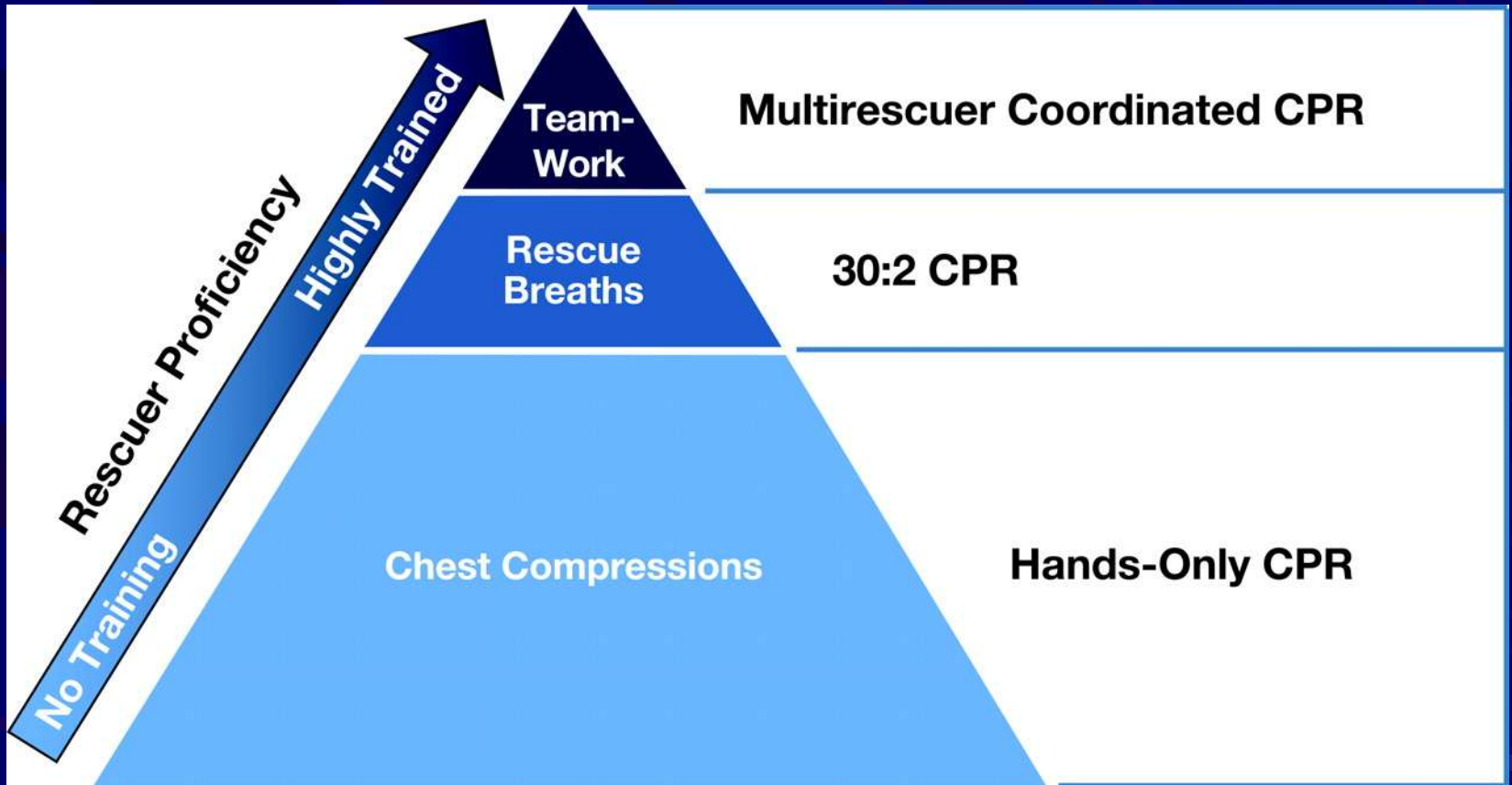
* Excluding arrests after arrival of EMS/First Responders

Dispatch Chain of Survival

Bystander CPR instructions for emergency medical dispatchers



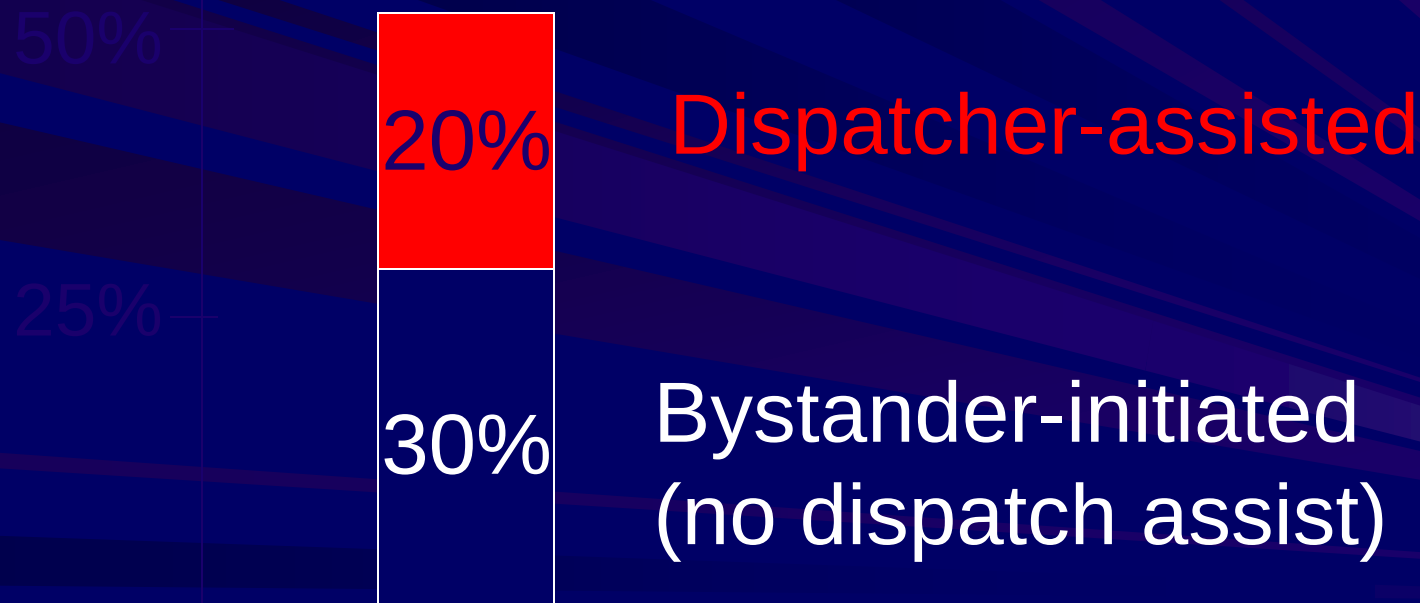
Building Blocks of CPR.



Travers A H et al. Circulation 2010;122:S676-S684

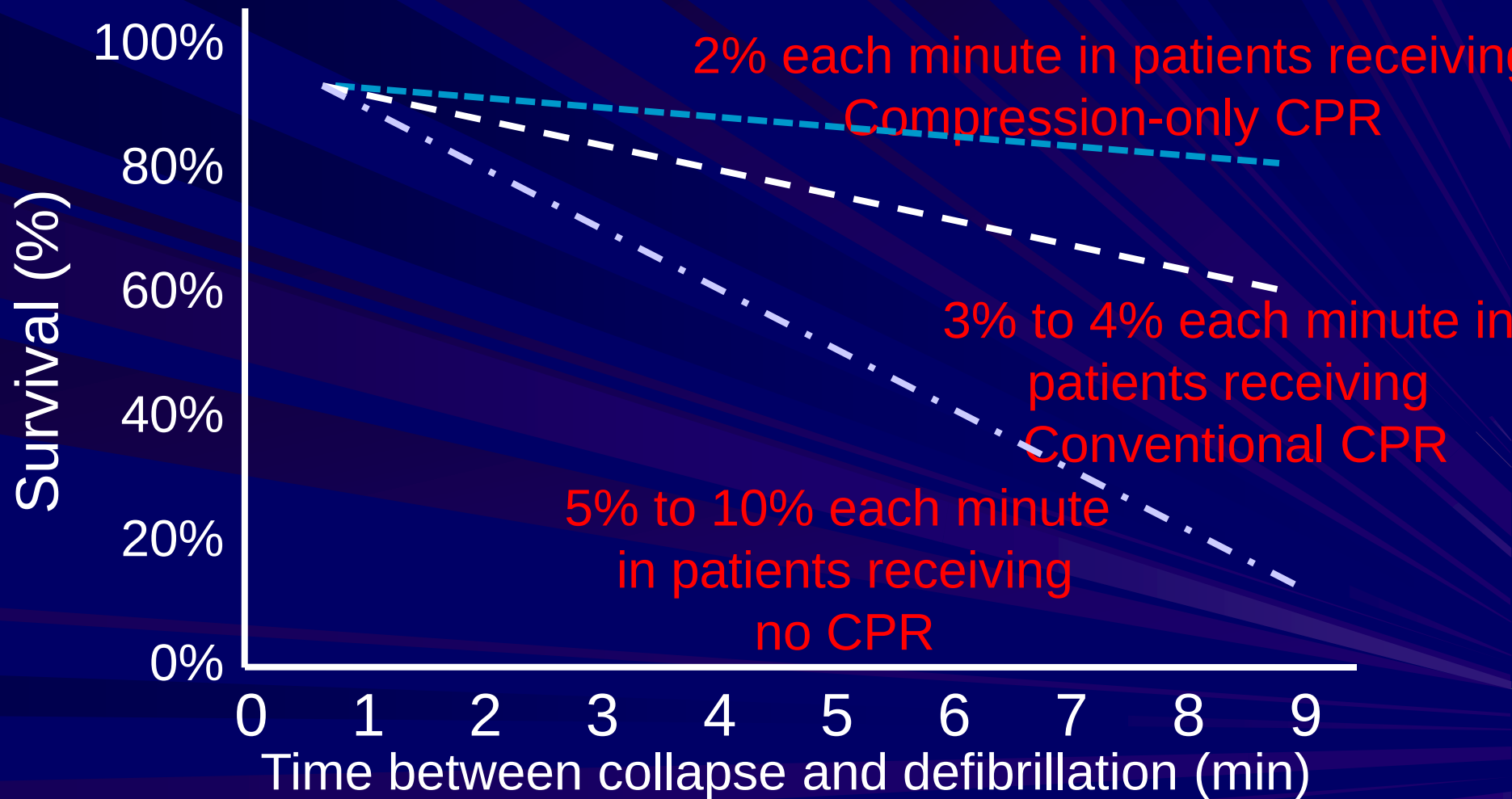
The Story of Dispatcher Assisted CPR King County Seattle

Bystander CPR since initiation of dispatcher assistance (1985 - 2007)



Potential to nearly double proportion who receive CPR

Bystander CPR Improves Chance of Survival



AHA DA-CPR Position Paper

Four Recommendations for EMD

- Dispatchers should assess whether someone has had a cardiac arrest and if so, tell callers how to administer CPR immediately.
- Dispatchers should confidently give Hands-Only CPR instructions for adults who have had a cardiac arrest *not* caused by asphyxia (as in drowning).
- Communities should measure performance of dispatchers and local EMS agencies, including how long it takes until CPR is begun.
- Performance measurements should be part of a quality assurance program involving the entire emergency response system including EMS and hospitals.

Dispatch: Preliminary

Dispatch Agency:

Date/Time of Call:

Incident #:

DISPATCH CPR MODULE

Dispatcher ID/Name:

Transfer Call?

If yes, time elapsed before dispatcher first addressed caller?

Minutes: Seconds:

- ☐ Yes
☐ No
☐ Unknown

Was this a cardiac arrest before arrival of EMS?

- ☐ Yes
☐ No
☐ Unknown

CPR already in progress?

- ☐ Yes
☐ No
☐ Unknown

CPR instructions delivered?

- ☐ Yes
☐ No
☐ Unknown

Chest Compressions Performed?

- ☐ Yes
☐ No
☐ Unknown

Barriers to CPR

- ☐ Hang up phone ☐ Caller left phone ☐ Caller refused ☐ Other (please specify)
☐ Language barrier ☐ Overly distraught ☐ Couldn't move patient

Dispatch: Patient

- ☐ Adult
☐ Child
☐ Infant

Conscious?

- ☐ Yes
☐ No
☐ Unknown

Breathing Normally?

- ☐ Yes
☐ No
☐ Unknown

Dispatch: Time Measures

Dispatch Recognizes Need for CPR:

 hh : mm : ss

Dispatcher Began Instructions:

 hh : mm : ss

Time of First Compression:

 hh : mm : ss

Time of First Rescue Breaths:

 hh : mm : ss**Dispatch: Comments**

Coaching or compliments for dispatcher?



Save Hearts in Arizona
Registry & Education



RAMSEY
SOCIAL
JUSTICE
FOUNDATION

CPR

Be The Link to Life



English

한국어

日本語

中文

Early use of automated
external defibrillator (AED).



Survival Rates by Response Time

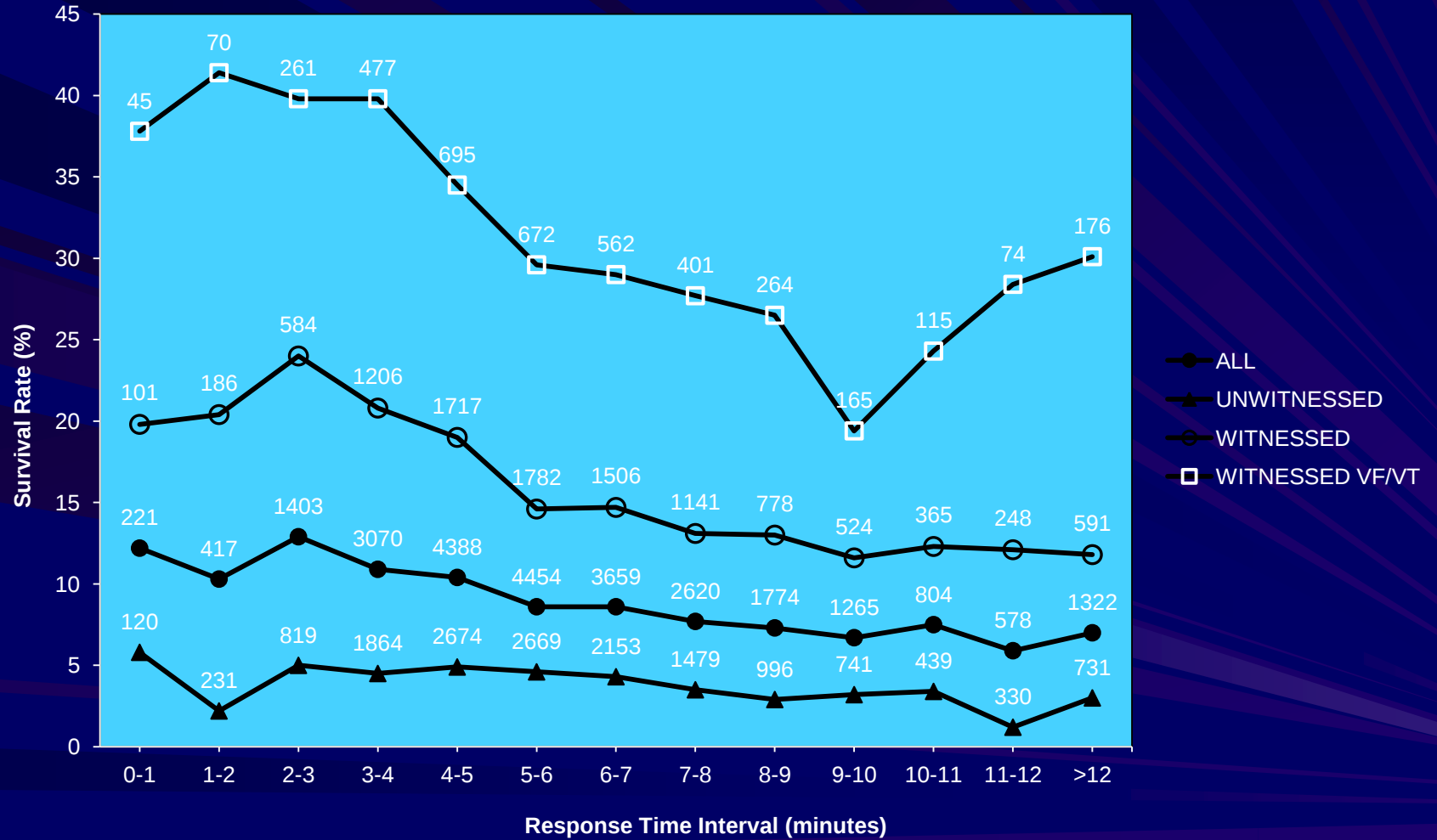


TABLE 5. Number and percentage of persons who experience and those who survive a bystander witnessed out-of-hospital cardiac arrest and are found in a shockable rhythm, by clinical characteristics - United States, 2005-2010

Characteristic	Experience		Survive	
	No.	(%)	No.	(%)
Who first initiated CPR				
Bystander	2,076	49.0	696	33.5
911 Responder	2,164	51.0	580	26.8
Total	4,240	100	1,276	30.1
Who first applied AED/monitor				
Bystander	376	8.9	188	50.0
911 Responder	3,867	91.1	1,090	28.2
Total	4,243	100	1,278	30.1

AED MODULE

Device Information			
Make:	Model:	Year:	Serial Number:
v If Other, please specify:			
Date of Sale	Device Resold?		
	v		
Frequency of checking the device for readiness	Results of device readiness checks		
v If Other, please specify:	v		

Location Information			
Mobile vs. Fixed	Mobile Location	Fixed Location	
v	v	v	
Organization/Company Name	Commonplace Name		
Street Address	Address Notes:		
City	State	Zip Code	County
	v		v
Vertical Location [Floor]	AED is stored in an:		
	v		
Publicly available	Hours of Operation	AED can be used by	
v		v	
AED Signage	Signage/Location Indicators in place?		
v	v		
On-Site Contact Name	On-site Contact Email address	On-site Contact Phone Number	
		) -	

AED Program Information			
AED Program Coordinator Name	AED Program Coordinator Email address	AED Program Coordinator Phone Number	Date of Last Update
		) -	non-editable timestamp?





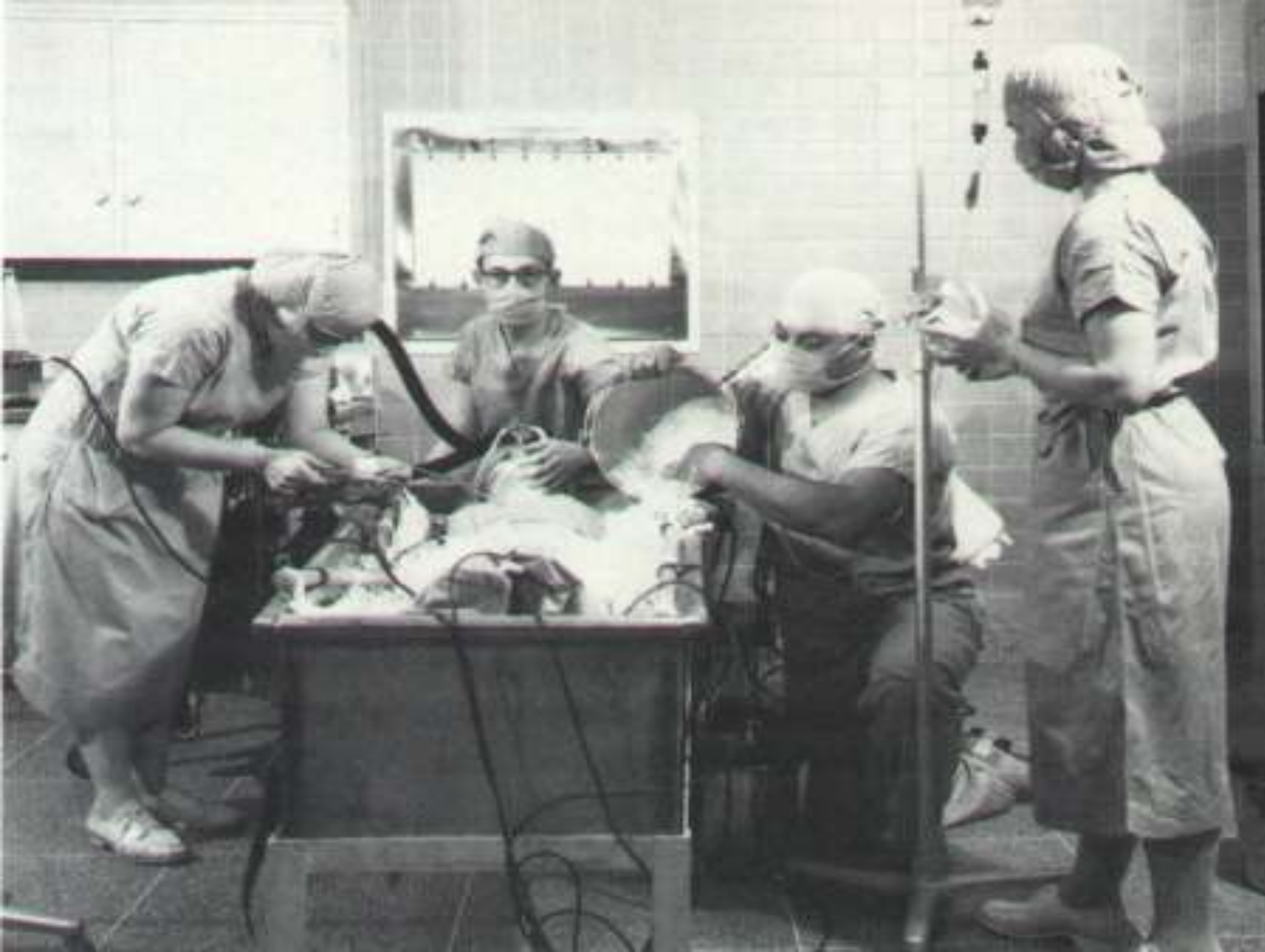
Improvement Is Possible

- 
- A person wearing a blue shirt is reaching up towards a fruit hanging from a branch. The background is a warm, golden-brown color, suggesting a sunset or sunrise. The person's arm and hand are visible, reaching towards the fruit. The fruit is a small, round object, possibly an apple or a piece of fruit, hanging from a thin branch. The overall scene is one of aspiration and reaching for a goal.
- | | |
|-----|--|
| 1.1 | A Few Words of Wisdom |
| 1.2 | Embracing the Challenge |
| 1.3 | Plan of Action: Grab The Low Hanging Fruit |
| 1.4 | Plan of Action: Reach For The Higher Hanging Fruit |
| 1.5 | Putting Plans into Action |
| 1.6 | Finding your own path |

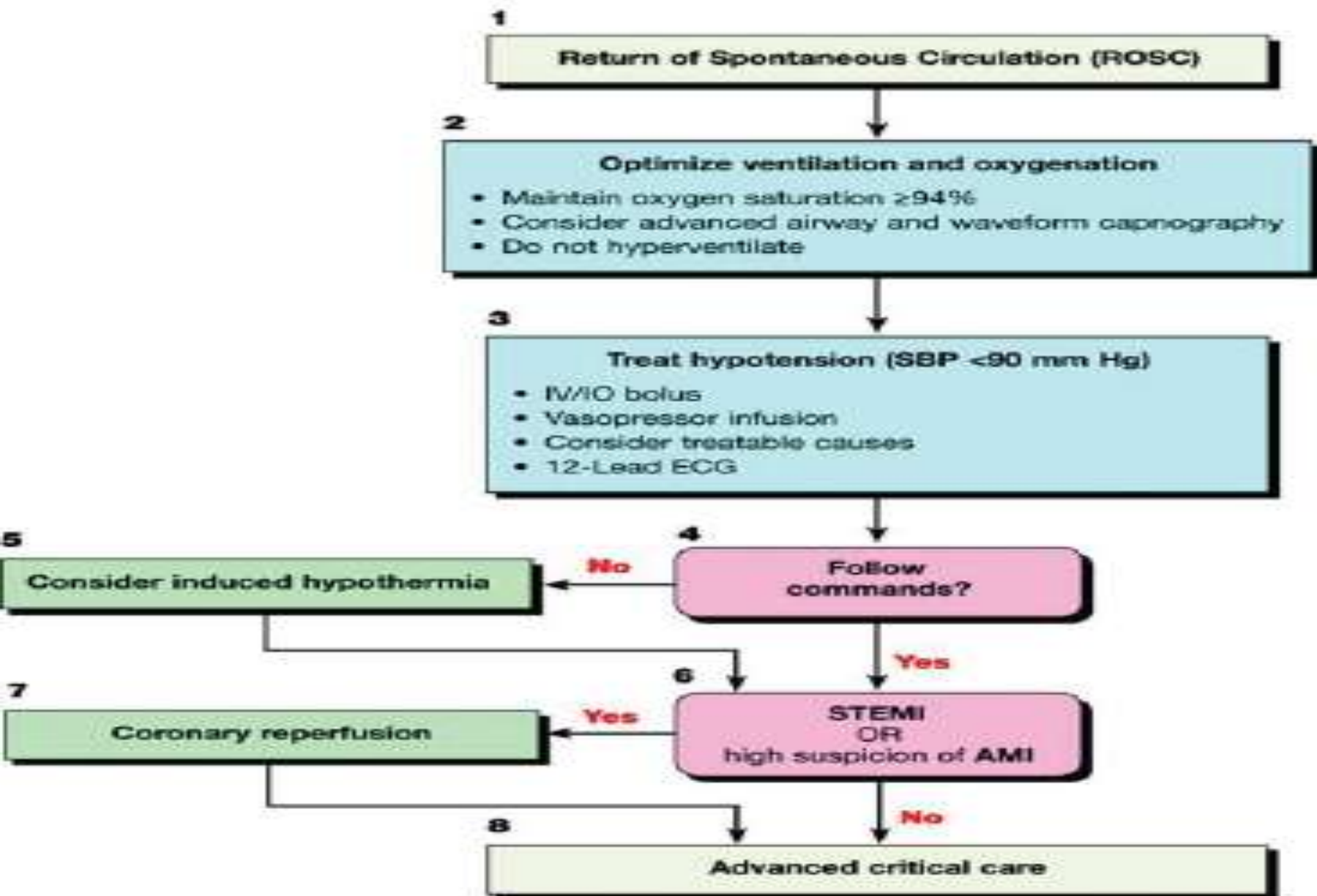


Early post-
resuscitative care.





Adult Immediate Post-Cardiac Arrest Care



© 2010 American Heart Association

Future Outcomes

- ✓ Efficacy – ideal circumstances
- ✓ Effectiveness – real world
- ✓ Treatment – what to do
- ✓ Performance – how well we do

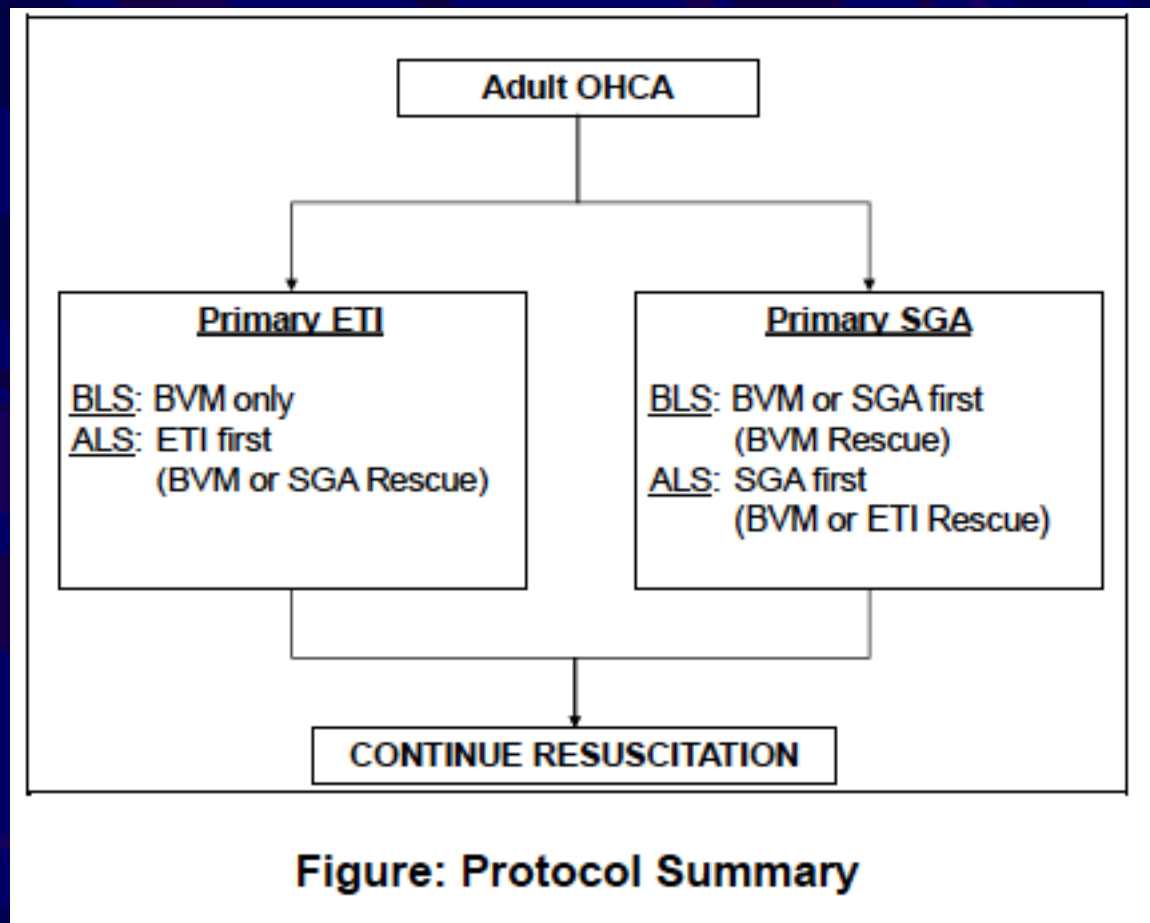
CARES AIRWAY DATA

Advanced Management Technique	N (%)
Supraglottic Airway	3,110 (29.3%)
Esophageal-Tracheal Combitube	309 (2.9%)
Laryngeal Mask Airway	55 (0.5%)
King Laryngeal Tube	2,746 (25.8%)
Endotracheal Intubation	5,591 (52.6%)
No Successful Advanced Airway Intervention	1,929 (18.2%)
Other*	62 (0.5%)

CARES AIRWAY DATA

Outcome	No Advanced Airway (n=1,929)	Supraglottic Airway (n=3,110)	Endotracheal Intubation (n=5,591)	P-value
Field Termination of Resuscitation (%)	33.8	34.6	22.3	<0.001
Sustained ROSC (%)	36.5	25.5	33.8	<0.001
ED Survival (%)	33.4	21.4	26.6	<0.001
Hospital Survival (%)	21.9	6.7	8.3	<0.001
Hospital Survival with Good Neurological Outcome (%)	18.6	5.2	5.4	<0.001

AIRWAY STUDY PROPOSAL





CARES WEBSITE

<https://mycares.net>

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