Emergency Medicine Resident Research Forum

Keynote Speaker: ***Bentley J. Bobrow, MD***
The University of Arizona College of Medicine,
Department of Emergency Medicine

Wednesday April 26, 2017
9:00 a.m. – 12:00 p.m.

The University of Arizona College of
Medicine – Tucson South Campus,
the Abrams Center,
1st floor Conference Room, 1106/1108
3950 S. Country Club Road
Tucson, Arizona 85713

ARIZONA®
EMERGENCY MEDICINE
RESEARCH CENTER

Emergency Medicine Research: Why Should You Care?

Objectives

- Describe the evolution and current structure of the AEMRC – clinical research + public health
- Translation of concept into practice
- Showcase AEMRC past and current research
- Inspire young physician scientists

Centers:

Our multidisciplinary centers promote collaborative research within the College of Medicine – Tucson, the University of Arizona and beyond. Several centers also provide clinical services and education to the college community and the public

ARIZONA AIDS EDUCATION AND TRAINING CENTER

ARIZONA CENTER FOR INTEGRATIVE MEDICINE

ARIZONA CENTER ON AGING

*ARIZONA EMERGENCY MEDICINE RESEARCH CENTER

ARIZONA RESPIRATORY CENTER

ARIZONA TELEMEDICINE PROGRAM

STEELE CHILDREN'S RESEARCH CENTER

ARIZONA ARTHRITIS CENTER

THE UNIVERSITY OF ARIZONA CANCER CENTER

.

SARVER HEART CENTER

THE VALLEY FEVER CENTER FOR EXCELLENCE

VIPER INSTITUTE

THE UNIVERSITY OF ARIZONA HEALTH SCIENCES | Patient Care | Research & Education | Health Plans

THE UNIVERSITY OF ARIZONA

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Home » Research

AEMRC

- AEMRC Tucson

Welcome to Arizona Emergency Medicine Research Center

The Arizona Emergency Medicine Research Center (AEMRC) is a collaborative statewide Center of Excellence dedicated to improving the health-care outcomes of patients with acute illness and injuries, in both pre-hospital settings and within the hospital.

The center's research focus extends from the pre-hospital environment, including 911 and emergency medical services (EMS) care, through the emergency department and critical care settings.

History

The AEMRC was founded in 1990 by Harvey Meislin, MD, FACEP, FAAEM, whose vision included the need to dramatically improve emergency systems and the care of patients with emergent problems in the emergency department or in the field. Today, the center is a national leader in emergency medicine research and training, including the application of new resuscitation techniques and event preparedness training.

Areas of Emphasis

The center brings together collaborative teams of multidisciplinary experts to achieve critical impact in areas affecting lives in Arizona today. Current areas of emphasis include improving outcomes in

AEMRC Leadership


Samuel M. Keim, MD, MS
Director, AEMRC


Kurt Denninghoff, MD
Associate Director, AEMRC COM-Tucson


Daniel W. Spaite, MD
Associate Director, AEMRC COM-Phoenix


Bentley J. Bobrow, MD
Associate Director, AEMRC COM-Phoenix

AEMRC staff

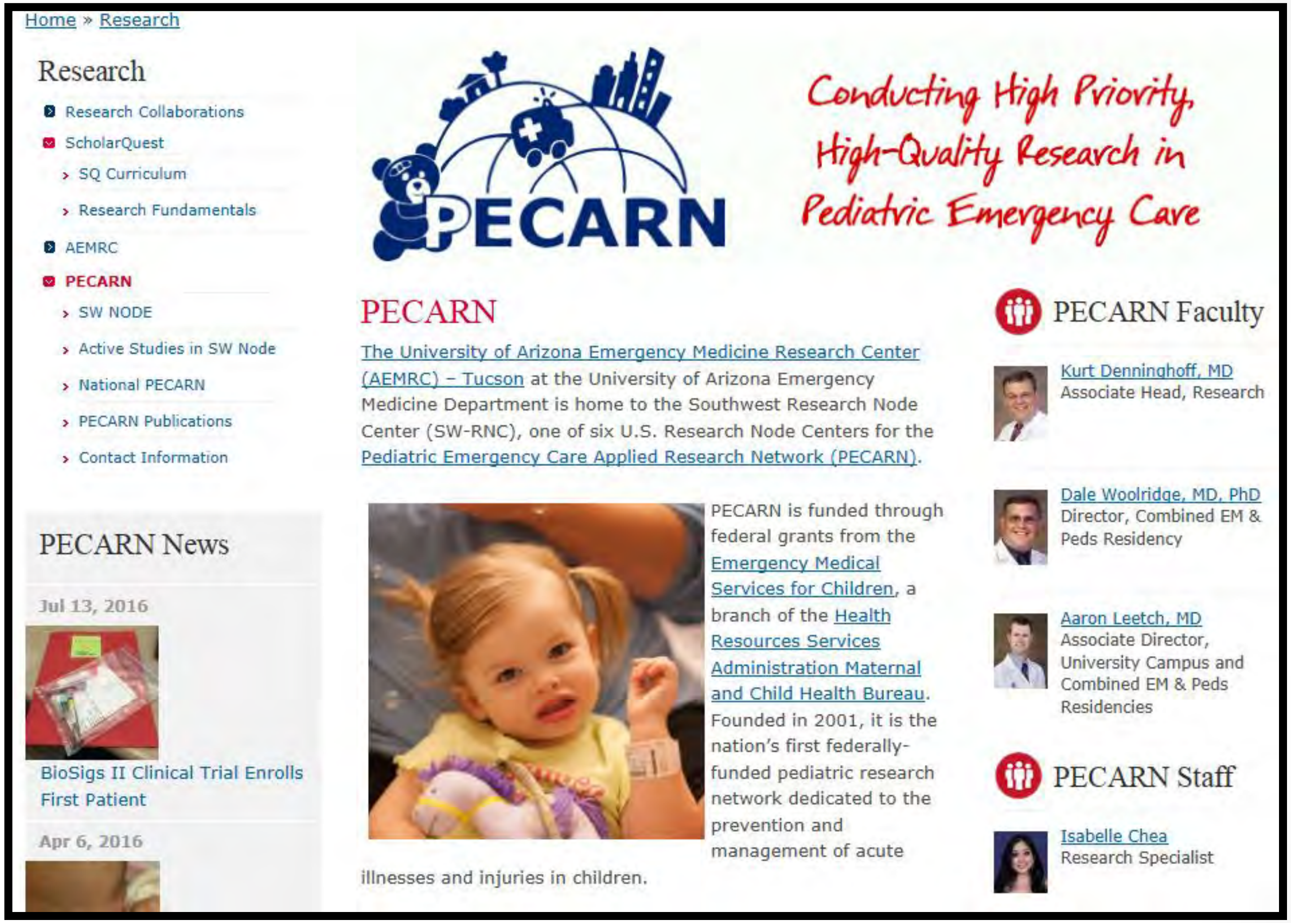
AEMRC News

Jan 24, 2017

SAVE THE DATE: Resident Research Forum 2017

Nov 16, 2016

Spreading the Word Around the World



Home » Research

Research

- Research Collaborations
- ScholarQuest
  - SQ Curriculum
  - Research Fundamentals
- AEMRC
- PECARN
  - SW NODE
  - Active Studies in SW Node
  - National PECARN
  - PECARN Publications
  - Contact Information

PECARN

Conducting High Priority, High-Quality Research in Pediatric Emergency Care

PECARN

The University of Arizona Emergency Medicine Research Center (AEMRC) – Tucson at the University of Arizona Emergency Medicine Department is home to the Southwest Research Node Center (SW-RNC), one of six U.S. Research Node Centers for the Pediatric Emergency Care Applied Research Network (PECARN).

PECARN is funded through federal grants from the Emergency Medical Services for Children, a branch of the Health Resources Services Administration Maternal and Child Health Bureau. Founded in 2001, it is the nation's first federally-funded pediatric research network dedicated to the prevention and management of acute illnesses and injuries in children.

PECARN Faculty

Kurt Denninghoff, MD
Associate Head, Research

Dale Woolridge, MD, PhD
Director, Combined EM & Peds Residency

Aaron Leetch, MD
Associate Director, University Campus and Combined EM & Peds Residencies

PECARN Staff

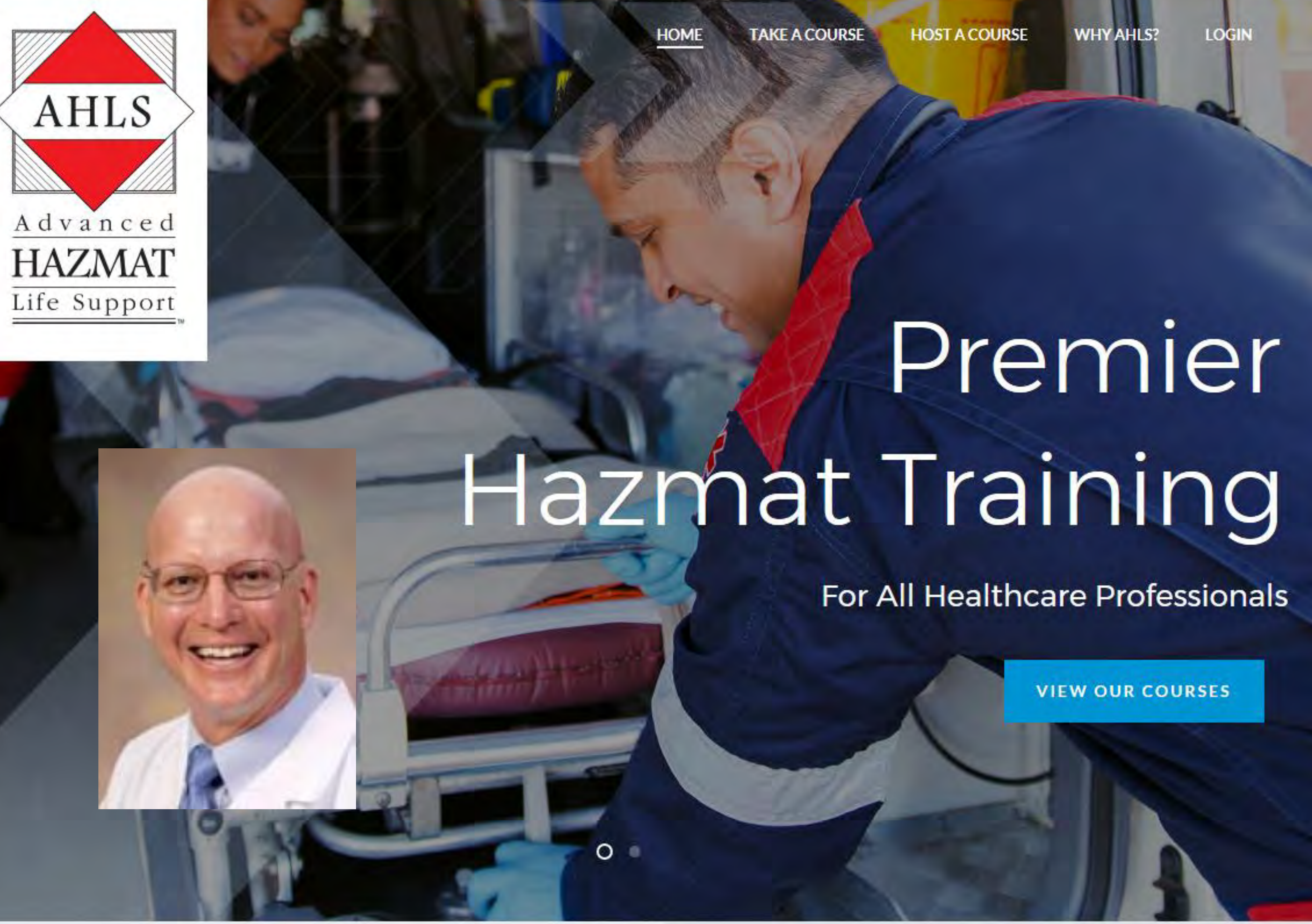
Isabelle Chea
Research Specialist

PECARN News

Jul 13, 2016

BioSigs II Clinical Trial Enrolls First Patient

Apr 6, 2016


HOME
TAKE A COURSE
HOST A COURSE
WHY AHLS?
LOGIN
AHLS
Advanced
HAZMAT
Life Support
Premier
Hazmat Training
For All Healthcare Professionals
VIEW OUR COURSES

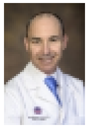
AEMRC Phoenix

The Arizona Emergency Medicine Research Center (AEMRC) Phoenix is an internationally acclaimed hub for research focusing on improving outcomes for victims of time-sensitive cardiovascular, neurologic, and traumatic medical emergencies. The AEMRC brings together a strong team of seasoned, NIH-funded, prehospital researchers concentrating on measuring and improving the effectiveness of life-saving prehospital medical interventions. The team includes expertise in epidemiology, database integration, advanced biostatistics, and prehospital outcomes research under the direction of **Drs. Dan Spaite** and **Ben Bobrow**.

AEMRC Phoenix has partnered with the Arizona Department of Health Services to implement successful public health programs such as the Save Hearts in Arizona Registry & Education (SHARE) Program (www.azshare.gov). The SHARE Program has collected over 20,000 out-of-hospital cardiac arrest events from over 150 EMS agencies, 40 hospitals, and 9 emergency medical dispatch centers in Arizona. SHARE promotes a system of care approach for measuring and improving survival from cardiac arrest in Arizona. This methodology encompasses all "links" in the "chain of survival"

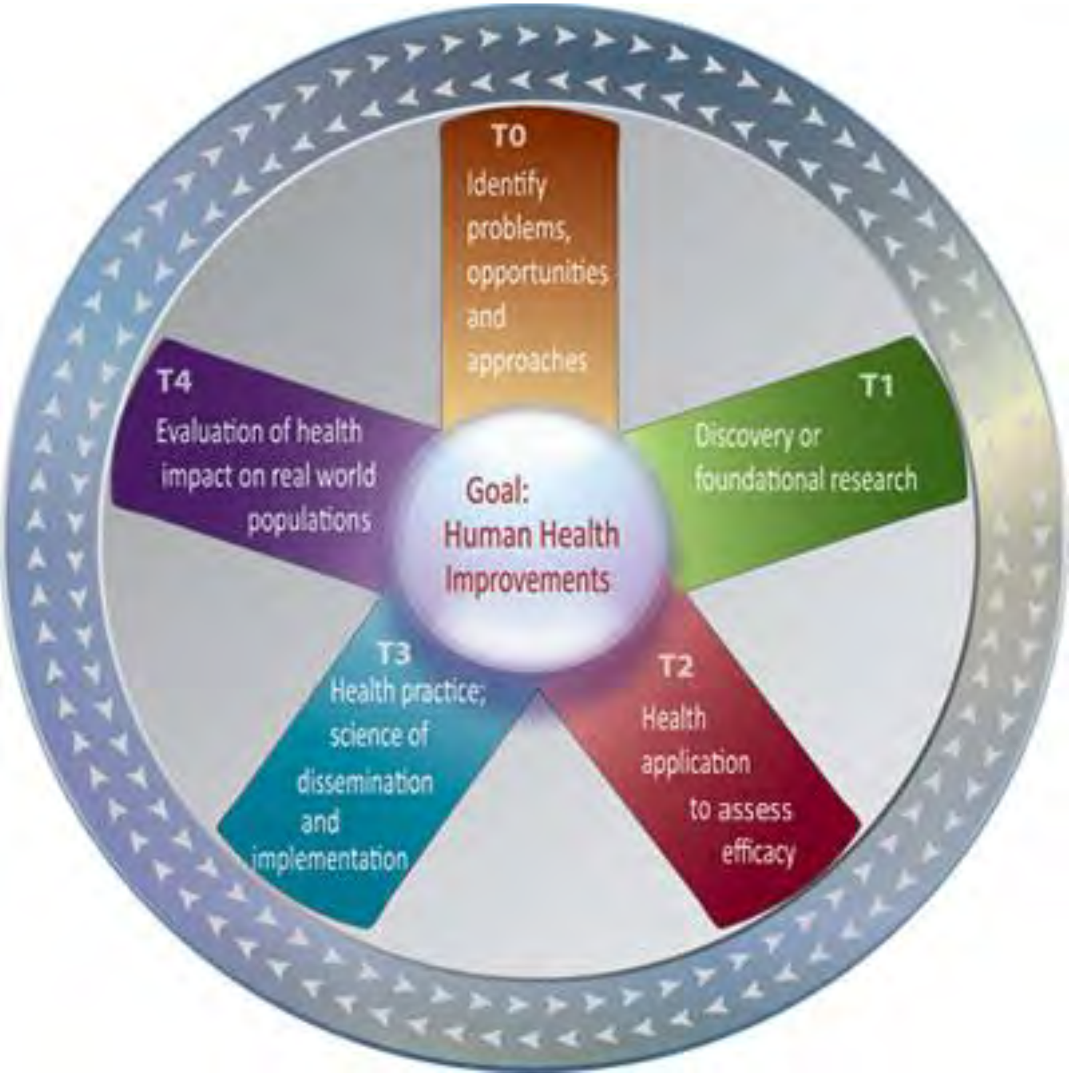
AEMRC Phoenix Leadership

Daniel W. Spaite, MD
Associate Director, AEMRC COM-Phoenix



Bentley J. Bobrow, MD
Associate Director, AEMRC COM-Phoenix

Translational Research



- **EMS + Hospital data**
- **Quality Improvement**
- **Guideline Development**
- **Statewide Dissemination**
- **Partnerships**

ARIZONA DEPARTMENT OF HEALTH SERVICES

AEMRC

THE UNIVERSITY OF ARIZONA

- **Data Linkage**
- **Data Analysis**
- **Implementation**
- **Intervention evaluation**
- **System evaluation**
- **Public-Private Partnerships**
- **Peer review publication**

Save Hearts in Arizona Registry & Education (AZ SHARE)

Signup for email updates

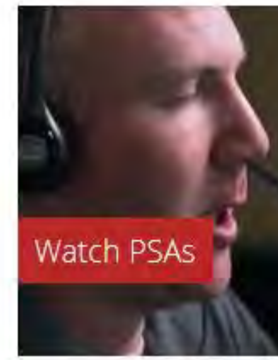
Home

- Next CPR University to be held June 29th and 30th, 2017. Watch for details at http://www.cpru.arizona.edu/

Learn Hands-Only CPR. It's easy and it's safe. Be a lifesaver today!

Is your school or workplace Heart Safe? Get recognized!

Register your AED and report its use.



Dispatchers coach callers in CPR and other videos.

Hands-Only CPR really works!

Learn how you too can be a life saver.

3560

Lives Saved & Counting!

English | En Español

Why Cardiac Resuscitation?

- Time critical, time dependent
- Involves multiple EMS skills/system factors
- Teamwork on the scene
- Coordination of stakeholders
- Measurable outcome
- EMS has a predominant influence on outcome
- If EMS is doing this well, most likely doing other things well

Newsletters

December 2014

July 2014

See list of all newsletters

Stall Street Journals

June 2015
April 2015
December 2014
July 2014
July 2013

EPIC for...

- Adults
- Kids

Excellence in Prehospital Injury Care (EPIC)

Why is the EPIC Project important?

According to the CDC's Report to Congress, in 2010, TBIs accounted for approximately 2.5 million emergency department (ED) visits, hospitalizations, and deaths in the United States. Of them:

- 52,844 die
- 283,630 are hospitalized
- >2.2 million are treated and released from EDs

TBI is a contributing factor to a third of all injury-related deaths in the United States.[1]

There is growing evidence that the management of TBI in the early minutes after injury profoundly impacts outcome. EMS operates in the ultra-acute setting, usually providing the first care for TBI victims when treatment matters the most. Reports on implementation of evidence-based TBI treatment guidelines inside the hospital are very promising. However, no studies to date have evaluated their impact in the prehospital setting.

The EMS agencies of Arizona have already proven their ability to dramatically improve cardiac arrest survival and, thus, Arizona was selected by the National Institutes of Health to do the same with TBI.

EPIC Project is Unique

- Funded by the NIH
  - 1R01NS071049-01A1 (Adults)
  - 3R01NS071049-S1 (EPIC4Kids)
  - **This is the first-ever NIH-funded statewide EMS evaluation**

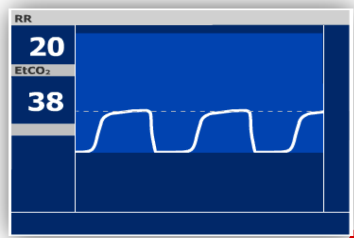
The Excellence in Prehospital Injury Care (EPIC) Study

- Statewide, 9-year, before-after system study evaluating the impact of implementing the National TBI Guidelines among the EMS agencies of Arizona

- 122 agencies and the 8 level I trauma centers are participating and will ultimately enroll over 22,000 patients

EPIC-TBI
Excellence in Prehospital Injury Care
Traumatic Brain Injury Project

Purpose: Evaluate the impact of implementing the EMS TBI guidelines throughout Arizona



Implementing the EBGs

Aggressively prevent and treat the *"Three H-Bombs of TBI"*

- *Hypoxemia*
- *Hypotension*
- *Hyperventilation*

Progress:

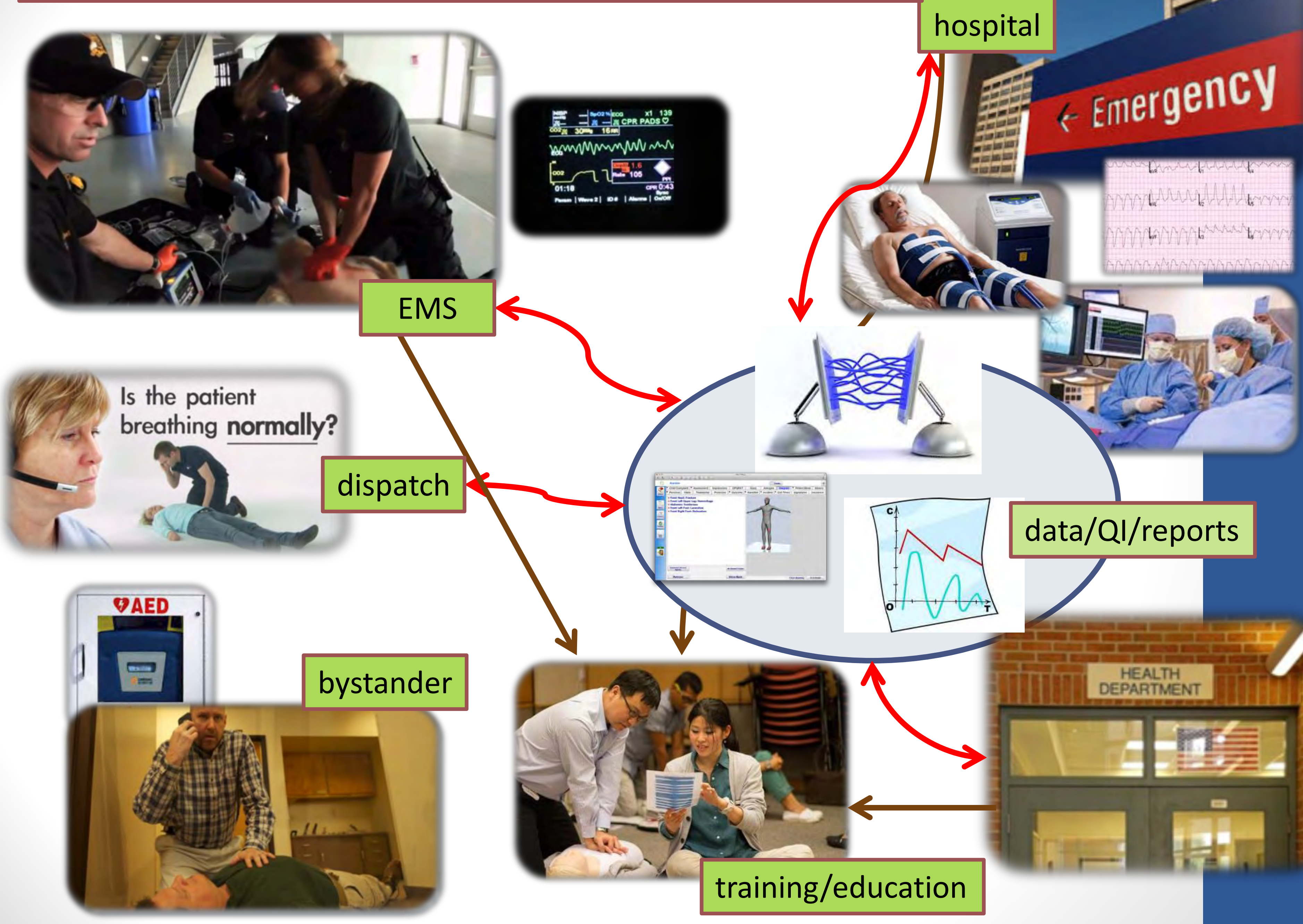
-EMS Agencies: 125 certified
~93% of TBIs statewide now receive care by EPIC agencies

-Master Trainers: ~600 statewide

-EMS Providers: >11,000 trained & certified (>80% of active providers)

-Estimated cases at end:
-Total: >20,000; Intubated: 4,000
-Final Analysis: 2017

UNDERSTANDING THE SYSTEM OF CARE



Survival rates of OHCA

• Chicago 1987	1%
• Ontario 1997	2%
• New York 1990	~1%
• Miami 1999	4%
• Seattle 1999-2000	5%
• Los Angeles 2000	1%
• Arizona 2003	3%

Ann Emergency Medicine 2005; 45: 504

Overall survival from OHCA has been stable for almost 30 years, as have the strong associations between key predictors (witnessed, bystander CPR, found in VF, and ROSC)

Sessons *et al*

Circ Cardiovasc Qual Outcomes, 2010; **3**:63-81

University of Arizona Sarver Heart Center CPR Research Group

Sanders, Ewy, Berg, Hilwig, Kern

Not shown

Charles Otto, MD (anesthesia),Terry Valenzuela MD (ED)

Chief Dan Newburn and Lani Clark

Adverse Hemodynamic Effects of Interrupting Chest Compressions for Rescue Breathing During Cardiopulmonary Resuscitation for Ventricular Fibrillation Cardiac Arrest

Robert A. Berg, MD; Arthur B. Sanders, MD; Karl B. Kern, MD; Ronald W. Hilwig, DVM, PhD; Joseph W. Heidenreich, BA; Matthew E. Porter, BA; Gordon A. Ewy, MD

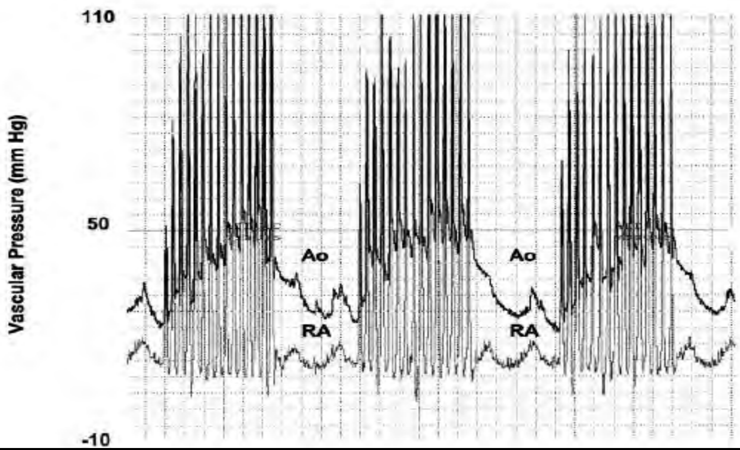


Figure 1. Aortic (Ao, dark band) and right atrial (RA, light band) pressures during standard CPR, CC+RB, with a 15:2 compression:ventilation ratio. Aortic relaxation, or diastolic, pressure (lower border of dark band) decreases during each set of 2 breaths, resulting in lower CPP during first several compressions of next cycle. Right atrial relaxation, or diastolic, pressure is most inferior border. Difference between Ao and RA relaxation pressures is CPP.

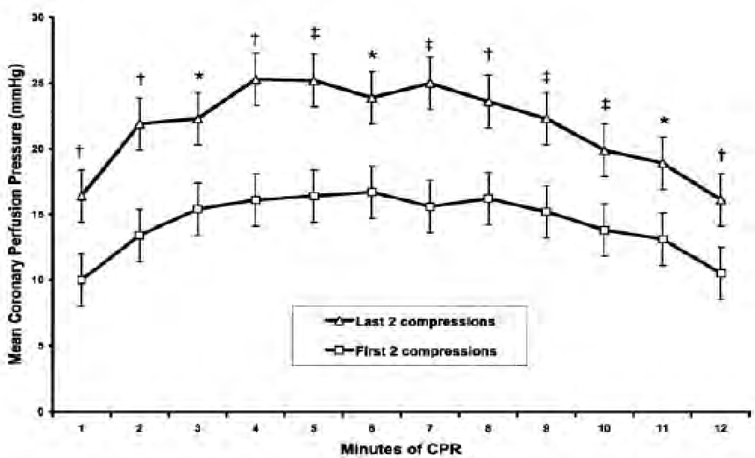
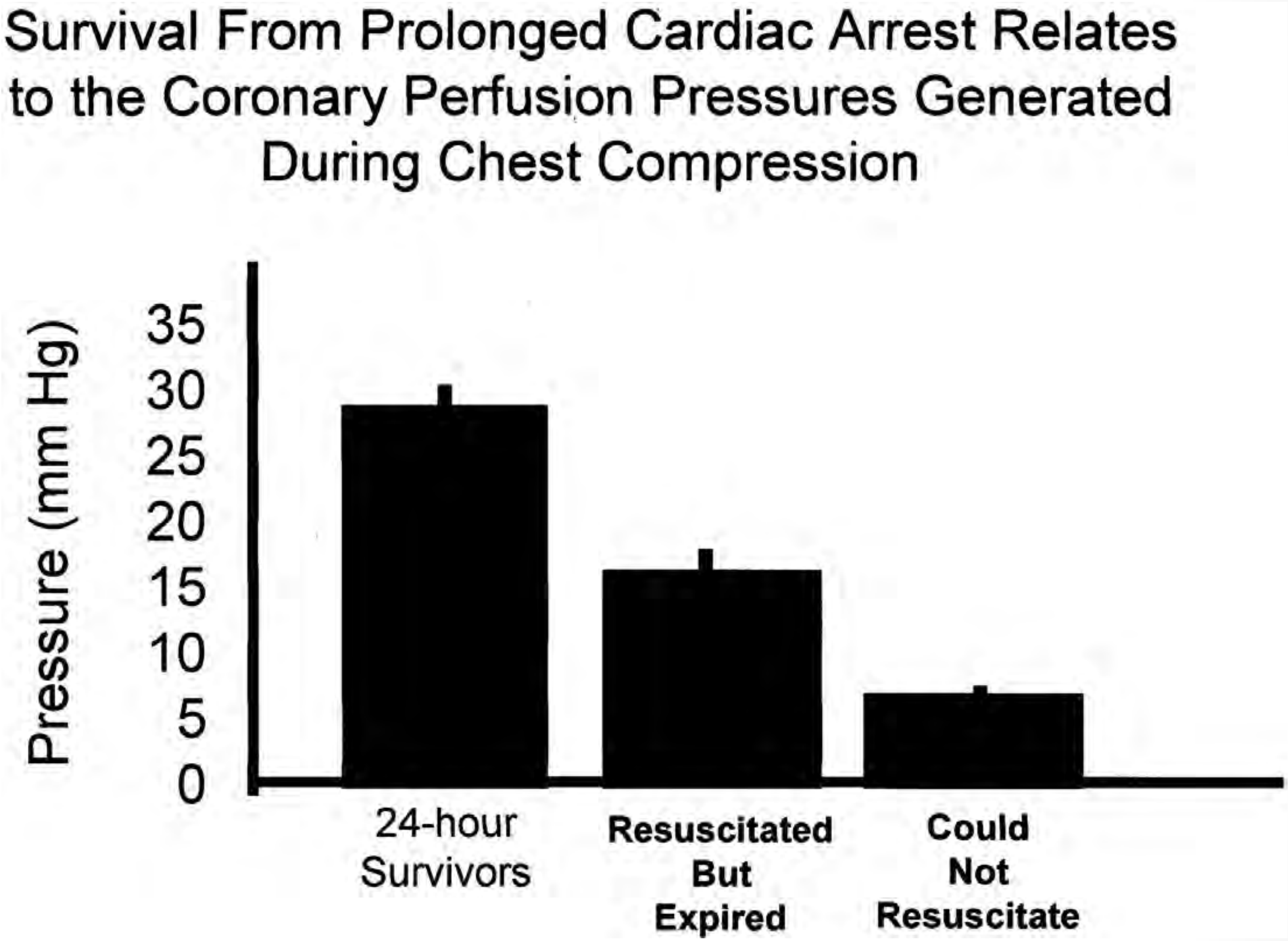


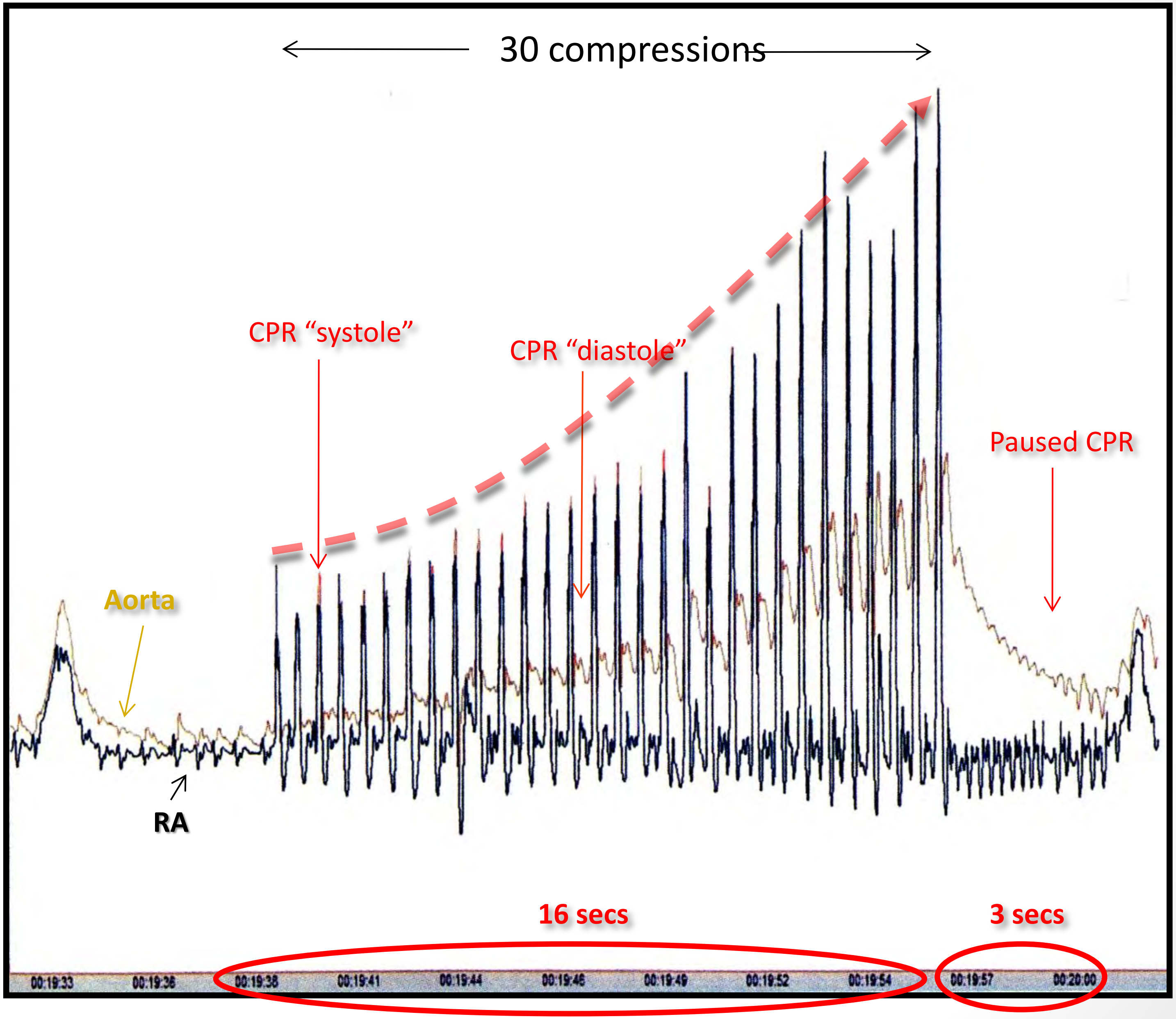
Figure 2. Mean CPP of first 2 compressions (bottom line) and last 2 compressions (top line) of each 15-compression cycle during CPR with CC+RB at a compression:ventilation ratio of 15:2. Mean CPP difference: *$P<0.05$; †$P<0.01$; ‡$P<0.001$.

Figure 2. Survival from prolonged cardiac arrest in canines relates to coronary perfusion pressure generated during external chest compressions.

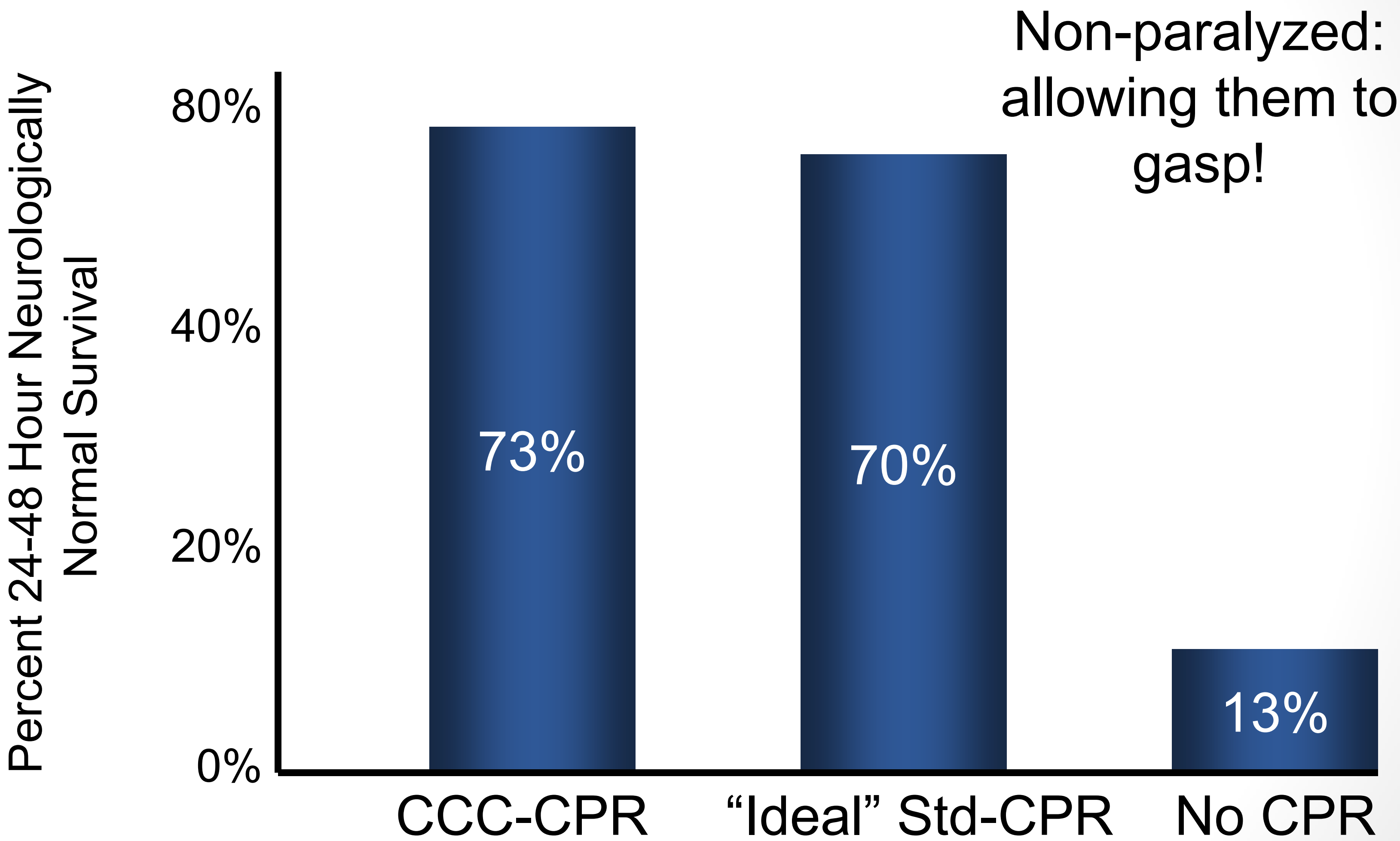


Gordon A. Ewy Circulation. 2005;111:2134-2142

The Price of CPR Pauses



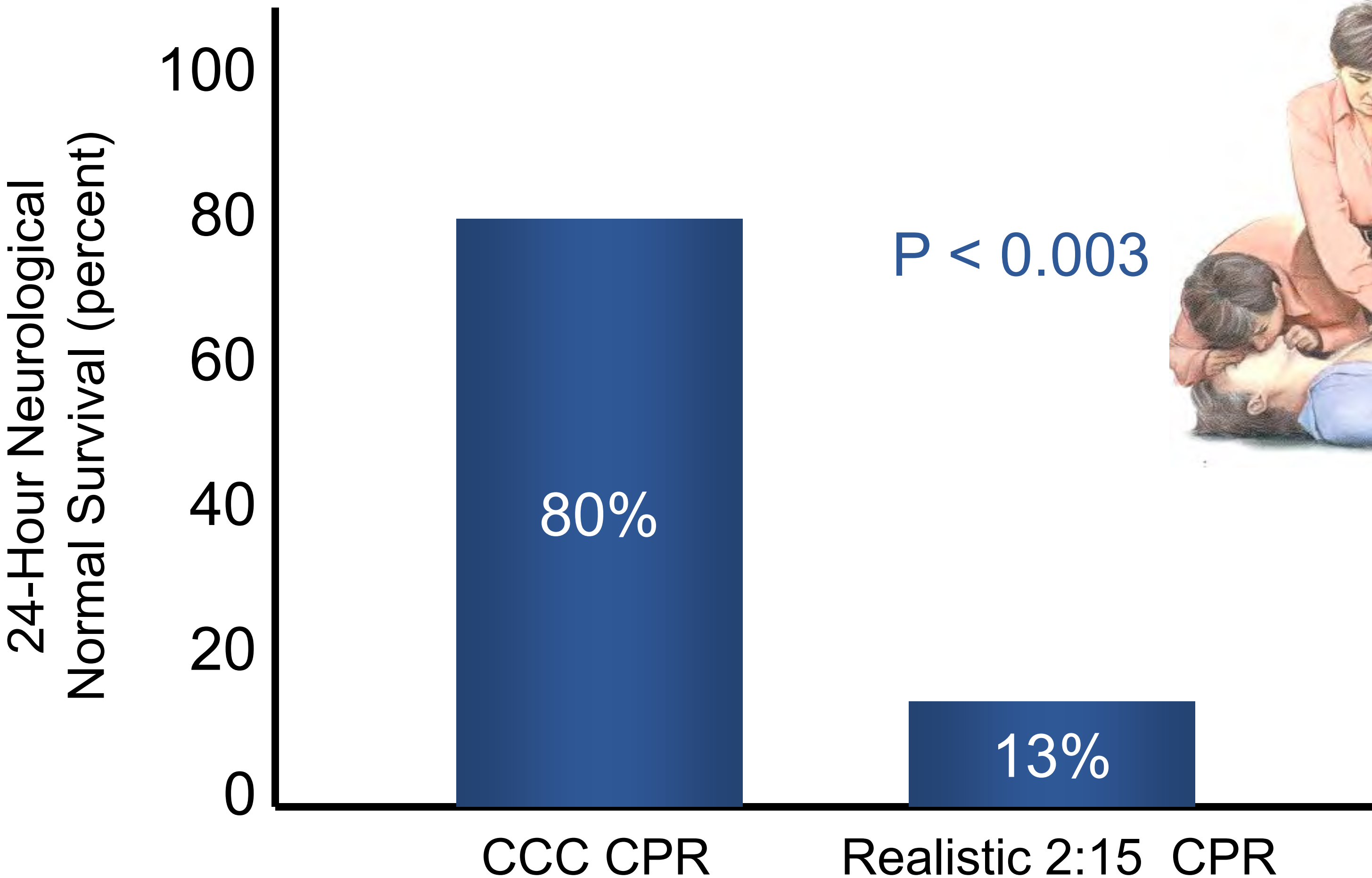
CPR studies of 169 non-paralyzed swine and published the results in 6 different publications between 1993 and 2002



University of Arizona Sarver Heart Center CPR Research Group

Outcomes During Simulated Single Lay Rescuer Scenario of VF

(3 minutes VF, 12 minutes CPR, then ACLS)



Kern, Hilwig, Berg, Sanders, Ewy. The Importance of Continuous Chest Compressions During CPR: Improved Outcome During Simulated Single Lay Rescuer Scenario *Circulation* 2002; 105: 645-649

EDITORIALS

Editorials represent the opinions of the authors and THE JOURNAL and not those of the American Medical Association.

Cardiopulmonary Resuscitation in the Real World: When Will the Guidelines Get the Message?

Arthur B. Sanders, MD

Gordon A. Ewy, MD

THE GUIDELINES FOR CARDIOPULMONARY RESUSCITATION (CPR) and Emergency Cardiovascular Care (ECC)[1] are probably the most widely implemented and best-known guidelines in medicine. In the setting of cardiac arrest, health care professionals want and need simple, practical, and effective guidelines. As the

(37%). Although neither of these studies was powered to assess patient survival, Abella et al found a trend showing that patients who had longer periods without chest compression had worse resuscitation outcome.

These reports are consistent with previous studies documenting low chest compression rates and high ventilation rates when CPR is performed by health care professionals.[5,6] They also complement studies looking at how laypersons and health professionals deliver CPR in cardiac arrest simulations. Assar et al[7] demonstrated that laypersons taught

Sanders AB and Ewy GA *JAMA* 2005 293: 363

Interruptions of Chest Compressions During Emergency Medical Systems Resuscitation

Terence D. Valenzuela, MD; Karl B. Kern, MD; Lani L. Clark, BS; Robert A. Berg, MS; Marc D. Berg, MS; David D. Berg; Ronald W. Hilwig, DVM, PhD; Charles W. Otto, MD; Daniel Newburn, BS; Gordon A. Ewy, MD

TABLE 1. Annual OOH Cardiac Arrest Survival Rates in Tucson, Arizona, 1992–2001

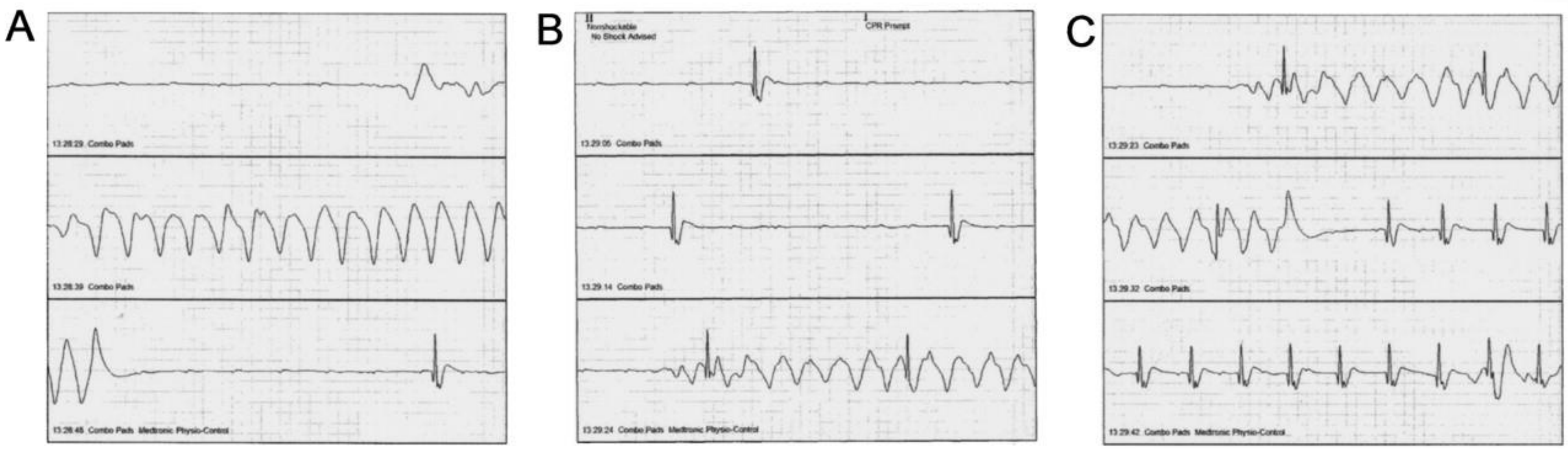
	Survival to Hospital Discharge Rate, %	
Year	All Initial Rhythms	VF Initial Rhythm
1992	7	14
1993	9	13
1994	4	7
1995	4	9
1996	4	8
1997	5	8
1998	7	9
1999	8	10
2000	5	8
2001	5	10

TABLE 3. Comparison of First 5 Minutes vs the Entire Resuscitation Effort

	First 5 Minutes	Entire Effort	*P*
Time with CCs, %	40±21	43±18	NS
Time without CCs, %	60±21	57±18	NS
Longest period with CCs, seconds	65 (46, 84)	122 (68, 206)	0.0001
Average period with CCs, seconds	46 (30, 67)	55 (43, 74)	NS
Longest period without CCs, seconds	95 (70, 147)	172 (109, 246)	0.0001
Average period without CCs, seconds	56 (41, 87)	57 (40, 78)	NS

CC indicates chest compression. Time interval data are reported as median and (25%, 75% interquartile range).

An AED ECG record from a representative patient.



Terence D. Valenzuela et al. Circulation. 2005;112:1259-1265

Cardiocerebral Resuscitation
for Cardiac Arrest

EMS arrival

CC-Only

200 chest compressions

Single shock:
No pulse check
nor rhythm analysis
after shock

200 chest compressions

Analysis

Single shock:
No pulse check
nor rhythm analysis
after shock

200 chest compressions

Analysis

Single shock:
No pulse check
nor rhythm analysis
after shock

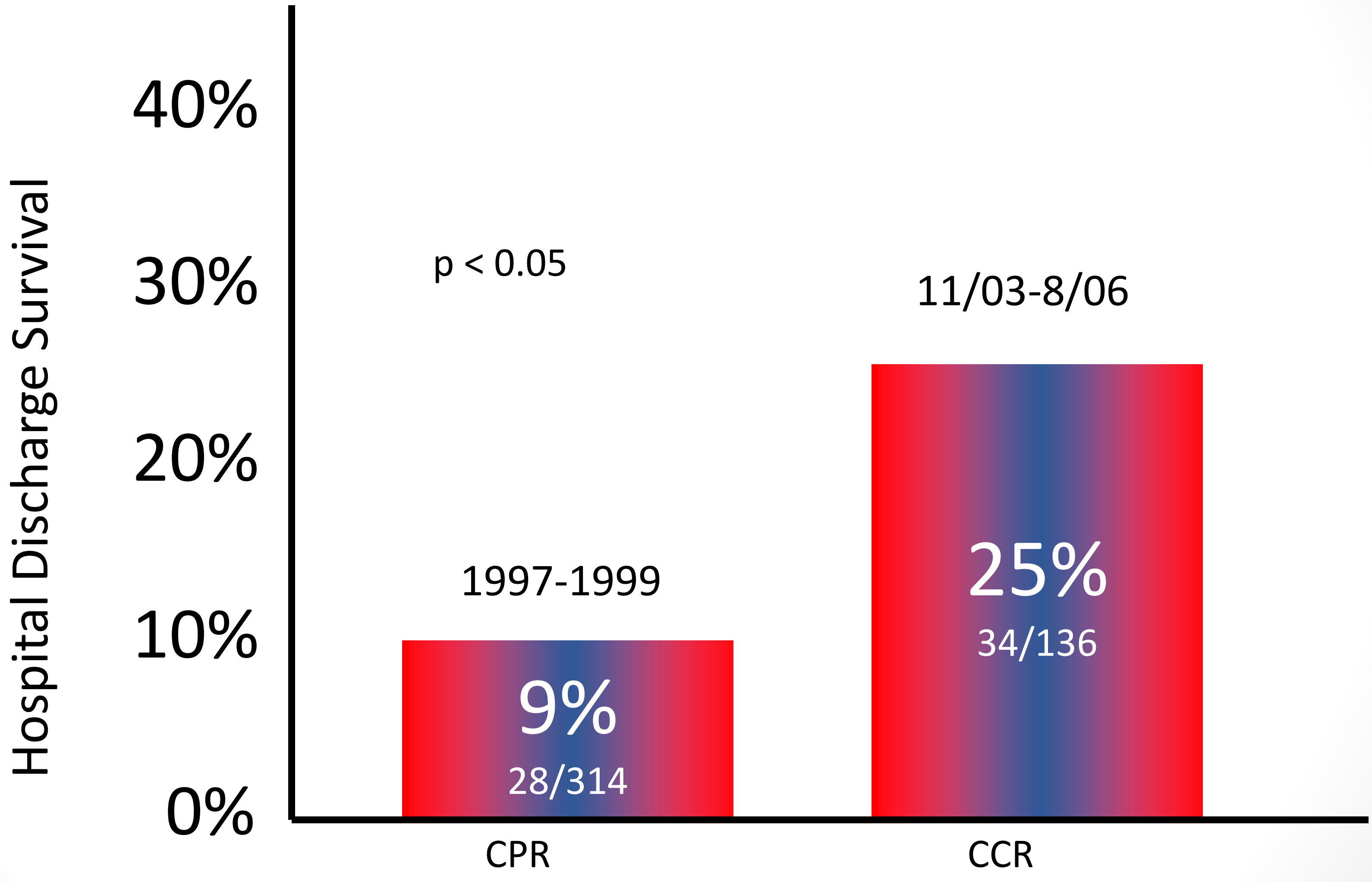
200 chest compressions 1

Passive insufflation of O_2,
Oral pharyngeal airway, Non-rebreather mask, High flow oxygen
Frees second person to start I.V.

1 = Consider intubation

Cardiocerebral Resuscitation

Saved Lives in Tucson



Terry Valenzuela MD   AHA Resuscitation Science Symposium 2006

ORIGINAL CONTRIBUTION

Minimally Interrupted Cardiac Resuscitation by Emergency Medical Services for Out-of-Hospital Cardiac Arrest

Bentley J. Bobrow, MD
Lani L. Clark, BS
Gordon A. Ewy, MD
Vatsal Chikani, MPH
Arthur B. Sanders, MD
Robert A. Berg, MD
Peter B. Richman, MD
Karl B. Kern, MD

Context Out-of-hospital cardiac arrest is a major public health problem.

Objective To investigate whether the survival of patients with out-of-hospital cardiac arrest would improve with minimally interrupted cardiac resuscitation (MICR), an alternate emergency medical services (EMS) protocol.

Design, Setting, and Patients A prospective study of survival-to-hospital discharge between January 1, 2005, and November 22, 2007. Patients with out-of-hospital cardiac arrests in 2 metropolitan cities in Arizona before and after MICR training of fire department emergency medical personnel were assessed. In a second analysis of protocol compliance, patients from the 2 metropolitan cities and 60 additional fire departments in Arizona who actually received MICR were compared with patients who

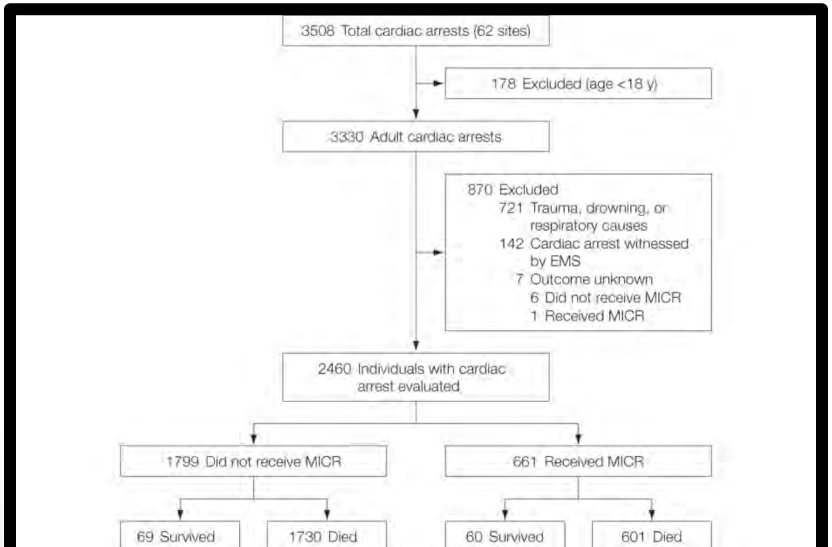


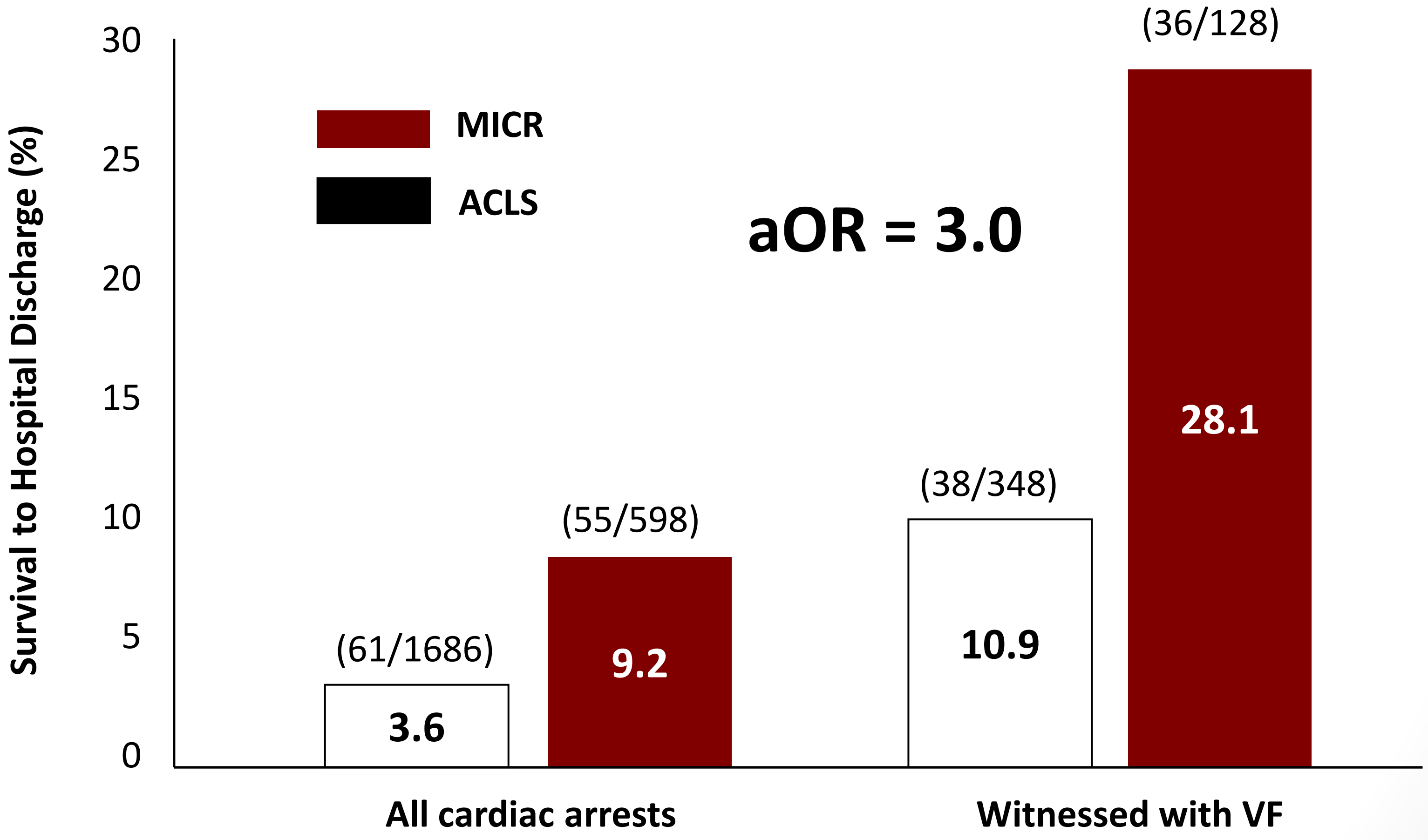
Table 2. Comparison of Major Outcomes in the Before and After Analysis

Outcomes	No./Total No. (%) of Patients: Before MICR Training	No./Total No. (%) of Patients: After MICR Training	Odds Ratio (95% CI): Unadjusted	Odds Ratio (95% CI): Adjusted	Significant Covariates in Final Model[a]
Primary outcomes					
Survival-to-hospital discharge	4/218 (1.8)	36/668 (5.4)	3.0 (1.1-8.6)	3.0 (1.1-8.9)	Witnessed arrest and VF
Survival with witnessed VF	2/43 (4.7)	23/131 (17.6)	4.4 (1.0-19.1)	8.6 (1.8-42.0)	Endotracheal intubation
Secondary outcomes					
Return of spontaneous circulation	34/218 (15.6)	154/668 (23.1)	1.6 (1.1-2.4)	1.3 (0.8-2.0)	Witnessed arrest, VF, endotracheal intubation, and site
Survival-to-hospital admission	35/218 (16.1)	113/668 (16.9)	1.1 (0.7-1.6)	0.8 (0.5-1.2)	Bystander CPR performed, witnessed arrest, VF, endotracheal intubation, entire EMS dispatch-to-arrival time

Abbreviations: CI, confidence interval; CPR, cardiopulmonary resuscitation; EMS, emergency medical services; MICR, minimally interrupted cardiac resuscitation; VF, ventricular fibrillation.

[a] Initial model included age, sex, location of cardiac arrest, bystander CPR performed, witnessed arrest, VF, endotracheal intubation, entire EMS dispatch-to-arrival time, and site. The final model included only significant covariates, as indicated.

Survival: MICR v. Standard CPR

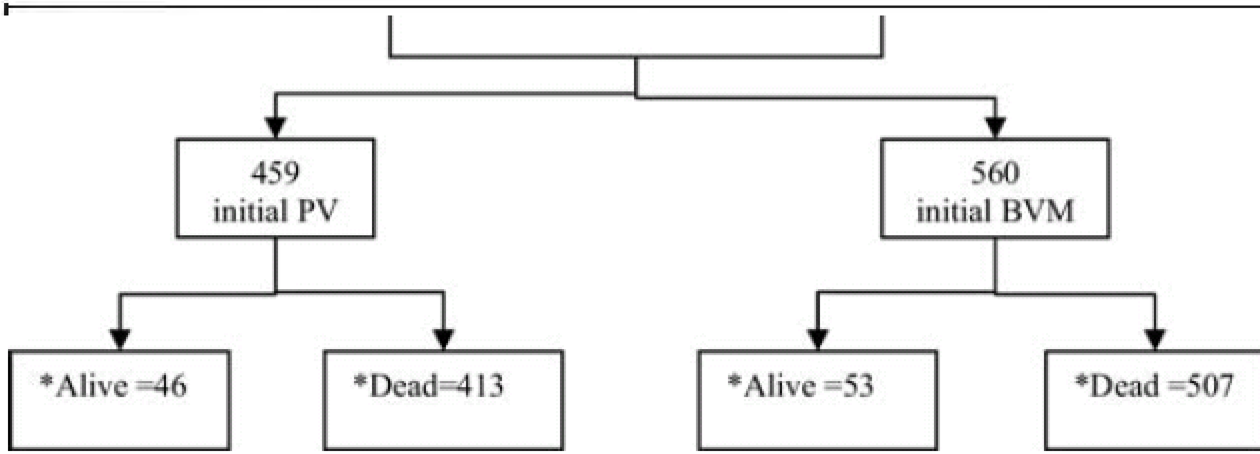


SHARE JAMA 2008 Vol. 299 No. 10

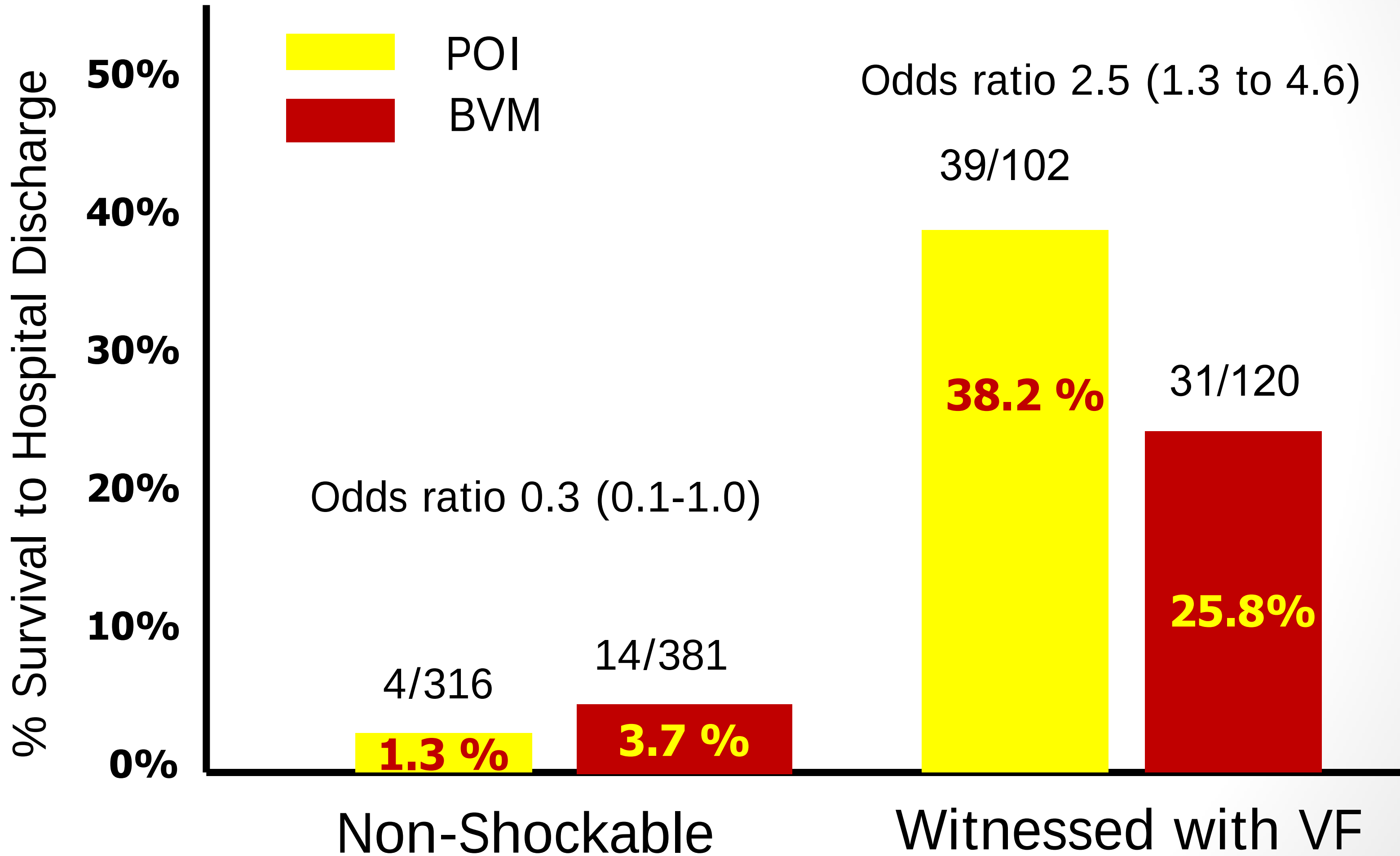
Passive Oxygen Insufflation Is Superior to Bag-Valve-Mask Ventilation for Witnessed Ventricular Fibrillation Out-of-Hospital Cardiac Arrest

Bentley J. Bobrow, MD
Gordon A. Ewy, MD
Lani Clark, BS
Vatsal Chikani, MPH
Robert A. Berg, MD
Arthur B. Sanders, MD
Tyler F. Vadeboncoeur, MD
Ronald W. Hilwig, DVM, PhD
Karl B. Kern, MD

From the Arizona Department of Health Services Bureau of Emergency Medical Services and Trauma System, Phoenix, AZ (Bobrow, Clark, Chikani); Department of Emergency Medicine, Maricopa Medical Center, Phoenix, AZ (Bobrow); the University of Arizona Sarver Heart Center (Bobrow, Ewy, Clark, Sanders, Hilwig, Kern); the Departments of Medicine (Ewy), and Emergency Medicine (Bobrow, Sanders), University of Arizona College of Medicine, Tucson, AZ, and Critical Care Medicine, Children's Hospital of Philadelphia, Philadelphia, PA (Berg); Department of Emergency Medicine, Mayo Clinic, Jacksonville, FL (Vadeboncoeur).



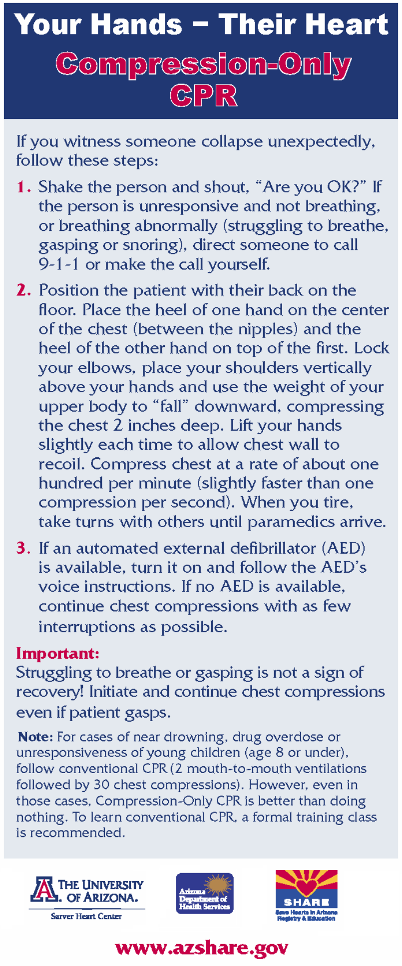
Outcomes by Ventilation Method
N=1,019



SHARE - Annals of EM Nov. 2009

Public health Intervention

- In 2005 ADHS and the SHC initiated a statewide public COCPR campaign:
  - celebrity endorsements,
  - newspaper articles,
  - Radio, billboard and TV spots,
  - flyers sent to households in utility bills
  - No structured DA-CPR



Your Hands – Their Heart

Compression-Only CPR

If you witness someone collapse unexpectedly, follow these steps:

1. Shake the person and shout, "Are you OK?" If the person is unresponsive and not breathing, or breathing abnormally (struggling to breathe, gasping or snoring), direct someone to call 9-1-1 or make the call yourself.
2. Position the patient with their back on the floor. Place the heel of one hand on the center of the chest (between the nipples) and the heel of the other hand on top of the first. Lock your elbows, place your shoulders vertically above your hands and use the weight of your upper body to "fall" downward, compressing the chest 2 inches deep. Lift your hands slightly each time to allow chest wall to recoil. Compress chest at a rate of about one hundred per minute (slightly faster than one compression per second). When you tire, take turns with others until paramedics arrive.
3. If an automated external defibrillator (AED) is available, turn it on and follow the AED's voice instructions. If no AED is available, continue chest compressions with as few interruptions as possible.

Important:
Struggling to breathe or gasping is not a sign of recovery! Initiate and continue chest compressions even if patient gasps.

Note: For cases of near drowning, drug overdose or unresponsiveness of young children (age 8 or under), follow conventional CPR (2 mouth-to-mouth ventilations followed by 30 chest compressions). However, even in those cases, Compression-Only CPR is better than doing nothing. To learn conventional CPR, a formal training class is recommended.

The University of Arizona. Sarver Heart Center

SHARE

www.azshare.gov


792-9222
New CPR developed here.
THE UNIVERSITY OF ARIZONA


CLEAR CHANNEL
Be a Lifesaver.
Learn Continuous
Chest Compression CPR.
The University of
Arizona
Sarver Heart Center
626-4083
UMC
University Medical Center
002912

ORIGINAL CONTRIBUTION

Chest Compression–Only CPR by Lay Rescuers and Survival From Out-of-Hospital Cardiac Arrest

Bentley J. Bobrow, MD
Daniel W. Spaite, MD
Robert A. Berg, MD
Uwe Stolz, PhD, MPH
Arthur B. Sanders, MD
Karl B. Kern, MD
Tyler F. Vadeboncoeur, MD
Lani L. Clark, BS
John V. Gallagher, MD
J. Stephan Stapczynski, MD
Frank LoVecchio, DO
Terry J. Mullins, MBA
Will O. Humble, MPH
Gordon A. Ewy, MD

Context Chest compression–only bystander cardiopulmonary resuscitation (CPR) may be as effective as conventional CPR with rescue breathing for out-of-hospital cardiac arrest.

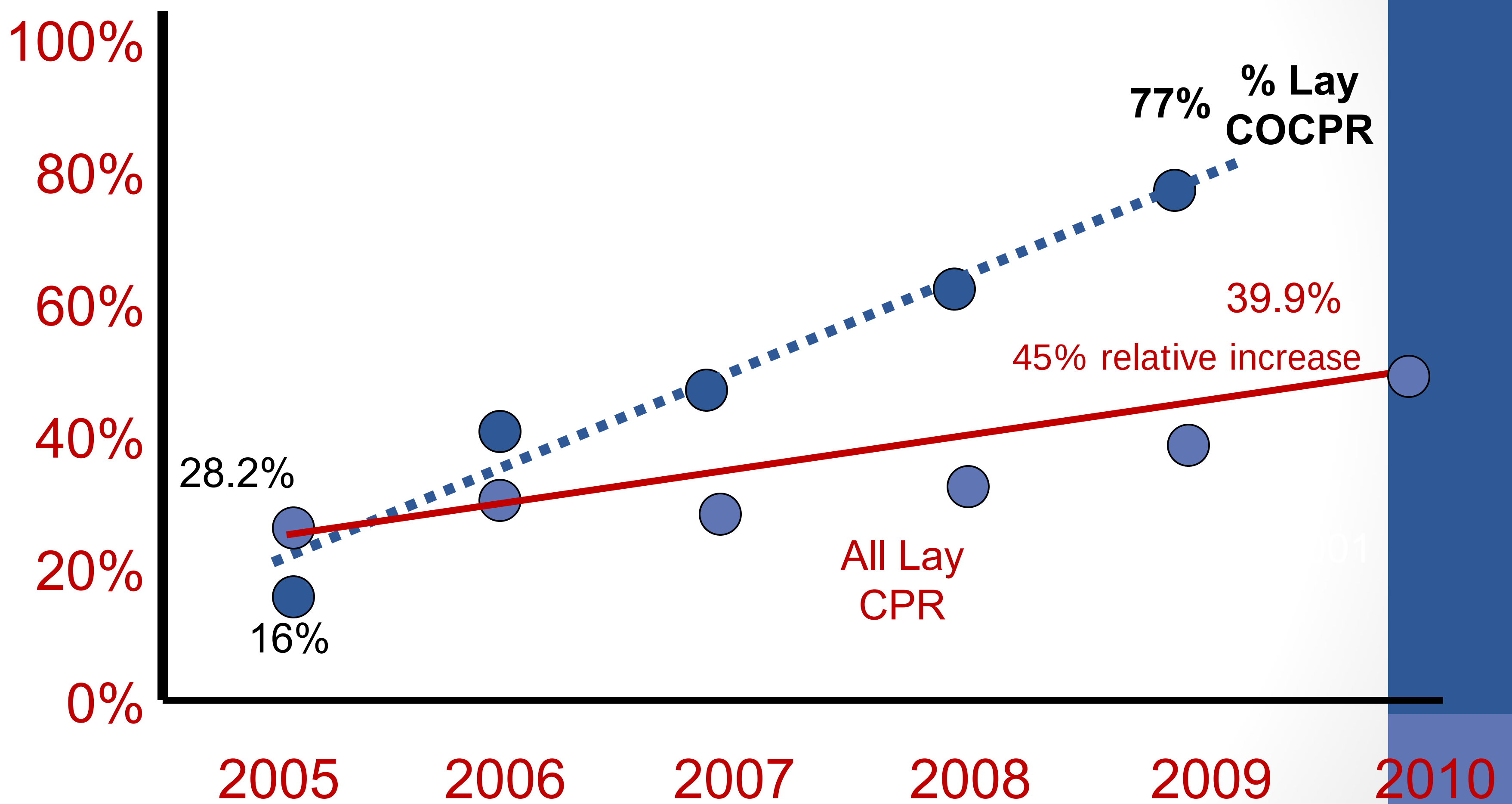
Objective To investigate the survival of patients with out-of-hospital cardiac arrest using compression-only CPR (COCPR) compared with conventional CPR.

Design, Setting, and Patients A 5-year prospective observational cohort study of survival in patients at least 18 years old with out-of-hospital cardiac arrest between January 1, 2005, and December 31, 2009, in Arizona. The relationship between layperson bystander CPR and survival to hospital discharge was evaluated using multivariable logistic regression.

Main Outcome Measure Survival to hospital discharge.

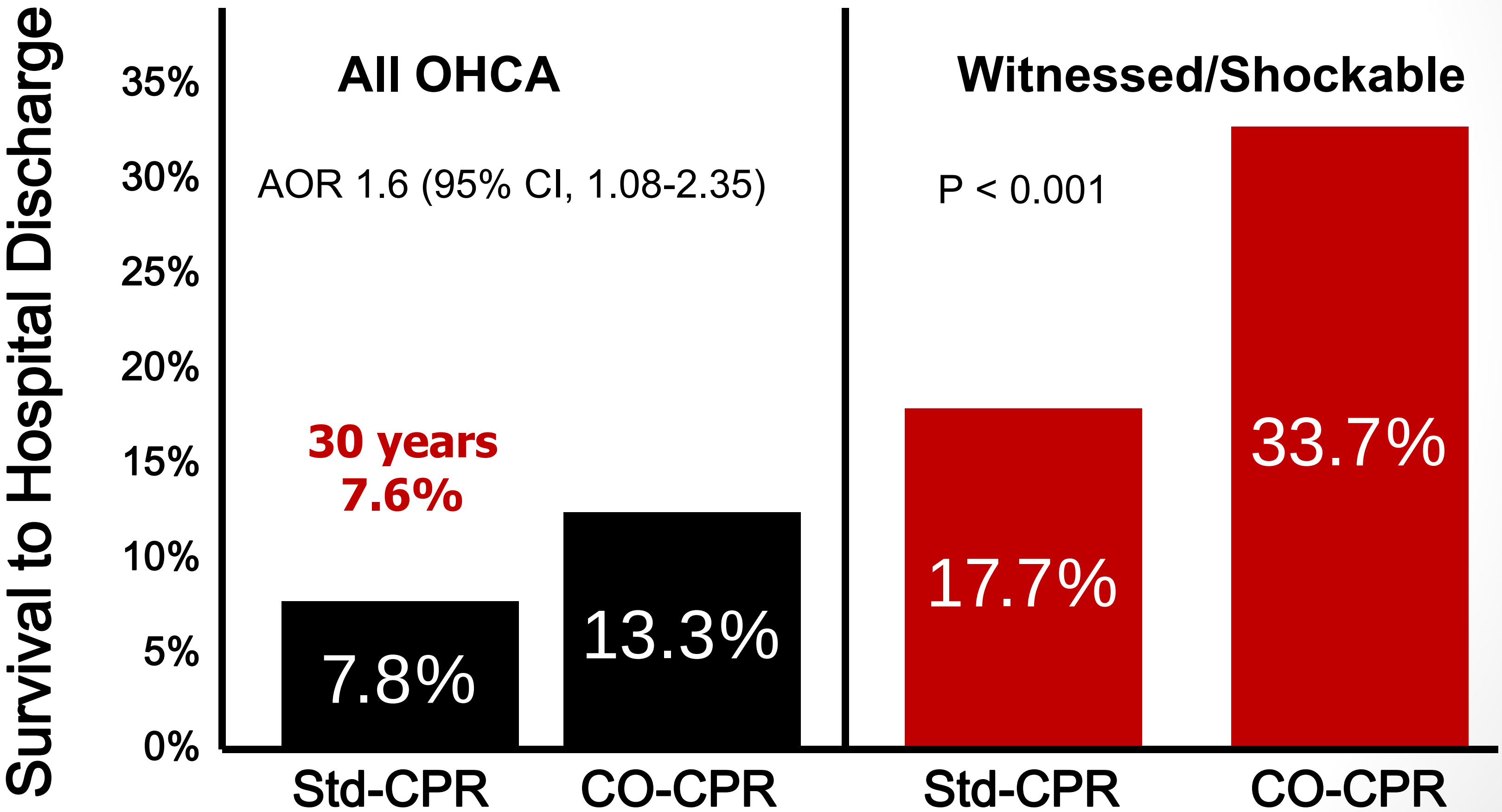
Results Among 5272 adults with out-of-hospital cardiac arrest of cardiac etiology not observed by responding emergency medical personnel, 779 were excluded because bystander CPR was provided by a health care professional or the arrest occurred in a medical facility. A total of 4415 met all inclusion criteria for analysis, including 2900 who received no bystander CPR, 666 who received conventional CPR, and 849 who received COCPR. Rates of survival to hospital discharge were 5.2% (95% confidence interval [CI], 4.4%-6.0%) for the no bystander CPR group, 7.8% (95% CI, 5.8%-9.8%) for conventional CPR, and 13.3% (95% CI, 11.0%-15.6%) for COCPR. The adjusted odds ratio

Bystander CPR: Incidence and Type



SHARE - JAMA 2010; Oct

OHCA Survival in Arizona (2005 to 2010)
Compression-Only CPR Advocated and Taught



SHARE JAMA 2010:304:1447-1454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ARTICLE IN PRESS

EMERGENCY MEDICAL SERVICES/ORIGINAL RESEARCH

Statewide Regionalization of Postarrest Care for Out-of-Hospital Cardiac Arrest: Association With Survival and Neurologic Outcome

Daniel W. Spaite, MD*; Bentley J. Bobrow, MD; Uwe Stolz, PhD, MPH; Robert A. Berg, MD; Arthur B. Sanders, MD; Karl B. Kern, MD; Vatsal Chikani, MPH; Will Humble, MPH; Terry Mullins, MBA; J. Stephan Stapczynski, MD; Gordon A. Ewy, MD; for the Arizona Cardiac Receiving Center Consortium†

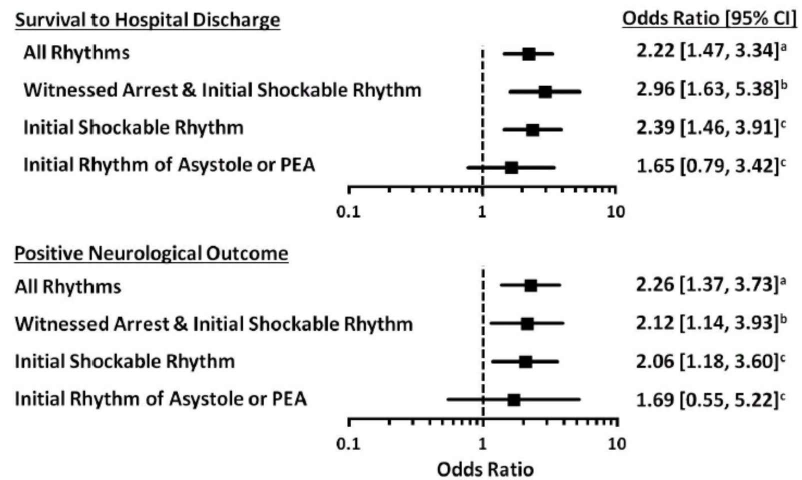
*Corresponding Author. E-mail: dan@aemrc.arizona.edu.

Study objective: For out-of-hospital cardiac arrest, authoritative, evidence-based recommendations have been made for regionalization of postarrest care. However, system-wide implementation of these guidelines has not been evaluated. Our hypothesis is that statewide regionalization of postarrest interventions, combined with emergency medical services (EMS) triage bypass, is associated with improved survival and neurologic outcome.

Requirements for Being Recognized as an Arizona Cardiac Receiving Center

__In order to be recognized as a Cardiac Receiving Center, a hospital must have:__

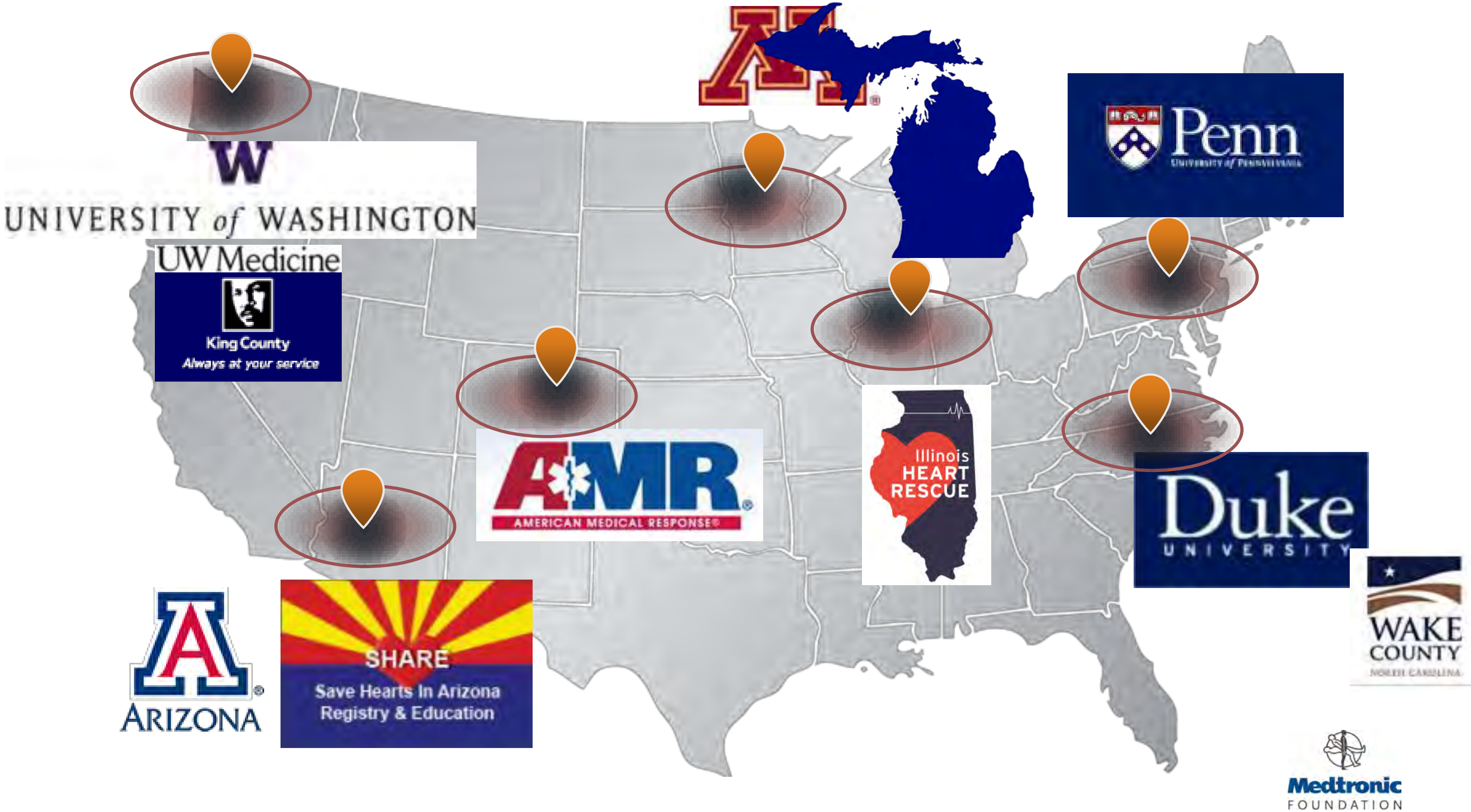
1) a Therapeutic Hypothermia (TH) method and associated protocol for out-of-hospital cardiac arrest (OHCA)
2) primary Percutaneous Coronary Intervention (PCI) capability with protocol for OHCA including consultation with a Cardiology Interventionist for consideration of emergent PCI
3) a system, included in the protocol, for timely completion and submission of the one-page data form for **EACH** __OHCA patient__ (NOT just cooled patients) and the one-page data form for __ALL EMS and ALL walk-in STEMI patients__. The data forms can be found on the SHARE website: http://www.azshare.gov/Info4CAC.htm
4) an evidence-based termination of resuscitation protocol (including a 72-hour moratorium on termination of care for patients receiving TH)
5) a protocol to address organ donation
6) CPR training for the community



Spaite et al., Annals of EM– 2014

HeartRescue PROJECT

HeartRescue Partners



The Most Important First Responder

Original Research

Telephone CPR Instructions in Emergency Dispatch Systems: A Qualitative Survey of 9-1-1 Call Centers

John Sutter, BS[*,¶]
Micah Panczyk, MS[*]
Daniel W. Spaite, MD[†]
Jose Ferrer, MD[‡]
Jason Roosa, MD, MS[§]
Christian Dameff, MD[*]
Blake Langlais[*]
Ryan A. Murphy, MD[¶]
Bentley J. Bobrow, MD[*†]

[*]Arizona Department of Health Services, Phoenix, Arizona
[†]University of Arizona, Department of Emergency Medicine, Arizona Emergency Medicine Research Center, Tucson, Arizona
[‡]American Heart Association
[§]Lutheran Medical Center, Wheat Ridge, Colorado
[¶]University of Arizona College of Medicine – Phoenix, Phoenix, Arizona

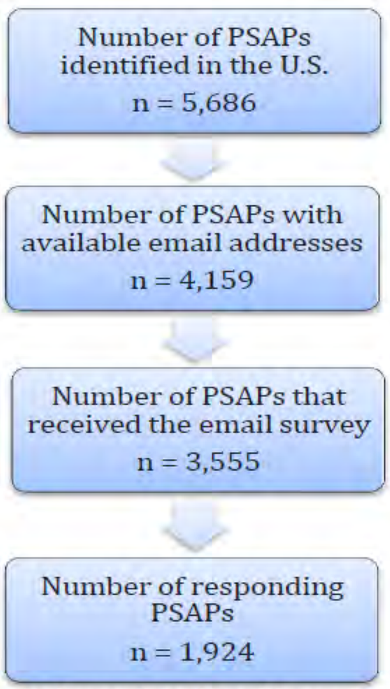


Figure 1. Number of responding public safety answering points in the United States.
PSAP, public safety answering point

Table 2. Structured script and guideline-based protocol use at public safety answering points that provide instructions for medical emergencies

Script/guideline use	n	%	Type of script/aid	n	%
Structured script	834	83	A manual system (e.g. printed cards)	507	61
Written guidelines	138	14	A computer-based system	318	39
No script or guidelines	30	3			
Total	1,002	100	Total		100

Research

Original Investigation

Implementation of a Regional Telephone Cardiopulmonary Resuscitation Program and Outcomes After Out-of-Hospital Cardiac Arrest

Bentley J. Bobrow, MD; Daniel W. Spaite, MD; Tyler F. Vadeboncoeur, MD; Chengcheng Hu, PhD; Terry Mullins, MBA; Wayne Tormala, MSW; Christian Dameff, MD; John Gallagher, MD; Gary Smith, MD; Micah Panczyk, MS

IMPORTANCE Bystander cardiopulmonary resuscitation (CPR) significantly improves survival from out-of-hospital cardiac arrest but is provided in less than half of events on average. Telephone CPR (TCPR) can significantly increase bystander CPR rates and improve clinical outcomes.

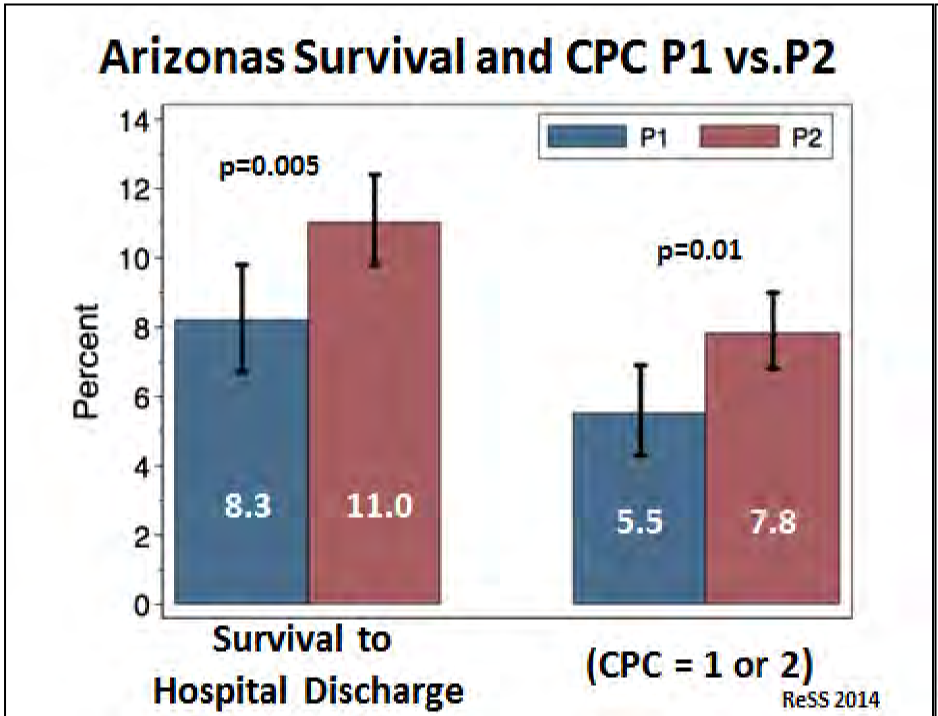
OBJECTIVE To investigate the effect of a TCPR bundle of care on TCPR process measures and outcomes.

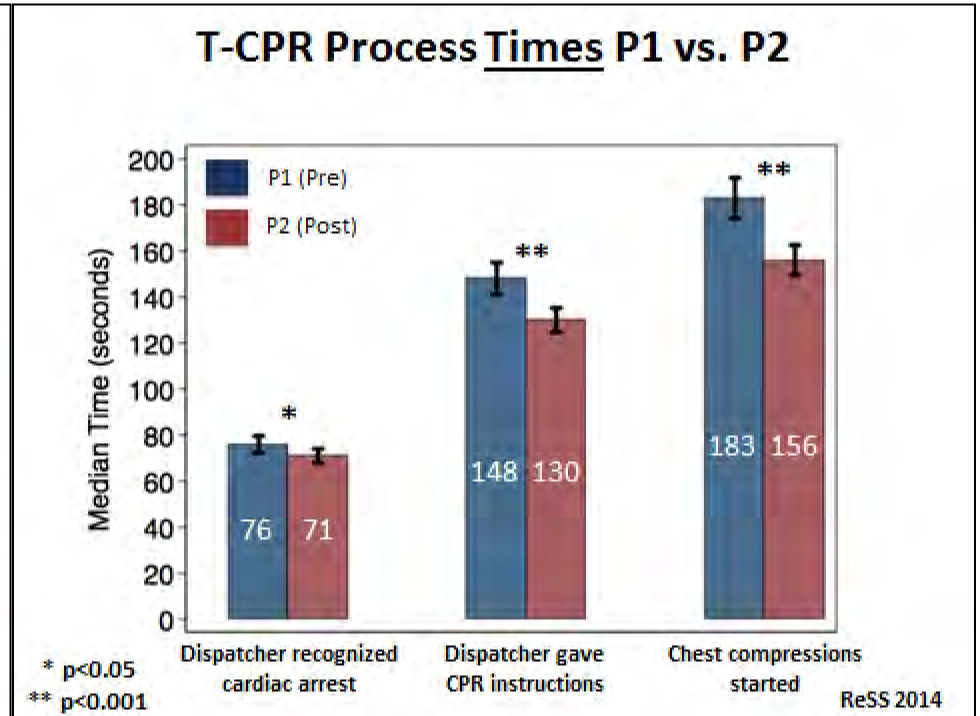
DESIGN, SETTING, AND PARTICIPANTS A prospective, before-after, observational study of adult patients with out-of-hospital cardiac arrest not receiving bystander CPR before the 9-1-1 call between October 1, 2010, and September 30, 2013.

INTERVENTIONS A TCPR program, including guideline-based protocols, telecommunicator training, data collection, and feedback, in 2 regional dispatch centers servicing metropolitan Phoenix, Arizona. Audio recordings of out-of-hospital cardiac arrest calls were audited and linked with emergency medical services and hospital outcome data.

Invited Commentary and Editor's Note

Supplemental content at jamacardiology.com





Clinical paper

Barriers to telephone cardiopulmonary resuscitation in public and residential locations☆

Hidetada Fukushima[a,b,c,*], Micah Panczyk[a], Daniel W. Spaite[b], Vatsal Chikani[a], Christian Dameff[d,e], Chengcheng Hu[f], Tonje S. Birkenes[g], Helge Myklebust[g], John Sutter[d], Blake Langlais[h], Zhixin Wu[a,b], Bentley J. Bobrow[a,b,d]

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[b] University of Arizona, Department of Emergency Medicine, Arizona Emergency Medicine Research Center, 714 East Van Buren St, Phoenix, AZ 85006, United States
[c] Department of Emergency and Critical Care Medicine, Nara Medical University, Shijo-cho, 840, Kashihara City, Nara 6348522, Japan
[d] University of Arizona College of Medicine Phoenix, 550 East Van Buren St, Phoenix, AZ 85004, United States
[e] Maricopa Medical Center, 2601 East Roosevelt St, Phoenix, AZ 85008, United States
[f] University of Arizona, Department of Epidemiology and Biostatistics, Mel and Enid Zuckerman College of Public Health, 1295 North, Martin Avenue, Tucson, AZ 85724, United States
[g] Laerdal Medical AS, Tanke Svilandsgate 30, N-4002 Stavanger, Norway
[h] Arizona State University, School of Mathematical and Statistical Science, University Drive and Mill Avenue, Tempe, AZ 85287, United States

Table 2
TCPR process analysis.

	Public locations (N = 187)	Residential locations (N = 1500)	p value*
Telecommunicator recognized CPR need[a]	145 (81.9%)	1332 (91.4%)	<0.001
TCPR instructions started[b]	93 (50.5%)	992 (66.8%)	<0.001
TCPR (instruction given and compressions started)[c]	70 (38.5%)	853 (58.5%)	<0.001

Table 3
Distribution of barriers to TCPR.

	Public locations (N = 187)	Residential locations (N = 1500)	p value*
Difficulties to access to the patient	6 (3.2%)	21 (1.4%)	0.063
Language	3 (1.6%)	35 (2.3%)	0.526
Caller left the phone	8 (4.3%)	82 (5.5%)	0.495
Caller hung up the phone	5 (2.7%)	77 (5.1%)	0.140
Caller was not with patient	22 (11.8%)	40 (2.7%)	<0.001
Caller refused CPR instruction	12 (6.4%)	133 (8.9%)	0.260
Telecommunicator was unable to calm callers	4 (2.1%)	127 (8.5%)	0.002
Caller's physical limitation to perform CPR	1 (0.5%)	18 (1.2%)	0.416
Caller was unable to get patient to hard flat surface	26 (13.9%)	381 (25.4%)	<0.001

CPR, cardiopulmonary resuscitation; TCPR, telephone CPR.
* Chi-square test or Fischer's exact test. The cases in which CPR was already in progress were removed from both groups.

Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

ELSEVIER

EUROPEAN RESUSCITATION COUNCIL

Clinical paper

Disparities in telephone CPR access and timing during out-of-hospital cardiac arrest

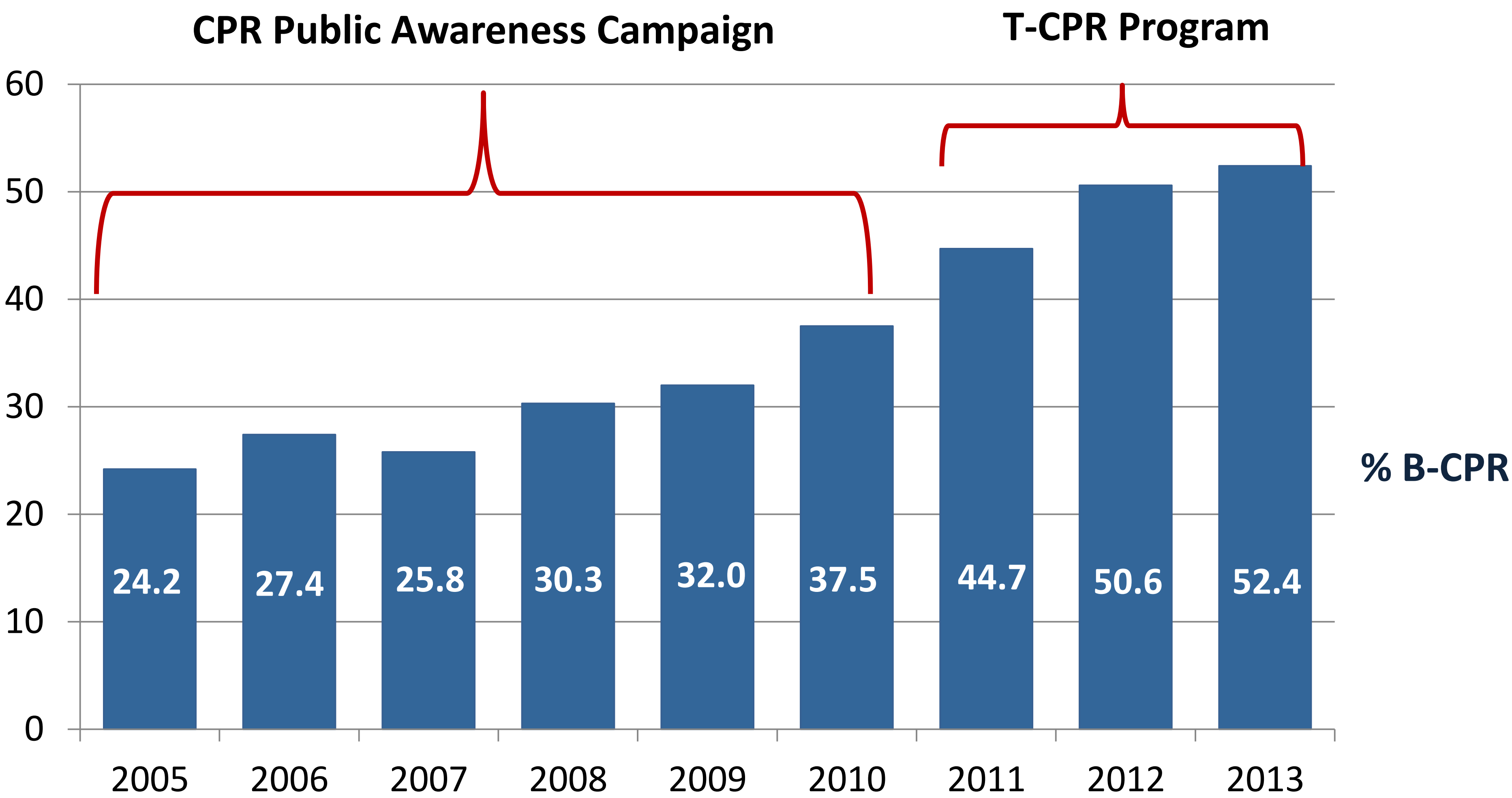
Tomas Nuño[a,b,c,*], Bentley J. Bobrow[a,b,d], Karen A. Rogge-Miller[a], Micah Panczyk[d], Terry Mullins[d], Wayne Tormala[d], Antonio Estrada[e], Samuel M. Keim[a,b], Daniel W. Spaite[a,b]

[a] Arizona Emergency Medicine Research Center, College of Medicine, University of Arizona, Phoenix, AZ, United States
[b] Department of Emergency Medicine, College of Medicine, University of Arizona, Tucson, AZ, United States
[c] Division of Public Health Practice & Translational Research, Mel and Enid Zuckerman College of Public Health, University of Arizona, Phoenix, AZ, United States
[d] Bureau of Emergency Medicine and Trauma System, Arizona Department of Health Services, Phoenix, AZ, United States
[e] Department of Mexican-American Studies, College of Social & Behavioral Sciences, University of Arizona, Tucson, AZ, United States

Table 2
Association between language barriers and TCPR Process Measures.

Variable	No language barrier indicated (n = 3344)	Spanish language barrier indicated (n = 39)	All other languages combined barrier indicated (n = 15)	*p*-value
Age of victim (mean years)	60.0 (SD = 20.5)	52.9 (SD = 22.9)	71.4 (SD = 13.8)	0.02
Percent of telecommunicators that recognized need for CPR	89.7 (SD = 30.4)	89.7 (SD = 30.7)	100.0 (SD = 0)	0.42
Percent of telecommunicators that began CPR instructions	56.6 (SD = 49.6)	74.4 (SD = 44.2)	53.3 (SD = 51.6)	0.08
Percent of patients that had CPR compressions started	59.0 (SD = 49.2)	48.7 (SD = 50.6)	46.7 (SD = 51.6)	0.27
Percent of patients that experienced delay of CPR	22.0 (SD = 41.4)	48.7 (SD = 50.6)	60.0 (SD = 50.7)	<0.001
Time until telecommunicator recognized need for CPR (mean s)	87.4 (SD = 63.8)	160.6 (SD = 97.6)	130.5 (SD = 84.6)	<0.001
Time until telecommunicator began CPR instructions (mean s)	144.4 (SD = 73.6)	231.3 (SD = 103.2)	170.4 (SD = 62.7)	<0.001
Time until first compression (mean s)	174.4 (SD = 88.0)	290.9 (SD = 144.4)	174.0 (SD = 83.4)	<0.001

B-CPR Rates by Year in Maricopa County



Contents lists available at ScienceDirect

Resuscitation

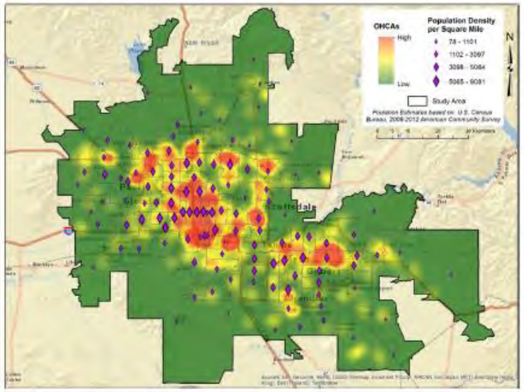
journal homepage: www.elsevier.com/locate/resuscitation

Clinical Paper

Analysis of out-of-hospital cardiac arrest location and public access defibrillator placement in Metropolitan Phoenix, Arizona☆

Sungwoo Moon[a,b,c,*], Tyler F. Vadeboncoeur[d], Wesley Kortuem[e], Marvis Kisakye[e], Madalyn Karamooz[f], Bernadette White[a], Paula Brazil[a], Daniel W. Spaite[b], Bentley J. Bobrow[a,b,g]

[a] Arizona Department of Health Services Bureau of Emergency Medical Services and Trauma System, Phoenix, AZ, United States
[b] Arizona Emergency Medicine Research Center, University of Arizona College of Medicine, Tucson, AZ, United States
[c] Department of Emergency Medicine, Korea University Ansan Hospital, Ansan, Gyeonggido, South Korea
[d] Department of Emergency Medicine, Mayo Clinic, Jacksonville, FL, United States
[e] Arizona Department of Health Services Bureau of Public Health Statistics, Phoenix, AZ, United States
[f] University of Pennsylvania School of Medicine, Philadelphia, PA, United States
[g] Department of Emergency Medicine, Maricopa Medical Center, Phoenix, AZ, United States



3. Map of kernel-density estimation of out-of-hospital cardiac arrests (OHCAs) and population densities of ZIP code tabulation areas (ZCTAs

Table 2
Top 5 location types of out-of-hospital cardiac arrest (OHCA) incidents and number of automated external defibrillators (AEDs) at the same location type.

Rank	Location type[a]	OHCAs (n = 654)			AEDs (n = 1704), no. (%)
		no. (%)	Male, no. (%)	Age, mean (±SD)	
1	In a Car/Road/Parking lot[b]	190 (29.1)	146 (76.8)	61 (±16)	No matched AED
2	Public business/Office/Workplace	65 (9.9)	49 (75.4)	54 (±12)	663 (38.9)
3	Public street/Sidewalk/Bus stop/alley[c]	60 (9.2)	48 (80.0)	57 (±16)	No matched AED
4	Park/Outdoor recreation	43 (6.6)	37 (86.0)	56 (±14)	16 (0.9)
5	Store/Mall	39 (5.9)	28 (71.8)	64 (±15)	34 (2.0)

[a] There are total 26 location types in OHCA database.
[b] When event occurred in a car or victims were driving.
[c] When event occurred in a pedestrian way, bus stop, or victims were walking.

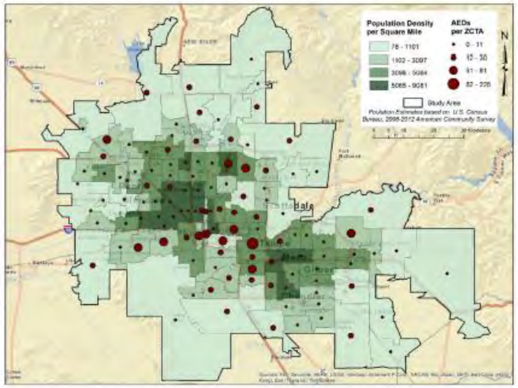


Fig. 4. Map of population densities and number of automated external defibrillators (AEDs) of ZIP code tabulation areas (ZCTAs) of Met

Table 3
Top 5 location types according to the number of placed automated external defibrillators (AEDs) and out-of-hospital cardiac arrest (OHCA) incidents in the same location type.

Rank	Location type[a]	AEDs (n = 1704), no. (%)	OHCAs (n = 654), no. (%)
1	Public business/Office	663 (38.9)	65 (9.9)
2	Schools	558 (32.8)	5 (0.8)
3	Federal/State/City government building	108 (6.3)	12 (1.8)
4	Place of worship	71 (4.2)	13 (2.0)
5	Retirement community or complex	60 (3.5)	10 (1.5)

[a] There are total 27 location types in AED registry.


MOMENTS OF TRUTH
by Tom Fishburne
WE PICKED OPTION C BY APPLYING THE EENIEMEENIEMINEYMO™ METHODOLOGY
A
B
C
AS LONG AS IT WASN'T BASED JUST ON YOUR GUT
LIBERATING CONSUMER INTELLIGENCE. EMPOWERING MARKETERS.
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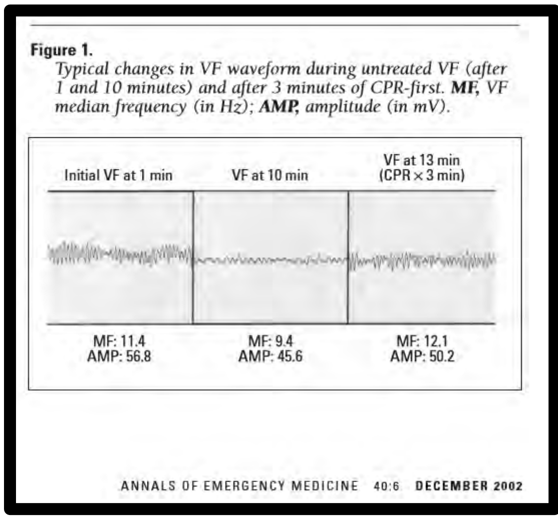
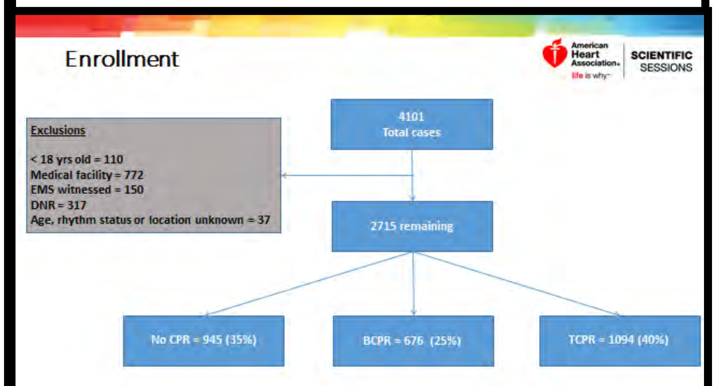
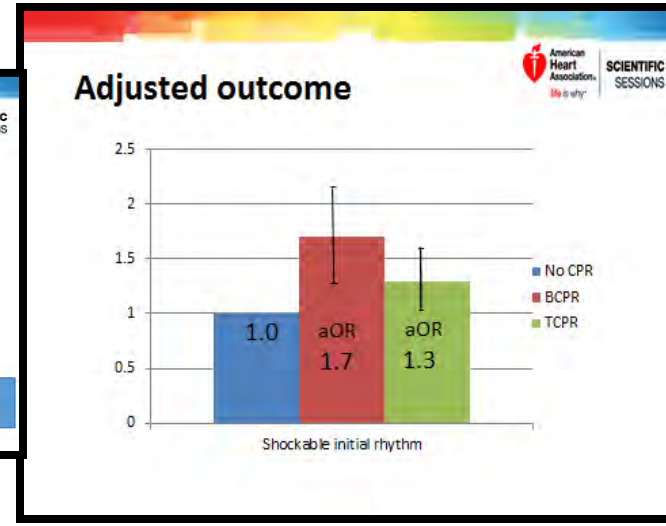
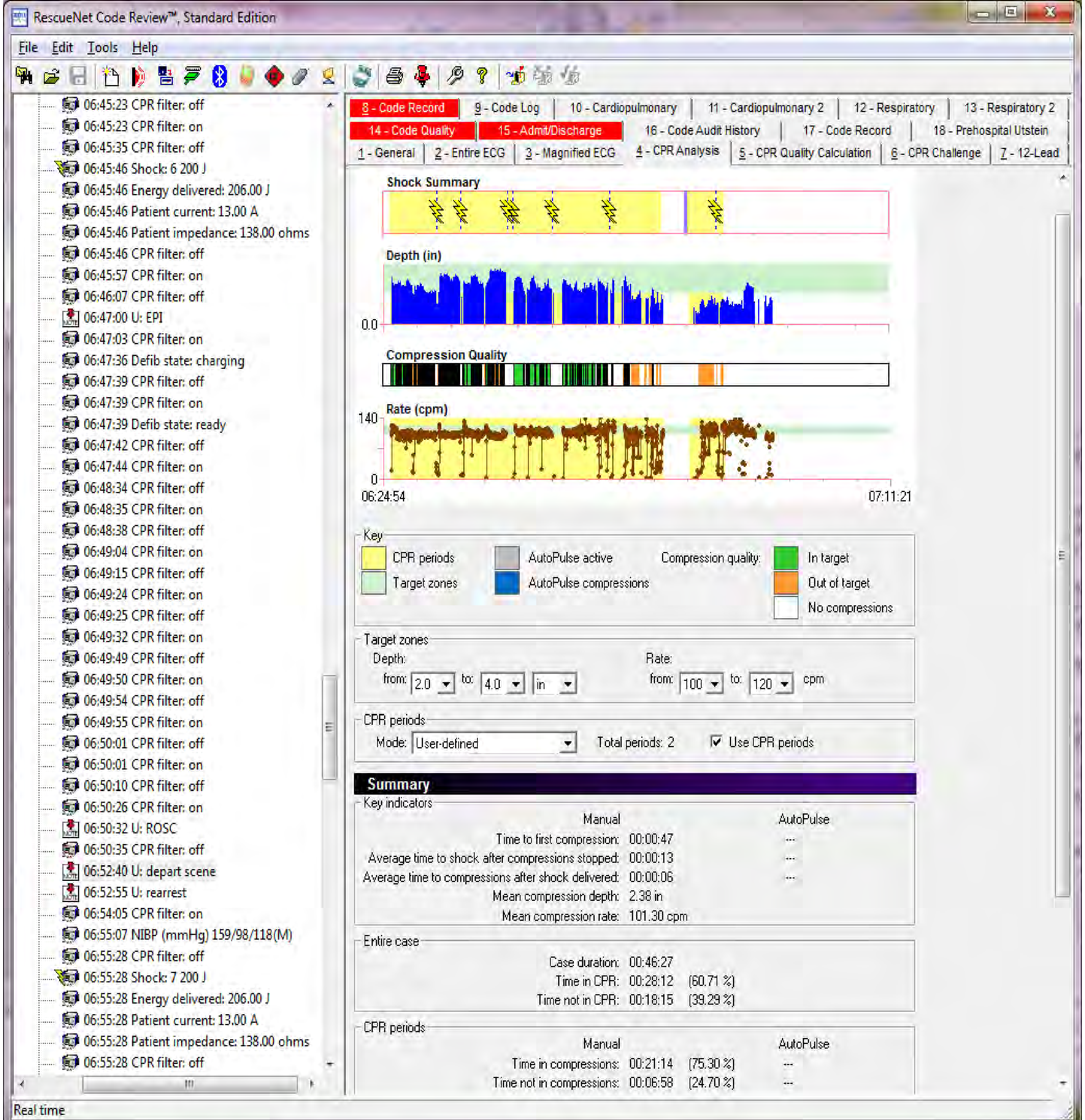
Hypothesis:

BCPR provision and TCPR provision would be associated with an increased likelihood of a shockable initial rhythm





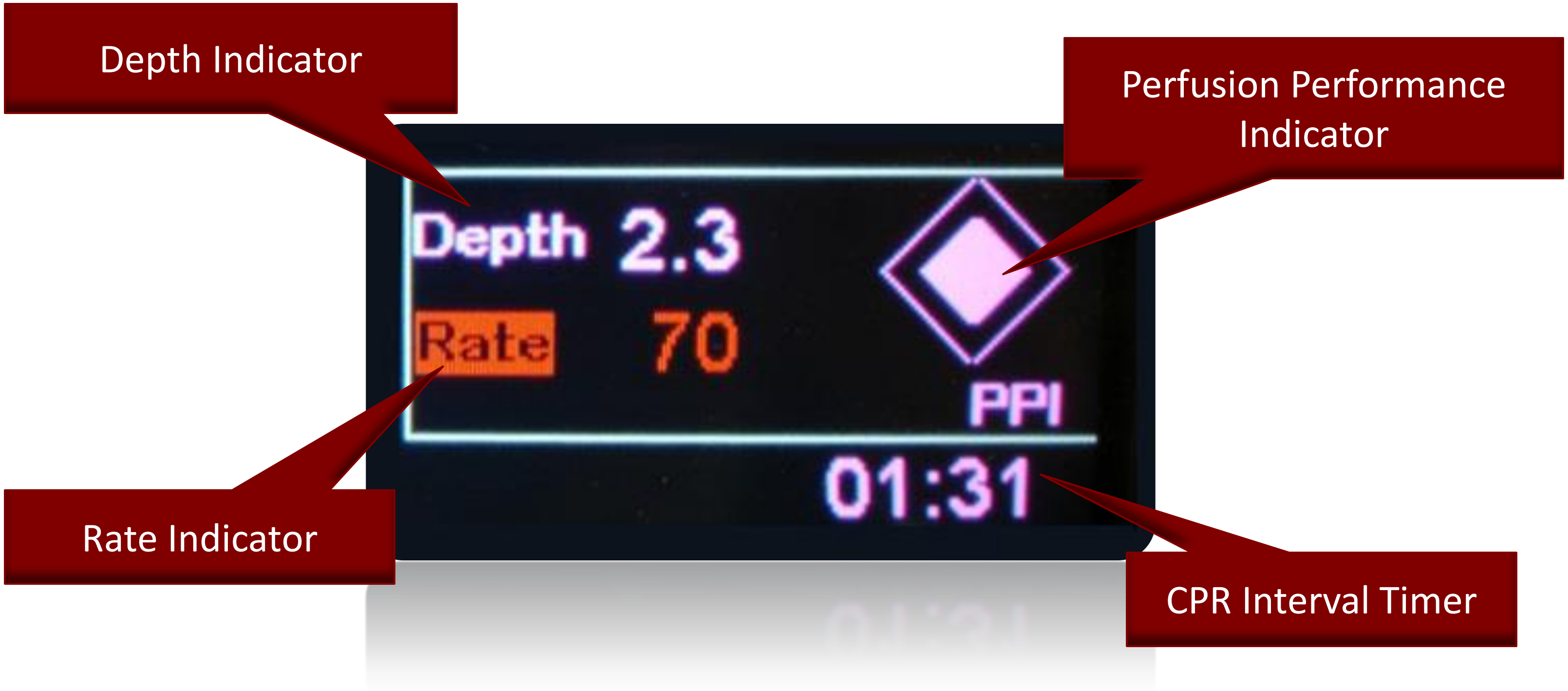



RescueNet Code Review™, Standard Edition
File Edit Tools Help
06:45:23 CPR filter: off
06:45:23 CPR filter: on
06:45:35 CPR filter: off
06:45:46 Shock: 6 200 J
06:45:46 Energy delivered: 206.00 J
06:45:46 Patient current: 13.00 A
06:45:46 Patient impedance: 138.00 ohms
06:45:46 CPR filter: off
06:45:57 CPR filter: on
06:46:07 CPR filter: off
06:47:00 U: EPI
06:47:03 CPR filter: on
06:47:36 Defib state: charging
06:47:39 CPR filter: off
06:47:39 CPR filter: on
06:47:39 Defib state: ready
06:47:42 CPR filter: off
06:47:44 CPR filter: on
06:48:34 CPR filter: off
06:48:35 CPR filter: on
06:48:38 CPR filter: off
06:49:04 CPR filter: on
06:49:15 CPR filter: off
06:49:24 CPR filter: on
06:49:25 CPR filter: off
06:49:32 CPR filter: on
06:49:49 CPR filter: off
06:49:50 CPR filter: on
06:49:54 CPR filter: off
06:49:55 CPR filter: on
06:50:01 CPR filter: off
06:50:01 CPR filter: on
06:50:10 CPR filter: off
06:50:26 CPR filter: on
06:50:32 U: ROSC
06:50:35 CPR filter: off
06:52:40 U: depart scene
06:52:55 U: rearrest
06:54:05 CPR filter: on
06:55:07 NIBP (mmHg) 159/98/118(M)
06:55:28 CPR filter: off
06:55:28 Shock: 7 200 J
06:55:28 Energy delivered: 206.00 J
06:55:28 Patient current: 13.00 A
06:55:28 Patient impedance: 138.00 ohms
06:55:28 CPR filter: off
8 - Code Record
9 - Code Log
10 - Cardiopulmonary
11 - Cardiopulmonary 2
12 - Respiratory
13 - Respiratory 2
14 - Code Quality
15 - Admit/Discharge
16 - Code Audit History
17 - Code Record
18 - Prehospital Utstein
1 - General
2 - Entire ECG
3 - Magnified ECG
4 - CPR Analysis
5 - CPR Quality Calculation
6 - CPR Challenge
7 - 12-Lead
Shock Summary
Depth (in)
0.0
Compression Quality
Rate (cpm)
140
0
06:24:54
07:11:21
Key
CPR periods
Target zones
AutoPulse active
AutoPulse compressions
Compression quality:
In target
Out of target
No compressions
Target zones
Depth:
from: 2.0 to: 4.0 in
Rate:
from: 100 to: 120 cpm
CPR periods
Mode: User-defined
Total periods: 2
Use CPR periods
Summary
Key indicators
Manual
AutoPulse
Time to first compression: 00:00:47 ---
Average time to shock after compressions stopped: 00:00:13 ---
Average time to compressions after shock delivered: 00:00:06 ---
Mean compression depth: 2.38 in
Mean compression rate: 101.30 cpm
Entire case
Case duration: 00:46:27
Time in CPR: 00:28:12 (60.71 %)
Time not in CPR: 00:18:15 (39.29 %)
CPR periods
Manual
AutoPulse
Time in compressions: 00:21:14 (75.30 %) ---
Time not in compressions: 00:06:58 (24.70 %) ---
Real time

Using Real-time CPR Feedback

Combined with Scenario-based Training and Debriefing Sessions

(avoiding pauses and excessive ventilation)



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journal homepage: www.elsevier.com/locate/resuscitation

ELSEVIER

EUROPEAN RESUSCITATION COUNCIL

Clinical paper

Chest compression release velocity: Association with survival and favorable neurologic outcome after out-of-hospital cardiac arrest☆,☆☆

Alexander Kovacs[a], Tyler F. Vadeboncoeur[b], Uwe Stolz[c], Daniel W. Spaite[c], Taro Irisawa[d], Annemarie Silver[e], Bentley J. Bobrow[a,c,f,*]

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[c] Department of Emergency Medicine, University of Arizona, PO Box 245057, 1501 N. Campbell, Tucson, AZ 85724-5057, United States
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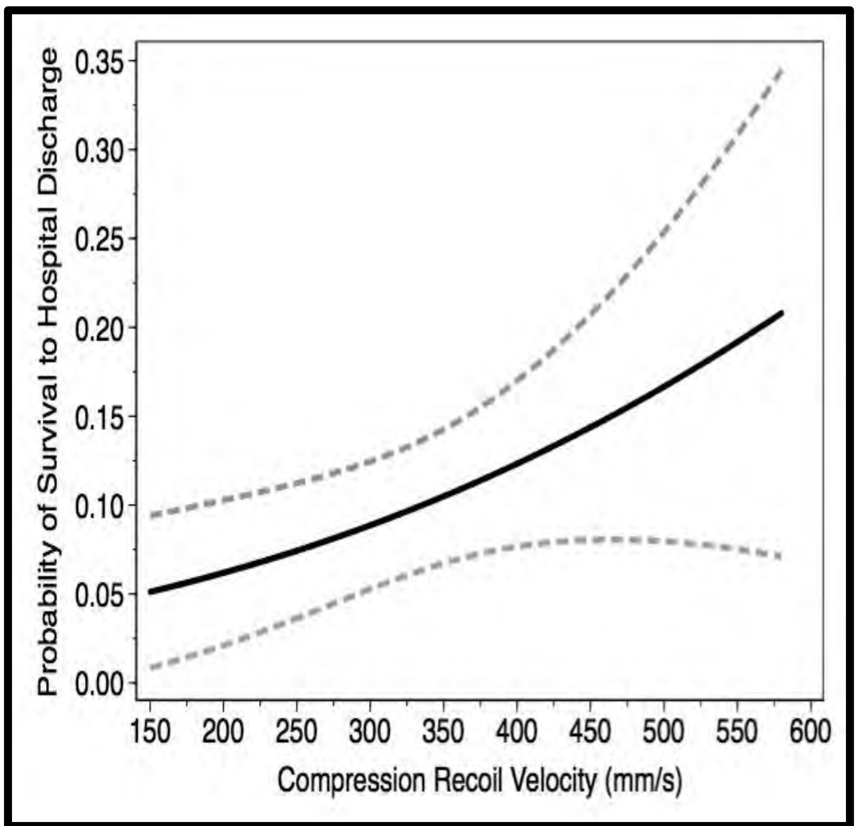
[e] Zoll Medical Corporation, 269 Mill Rd, Chelmsford, MA 01824, United States
[f] Bureau of Emergency Medical Services and Trauma System, Arizona Department of Health Services, 150 N. 18th Avenue, #540, Phoenix, AZ 85007-3248, United States

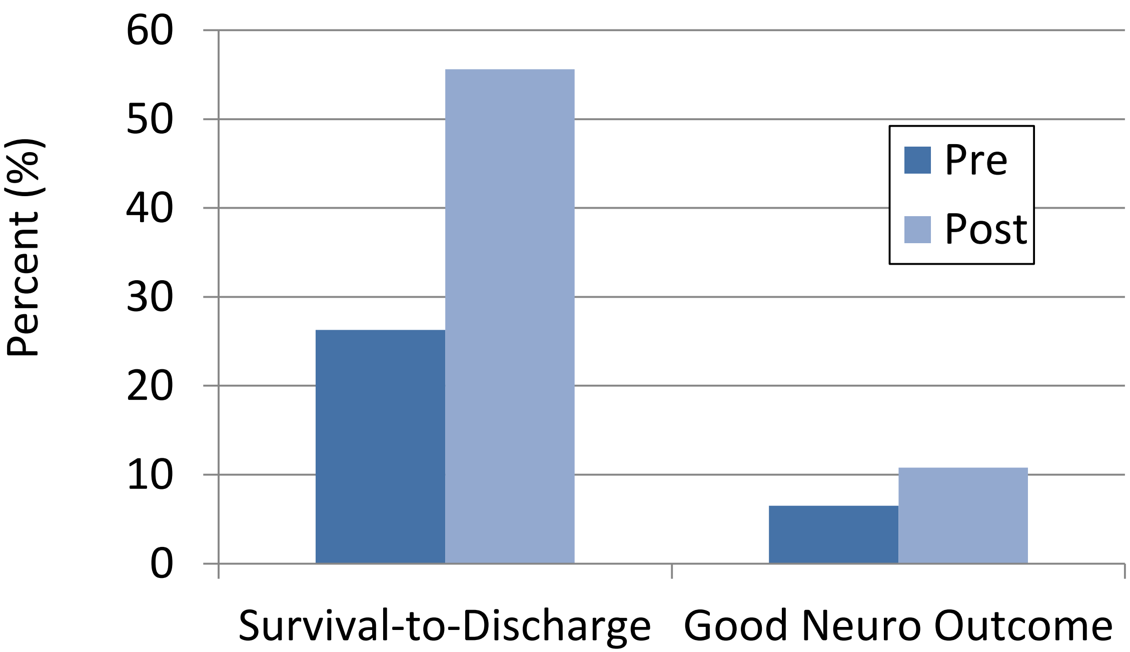


Resuscitation 2015

The Influence of Scenario-Based Training and Real-Time Audiovisual Feedback on Out-of-Hospital Cardiopulmonary Resuscitation Quality and Survival From Out-of-Hospital Cardiac Arrest

Bentley J. Bobrow, MD; Tyler F. Vadeboncoeur, MD; Uwe Stolz, PhD, MPH; Annemarie E. Silver, PhD; John M. Tobin, CEP; Scott A. Crawford, EMT-B; Terence K. Mason, RN; Jerome Schirmer, CEP; Gary A. Smith, MD; Daniel W. Spaite, MD

- Survival to discharge improved from 26% -56%



- **Depth = 2.15 in**
- **CC Fraction = 83.7%**
- **Pre-shock pause = 15.5 s**

***SHARE Annals EM* - 2013**

Emergency Department CPR Quality

- Average depth: 1.83 in
- # of compressions >2 in: 36%
- Average rate: 124/min
- Average CC fraction: 79%
- Preshock pause: 11.5 s


Resuscitation 93 (2015) 8–13

Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

ELSEVIER

EUROPEAN RESUSCITATION COUNCIL

Clinical Paper

Measuring and improving cardiopulmonary resuscitation quality inside the emergency department☆,☆☆

Christopher Crowe[a], Bentley J. Bobrow[b,d,*], Tyler F. Vadeboncoeur[c], Christian Dameff[a], Uwe Stolz[d], Annemarie Silver[e], Jason Roosa[f], Rianne Page[a], Frank LoVecchio[a], Daniel W. Spaite[d]

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[b] Bureau of Emergency Medical Services and Trauma System, Arizona Department of Health Services, 150 N. 18th Ave., Suite 540, Phoenix, AZ 85007, United States
[c] Department of Emergency Medicine, Mayo Clinic Florida, 4500 San Pablo Road, Jacksonville, FL 32224, United States
[d] Department of Emergency Medicine, University of Arizona, PO Box 245057, 1501 N. Campbell, Tucson, AZ 85724-5057, United States
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Crowe et al. Resuscitation

EMERGENCY MEDICAL SERVICES/ORIGINAL RESEARCH

Statewide Regionalization of Postarrest Care for Out-of-Hospital Cardiac Arrest: Association With Survival and Neurologic Outcome

Daniel W. Spaite, MD*; Bentley J. Bobrow, MD; Uwe Stolz, PhD, MPH; Robert A. Berg, MD; Arthur B. Sanders, MD; Karl B. Kern, MD; Vatsal Chikani, MPH; Will Humble, MPH; Terry Mullins, MBA; J. Stephan Stapczynski, MD; Gordon A. Ewy, MD; for the Arizona Cardiac Receiving Center Consortium[†]

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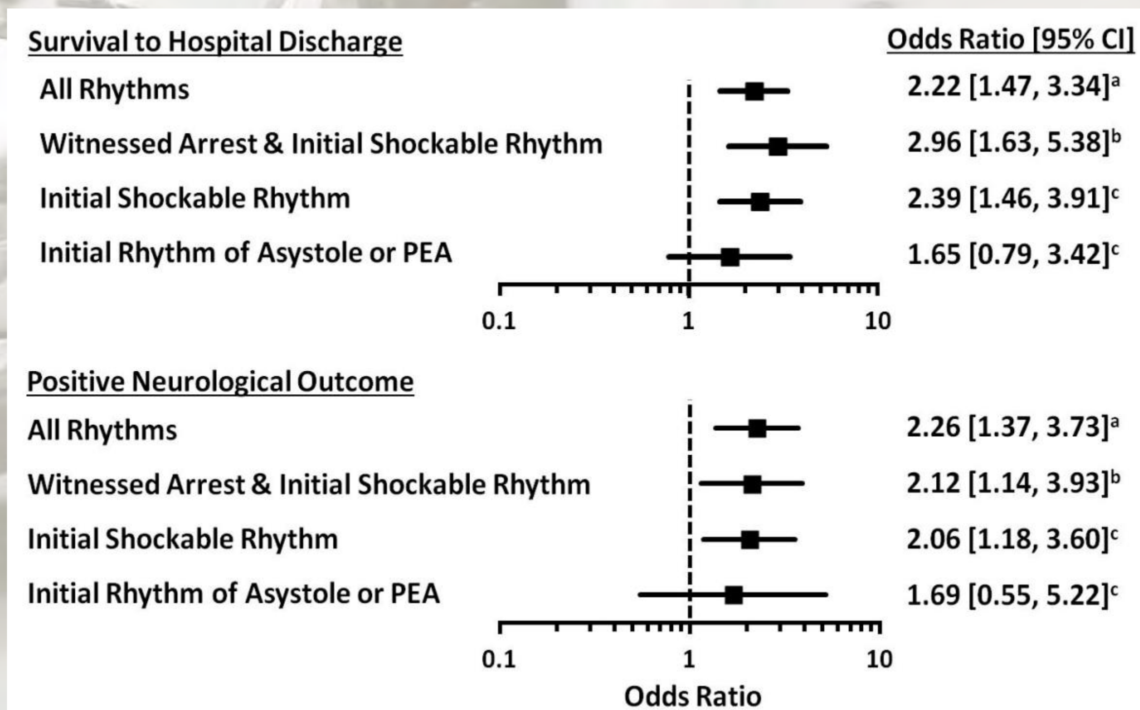

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EPIC-TBI
Excellence in Prehospital Injury Care
Traumatic Brain Injury Project

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Newsletters

December 2014

July 2014

See list of all newsletters

Stall Street Journals

June 2015
April 2015
December 2014
July 2014
July 2013

EPIC for...

- Adults
- Kids

Excellence in Prehospital Injury Care (EPIC)

Why is the EPIC Project important?

According to the CDC's Report to Congress, in 2010, TBIs accounted for approximately 2.5 million emergency department (ED) visits, hospitalizations, and deaths in the United States. Of them:

- 52,844 die
- 283,630 are hospitalized
- >2.2 million are treated and released from EDs

TBI is a contributing factor to a third of all injury-related deaths in the United States.[1]

There is growing evidence that the management of TBI in the early minutes after injury profoundly impacts outcome. EMS operates in the ultra-acute setting, usually providing the first care for TBI victims when treatment matters the most. Reports on implementation of evidence-based TBI treatment guidelines inside the hospital are very promising. However, no studies to date have evaluated their impact in the prehospital setting.

The EMS agencies of Arizona have already proven their ability to dramatically improve cardiac arrest survival and, thus, Arizona was selected by the National Institutes of Health to do the same with TBI.

RESEARCH METHODS & STATISTICS

Evaluation of the Impact of Implementing the Emergency Medical Services Traumatic Brain Injury Guidelines in Arizona: The Excellence in Prehospital Injury Care (EPIC) Study Methodology

Daniel W. Spaite, MD, Bentley J. Bobrow, MD, Uwe Stolz, PhD, MPH, Duane Sherrill, PhD, Vatsal Chikani, MPH, Bruce Barnhart, RN, Michael Sotelo, Joshua B. Gaither, MD, Chad Viscusi, MD, P. David Adelson, MD, and Kurt R. Denninghoff, MD

Risk adjustment/severity measures[91,108,109] (from EMS patient care reports and the ASTR)

Demographics/history/EMS system response: Age, sex, mechanism of injury (ICD-9/10-CM E-code Injury Descriptors), preexisting medical conditions, EMS time intervals[150] (e.g., interval from 9-1-1 call to trauma center arrival).

Prehospital data: Initial and additional respiratory rate; heart rate; sBP; Glasgow Coma Scale (GCS) score; O_2 saturation and $ETCO_2$; prehospital procedures including IV fluids given (mL), ETI, rapid sequence intubation, supraglottic airway use, RTS, prehospital impression (conditions/"diagnoses") by EMS.

Trauma center data: The ASTR data set contains nearly 200 data elements related to demography, severity, risk adjustment, treatment, procedures, and outcomes. Examples (detailed data set in Data Supplement S3)—initial and additional vital signs, GCS, RTS, probability of survival (TRISS), procedures (ICD-9/10-CM procedure codes), need for emergent surgery, need for emergent neurosurgery, intracranial pressure monitoring (yes/no), Abbreviated Injury Scale score, ISS, injury diagnoses (ICD-9/10-CM N-codes), preexisting comorbidities, hospital complications, hospital/ICU length of stay.

Outcome measures[7,8,10,11,17,18,23,85,86,95,96]

Primary outcome measure: Survival to hospital discharge.

Secondary outcomes: Prehospital mortality (patients with spontaneous circulation on EMS arrival who then require cardiopulmonary resuscitation by EMS and have no signs of life on arrival at the trauma center), hospital days, ICU days, total ventilator days, hospital complications, discharge disposition (e.g., home, long-term care facility, inpatient rehabilitation), and trauma center costs (charges).

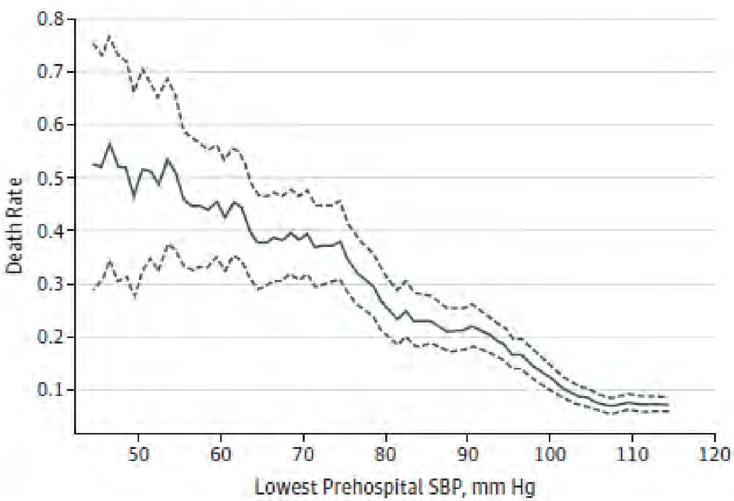
Research

JAMA Surgery | Original Investigation

Mortality and Prehospital Blood Pressure in Patients With Major Traumatic Brain Injury Implications for the Hypotension Threshold

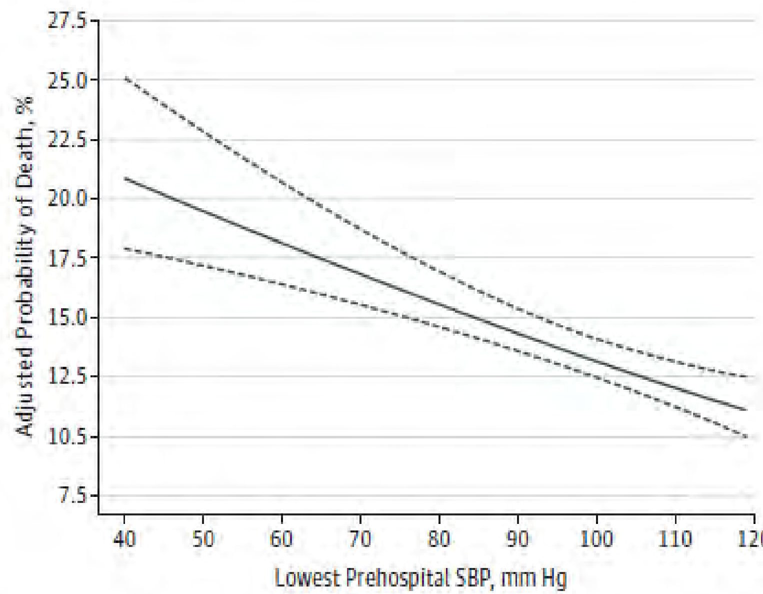
Daniel W. Spaite, MD; Chengcheng Hu, PhD; Bentley J. Bobrow, MD; Vatsal Chikani, MPH; Duane Sherrill, PhD; Bruce Barnhart, RN, CEP; Joshua B. Gaither, MD; Kurt R. Denninghoff, MD; Chad Viscusi, MD; Terry Mullins, MBA; P. David Adelson, MD

Figure 1. Unadjusted Moving Average of Death Rate by Lowest Systolic Blood Pressure (SBP)



The solid line represents the moving average of the estimated death rate for each interval spanning 10 consecutive values, and the dotted lines represent the pointwise 95% CIs.

Figure 2. Adjusted Probability of Death by Lowest Systolic Blood Pressure (SBP)



EMERGENCY MEDICAL SERVICES/ORIGINAL RESEARCH

The Effect of Combined Out-of-Hospital Hypotension and Hypoxia on Mortality in Major Traumatic Brain Injury

Daniel W. Spaite, MD*; Chengcheng Hu, PhD; Bentley J. Bobrow, MD; Vatsal Chikani, MPH; Bruce Barnhart, RN, CEP; Joshua B. Gaither, MD; Kurt R. Denninghoff, MD; P. David Adelson, MD; Samuel M. Keim, MD, MS; Chad Viscusi, MD; Terry Mullins, MBA; Duane Sherrill, PhD

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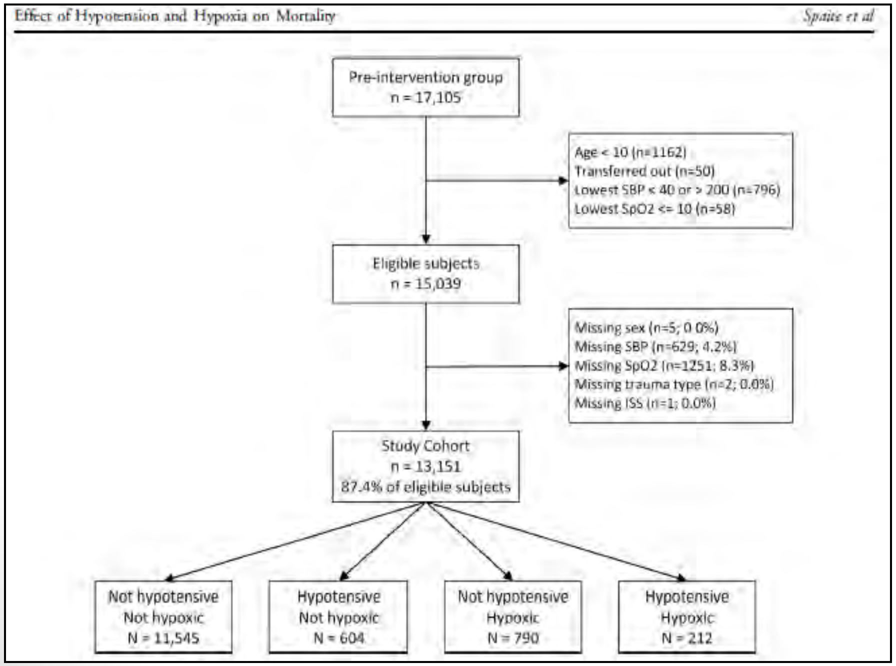


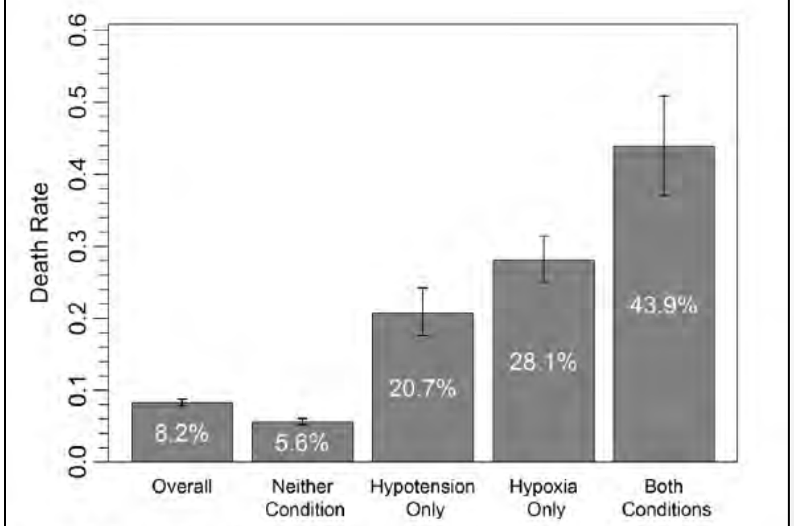


Figure 2. Crude mortality rate by hypotension and hypoxia status. Error bars represent 95% CIs.

Conclusions

In a statewide, multisystem analysis of patients with major TBI, we found a linear association between the lowest prehospital SBP and the severity-adjusted probability of death across an exceptionally wide range. This suggests that there may not be a clinically meaningful threshold. Furthermore, for the injured brain, physiologically detrimental hypotension may occur at significantly higher levels than current guidelines suggest. These findings highlight the need for specific trials comparing various blood pressure treatment thresholds well above the classic 90 mm Hg.

Balancing the Potential Risks and Benefits of Out-of-Hospital Intubation in Traumatic Brain Injury: The Intubation/Hyperventilation Effect

Joshua B. Gaither, MD, Daniel W. Spaite, MD, Bentley J. Bobrow, MD, Kurt R. Denninghoff, MD, Uwe Stolz, PhD, MPH, Daniel L. Beskind, MD, Harvey W. Meislin, MD

From the Arizona Emergency Medicine Research Center, Department of Emergency Medicine, University of Arizona College of Medicine, Tucson, AZ (Gaither, Spaite, Bobrow, Denninghoff, Stolz, Beskind, Meislin); and the Department of Emergency Medicine, Maricopa Integrated Healthcare System, Phoenix, AZ (Bobrow).

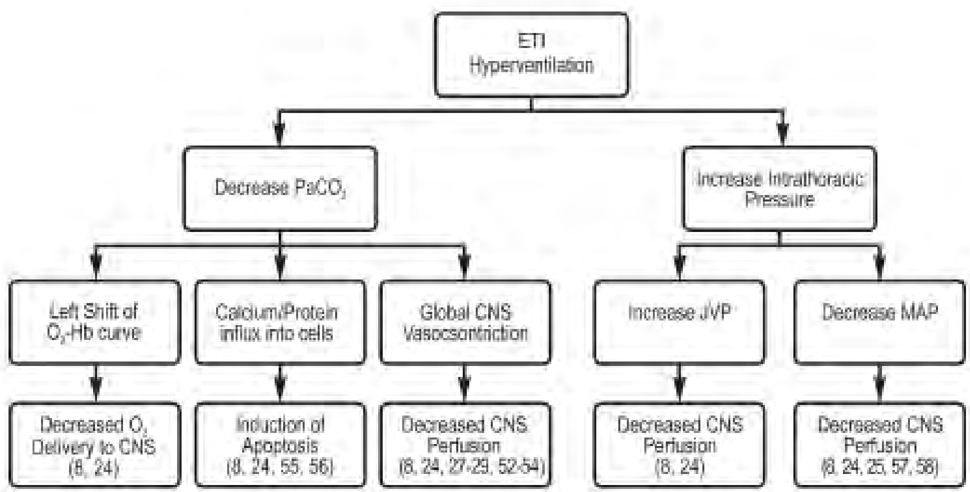


Figure. Mechanisms of secondary injury induced during hyperventilation. *ETI*, intubation; *O_2*, oxygen; *Hb*, hemoglobin; *CNS*, central nervous system; *JVP*, jugular venous pressure.

Refereed Journal Articles: Full-Length Publications

Shultz JM, Thorensen S, Flynn BW, Muschert GW, Shaw JA, Espinel Z, Walter FG, Gaither JB, Garcia-Barcena Y, O'Keefe K, Cohen AM. Multiple Vantage Points on the Mental Health Effects of Mass Shootings; Current Psychiatry Reports. 2014;16(9); 469. (DIO: 10.1007/s11920-014-0469-5) (PMID: 25085235)

Gaither JB, Spaite, DW, Stolz U, **Ennis J**, Mosier, J, Sakles J. Prevalence of Difficult Airway Predictors in Failed Prehospital Endotracheal Intubation; Journal of Emergency Medicine. 2014; 47; 294-300. (DOI:10.1016/j.jemermed.2014.04.021).

Panchal AR, Gaither JB, **Svirky I**, **Prosser B**, Stolz U, Spaite DW. Impact of Professionalism on Transfer of Care to the Emergency Department; J Emerg Med. July, 2015; 49(1); 18-25. (DIO: 10.1016/j.jemermed.2014.12.062) (PMID: 25802157)

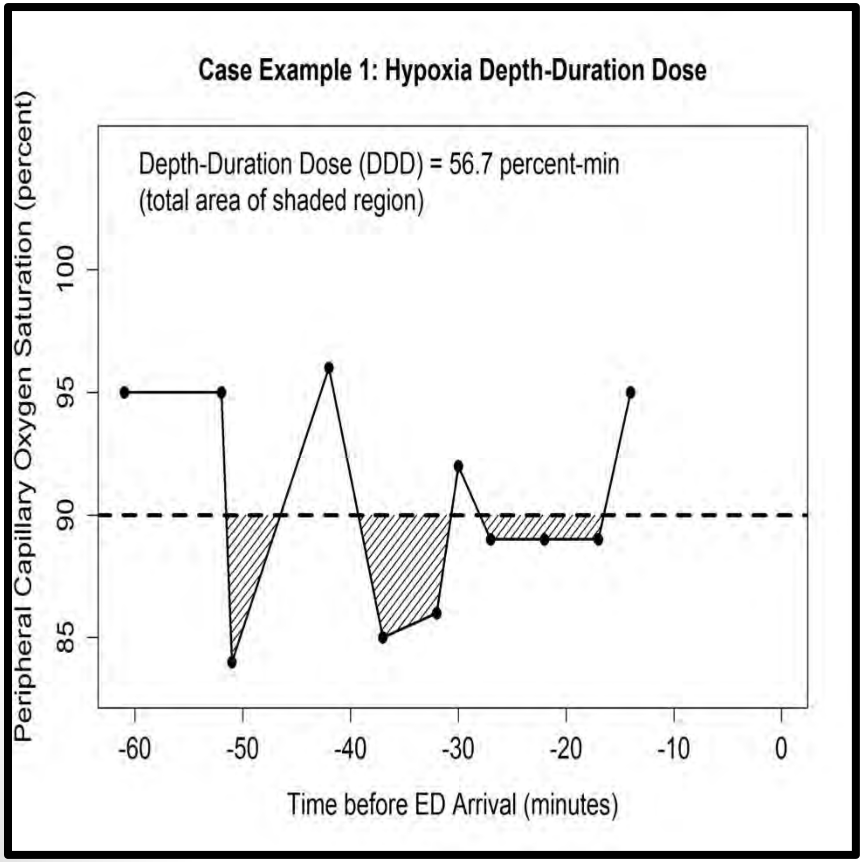
Gaither JB, **Galson S**, **Curry M**, **Mhayamaguru M**, Williams C, Keim S, Borrow BJ, Spaite DW; Environmental Hyperthermia in Prehospital Patients With Major Traumatic Brain Injury; J. Emerg Med. 2015; 49(3): 375-381. (DOI: 10.1016j.jemermed.2015.01.038) (PMID 26159904)

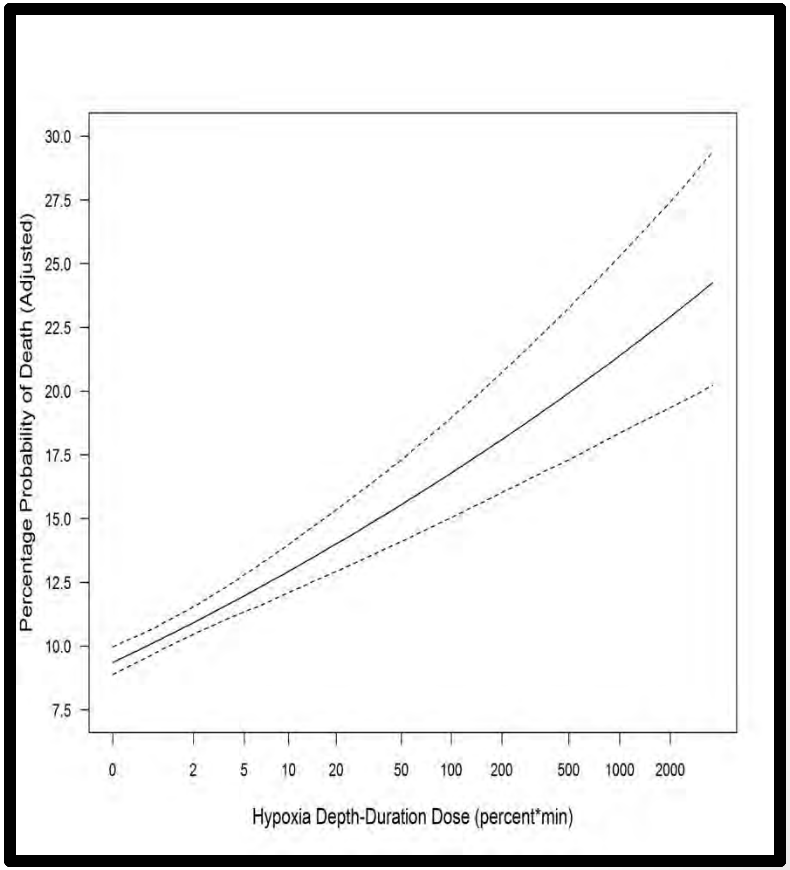
Gaither JB**, Ennis J**, Stolz U, Mosier J, Sakles J; Association Between Difficult Airway Predictors and Failed Prehospital Endotracheal Intubation; Air Med J. 2105; 34(6): 343-347. (DOI: http://dx.doi.org/10.1016/j.amj.2015.06.001) (PMID 26611221)

Martin-Gill C, Gaither JB, Bigham BL, Myers JB, Kupas DF, Spaite DW. National Prehospital Evidence-Based Guidelines Strategy: A Summary for EMS Stakeholders. *Prehosp Emerg Care.* E-pub Jan, 2016. (DOI: 10.3109/10903127.2015.1102995) (PMID 26808116)

Gaither JB, Chikani V, Uwe S, Viscusi C, Denninghoff KR, Barnhart B, Mullins T, **Mhayamaguru M**, **Rice AD**, **Smith JJ**, Keim SM, Bobrow BJ, Spaite DW: Body Temperature After EMS Transport: Association with Traumatic Brain Injury Outcomes. Prehosp Emeg Care 2017 (*Forthcoming*). PMID: XXX doi: 10.1080/10903127.2017.1308609 .

Evaluation of Prehospital Hypoxia "Depth-Duration Dose" and Mortality in Major Traumatic Brain Injury





THE UNIVERSITY OF ARIZONA HEALTH NETWORK

Association Between Initial Trauma Center Body Temperature and Mortality from Major Traumatic Brain Injury

- Joshua B Gaither[1], Vatsal Chikani[3], Daniel W. Spaite[1], Uwe Stolz[1], Sophie Garison[1], Jennifer Smith[1], Bruce Barnhart[1], P. David Adelson[4], Chad Viscusi[1], Kurt Denninghoff[1], Bentley J Bobrow[2]

Background

Several studies have demonstrated a correlation between fever during hospitalization and poor outcomes in major Traumatic Brain Injury (TBI). The fever in these studies is thought to be related to either a post-ischemic syndrome, infection, or both. However, elevated temp immediately after EMS transport is much more likely to reflect environmental, rather than pathophysiological, factors.

Objectives

1. Identify variations in initial body temperature following TBI
2. Determine if a correlation exists between elevated initial trauma center body temperature (ITCT) and TC mortality.

Methods

All moderate/severe TBI cases (CDC Barell Matrix Type-1) in the Excellence in Prehospital Injury Care (EPIC) project from 1/1/07-12/31/12 were evaluated to compare mortality across the following temperature categories: Hypothermia (<36°C), Low Normal (36-36.9°C), Normal (37-37.4°C), High Normal (37.5-367.9°C), and Hyperthermia (>38°C).

	Hypothermia	Low normal	Normal	High Normal	Hyperthermia	Total TBI
Definition	<36°C	36-36.9°C	37-37.4°C	37.5-37.9°C	>38°C	19,487
Male	2,474 (69.6%)	8,217 (67.0%)	1,851 (68.9%)	451 (71.4%)	252 (70.3%)	1,3245 (67.9%)
Age (Years)	40 (22-59)	44 (22-66)	36 (20-58)	30 (17-51)	43 (20-58)	41 (22-63)
ISS						
1-8	141 (3.9%)	1,153 (9.4%)	321 (11.9%)	64 (10.1%)	10 (2.7%)	1,689 (8.6%)
9-15	799 (22.4%)	4,596 (37.4%)	1,038 (38.6%)	221 (35.0%)	78 (21.7%)	6,732 (34.5%)
16-24	1,049 (29.5%)	4,197 (34.2%)	908 (33.8%)	191 (30.2%)	122 (34.0%)	6,467 (33.1%)
25-75	1,564 (44.0%)	2,313 (18.8%)	419 (15.5%)	155 (24.5%)	148 (41.3%)	4,599 (23.6%)
Payer						
Self pay	440 (12.3%)	1,476 (12.0%)	373 (13.8%)	82 (12.9%)	34 (9.4%)	2,405 (12.3%)
Public	1,808 (50.8%)	6,549 (53.4%)	1,352 (50.3%)	338 (53.5%)	200 (55.8%)	10,247 (52.5%)
Private	1,146 (32.2%)	3,958 (32.2%)	883 (32.8%)	198 (31.3%)	109 (30.4%)	6,294 (32.3%)
Other	159 (4.4%)	276 (2.2%)	78 (2.9%)	13 (2.0%)	15 (4.1%)	541 (2.7%)
Trauma Type						
Blunt	3,321 (93.4%)	11,956 (97.5%)	2,620 (97.5%)	600 (95.0%)	341 (95.2%)	18,838 (96.6%)
Penetrating	232 (6.5%)	303 (2.4%)	66 (2.4%)	31 (4.9%)	17 (4.7%)	649 (3.3%)
Mortality	659 (18.5%)	642 (5.2%)	94 (3.4%)	52 (8.2%)	49 (13.6%)	1,496 (7.6%)

Statistical Methods

Multivariable logistic regression analysis was used to determine the relationship between ITCT and survival, adjusting for: ISS, age, sex, trauma type (Blunt vs. penetrating), and payer type (private, public, self, other). Adjusted odds ratios (aOR) with 95% Confidence Intervals (CI) for mortality were calculated for each group compared to those with a Normal temperature. We used LOWESS smoothing function to analyze mortality across body temperatures (as a continuous variable) upon TC arrival .

Results

19,487 cases met inclusion criteria : All had initial TC temperature and survival data

Table. Crude and adjusted odds ratio (aOR) for death (Reference group = Normal).

	Hypothermia	Low normal	Normal	High Normal	Hyperthermia
Temp.	<36°C	36-36.9°C	37-37.4°C	37.5-37.9°C	>38°C
N, Deaths (%)	3553, 656 (18.6%)	12259, 642 (5.2%)	2686, 94 (3.5%)	631, 52 (8.2%)	358, 49 (13.7%)
aOR of Death (95% CIs)	2.86 (2.23-3.68)	1.34 (1.05-1.71)	Ref	1.89 (1.26-2.85)	2.12 (1.40-3.21)

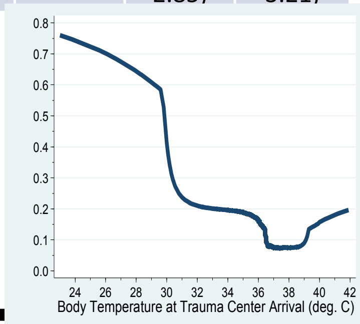


Figure. LOWESS smoothing function of the probability of death versus the body temperature (deg. C) at trauma center arrival for patients with moderate to severe TBI.

Limitations

Limitations of this study include:

- This is a retrospective observational study and there is the possibility of bias or unmeasured confounders/risk factors. The Trauma Registry does not contain prehospital body temperatures, for example.
- Although variations in ITCT are more likely to reflect exposure to environmental temperature extremes, temperature variations due to critical illness can not be excluded.
- This observational study only establishes a statistical relationship between temperature and outcomes, not cause and effect.

Summary and Conclusions

In this study, using a large, statewide population of moderate and severe TBI cases, an elevated ITCT was independently associated with higher mortality in patients with major TBI, a finding that has not been previously reported. Future work is needed to identify the epidemiology and the causes of temperature elevation during the prehospital interval and to identify whether initiation of in-field measures to prevent high ITCT might improve outcome.

Acknowledgements

This research is part of the Excellence in Prehospital Injury Care (EPIC) TBI Study, a statewide, before/after, controlled study of the impact of implementing the EMS TBI Treatment Guidelines. Funding Source: NIH/NINDS: 1R01NS071049

Hypotension

- Current Guidelines recommend treating hypotension in TBI
- Our findings in the hypotensive and normotensive cohorts support the concept of restoring/optimizing cerebral perfusion in EMS TBI management

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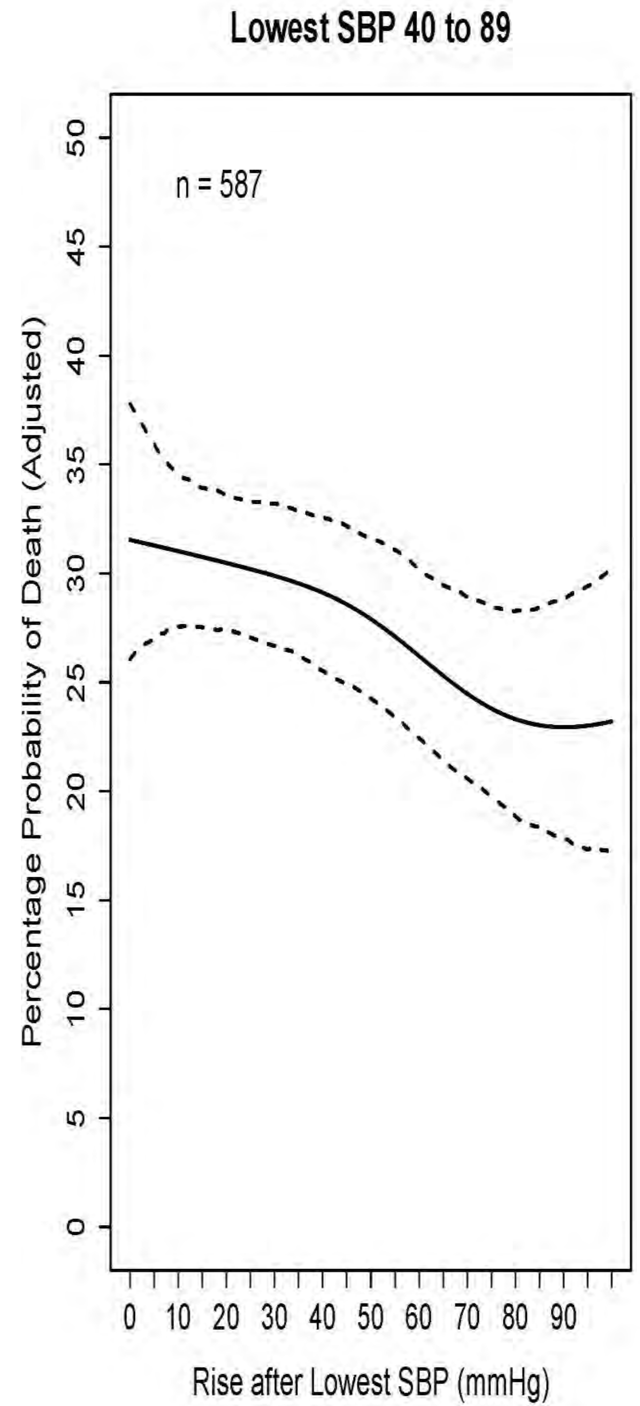
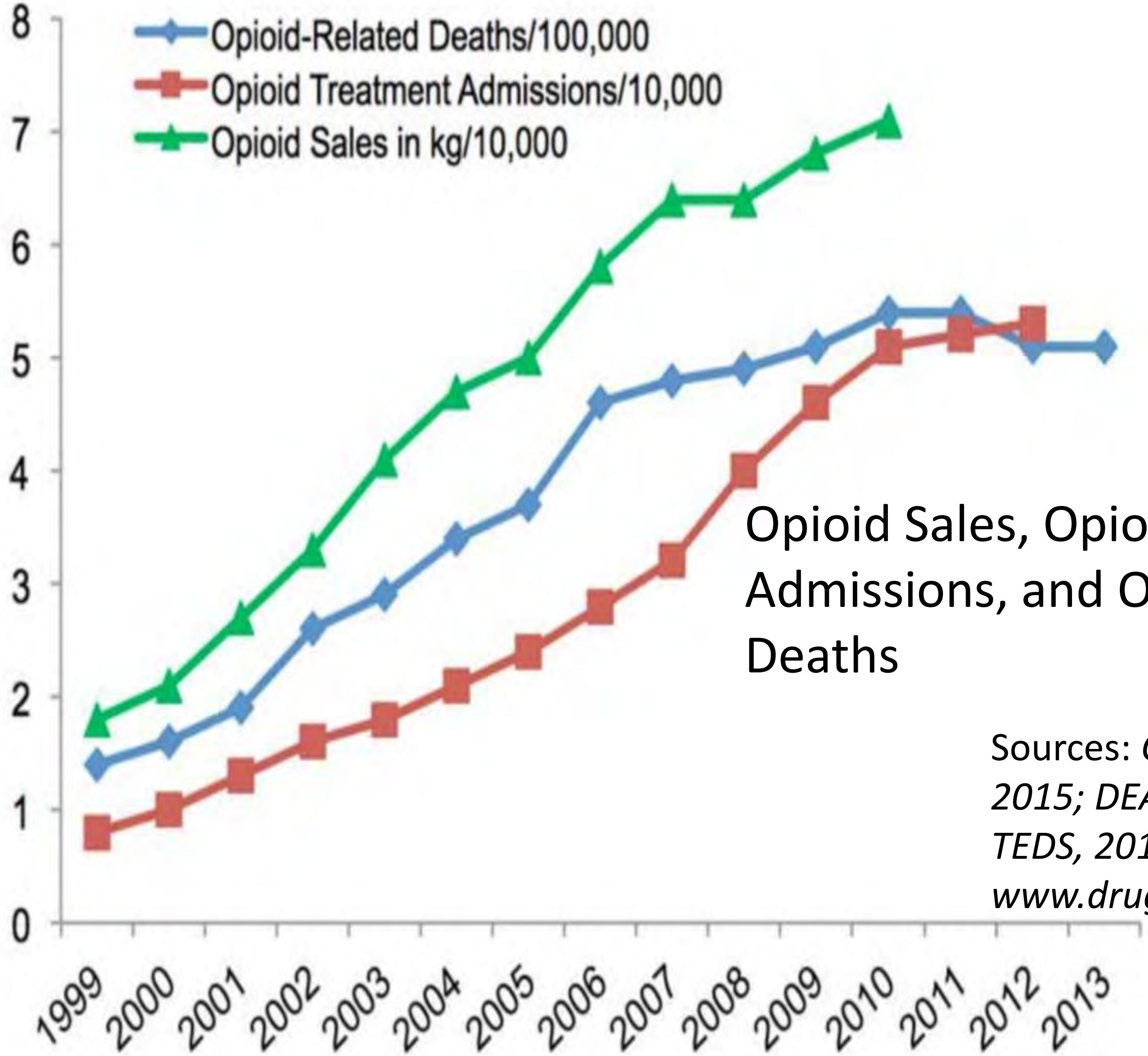




Opioid Sales, Opioid Treatment Admissions, and Opioid-related Deaths

Sources: *CDC Wonder, 2015; DEA ARCOS, 2015; TEDS, 2015 www.drugabuse.gov*

APPROACH: **NCBP System Reporting**

APPROACH: **Data Integration**

EMS Data
(Statewide)

EMS data are collected by agencies per NEMSIS Version 3 standards

→

AZ-PIERS System
(AZDHS)

EMS data entered into the AZ-PIERS System

→

Opiate/MM Program Database
(UA)

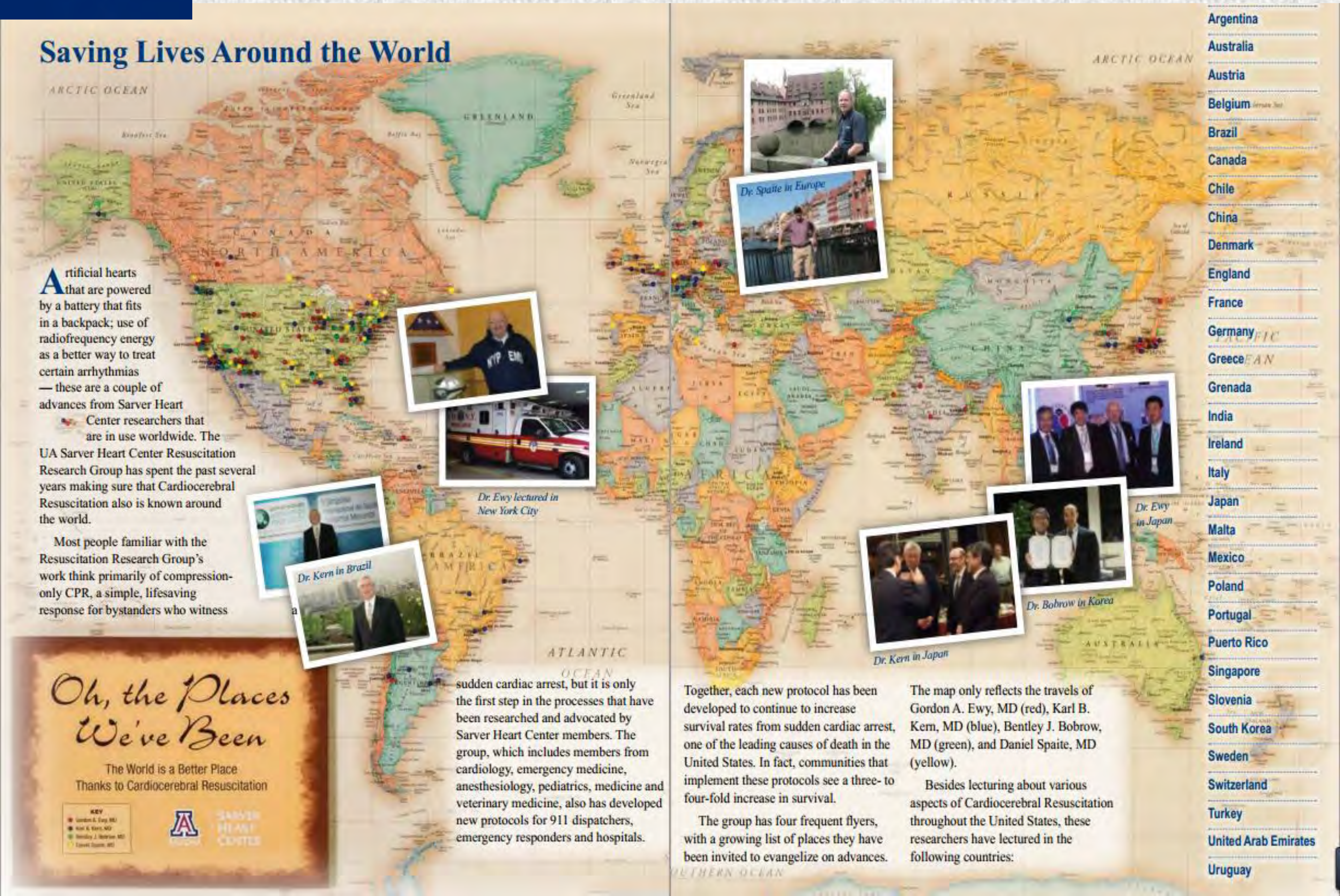
EMS data uploaded to secure, interactive, relational database (similar to SHARE/EPIC)

→

NCBP System

De-identified data are uploaded to the NCBP System daily allowing rapid case identification, queries, monitoring and reporting

International Impact and Collaboration



Saving Lives Around the World

Artificial hearts that are powered by a battery that fits in a backpack; use of radiofrequency energy as a better way to treat certain arrhythmias — these are a couple of advances from Sarver Heart Center researchers that are in use worldwide. The UA Sarver Heart Center Resuscitation Research Group has spent the past several years making sure that Cardiocerebral Resuscitation also is known around the world.

Most people familiar with the Resuscitation Research Group's work think primarily of compression-only CPR, a simple, lifesaving response for bystanders who witness sudden cardiac arrest, but it is only the first step in the processes that have been researched and advocated by Sarver Heart Center members. The group, which includes members from cardiology, emergency medicine, anesthesiology, pediatrics, medicine and veterinary medicine, also has developed new protocols for 911 dispatchers, emergency responders and hospitals.

Together, each new protocol has been developed to continue to increase survival rates from sudden cardiac arrest, one of the leading causes of death in the United States. In fact, communities that implement these protocols see a three- to four-fold increase in survival.

The group has four frequent flyers, with a growing list of places they have been invited to evangelize on advances.

The map only reflects the travels of Gordon A. Ewy, MD (red), Karl B. Kern, MD (blue), Bentley J. Bobrow, MD (green), and Daniel Spaite, MD (yellow).

Besides lecturing about various aspects of Cardiocerebral Resuscitation throughout the United States, these researchers have lectured in the following countries:

- Argentina
- Australia
- Austria
- Belgium
- Brazil
- Canada
- Chile
- China
- Denmark
- England
- France
- Germany
- Greece
- Grenada
- India
- Ireland
- Italy
- Japan
- Malta
- Mexico
- Poland
- Portugal
- Puerto Rico
- Singapore
- Slovenia
- South Korea
- Sweden
- Switzerland
- Turkey
- United Arab Emirates
- Uruguay

Dr. Spaite in Europe

Dr. Ewy lectured in New York City

Dr. Kern in Brazil

Dr. Ewy in Japan

Dr. Bobrow in Korea

Dr. Kern in Japan

Oh, the Places We've Been

The World is a Better Place Thanks to Cardiocerebral Resuscitation

HeartRescue
INDIA

Why This Matters
Prehospital Response

Medtronic
Further, Together


“世界急救日”急救技能推广普及活
让更多的普通市民有兴趣学习徒手心肺复苏操作

You DO care about this stuff because:

- It has lead to improved patient outcomes
- It advances our specialty
- It can enrich your personal career satisfaction
- Being from UA people will ask you about it
- It's really cool!


Wait a minute… they're not doing CPR on you! They're doing Cardiocerebral Resuscitation!
7/27 © 2008 Gr

Thank you

Bentley.Bobrow@azdhs.gov

Banner
University Medical Center