





RACE CARS: Working with EMD to Save Lives

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Every Second Counts. Every Action Matters.



Cardiac Arrest Resuscitation System



Conflicts of Interest:

- Our project is funded by the Medtronic Foundation
- The Medicines Company

Heart Rescue and RACE CARS

OBJECTIVES:

- Discuss cardiac arrest factors
- Discuss The Medtronic Foundation HeartRescue and RACE CARS project
- Discuss EMD's role in improving survival from cardiac arrest

If we can't
save them,



RACE CARS

History STEMI Systems in NC:

“RACE moved beyond the cath lab and PCI hospitals to focus on EDs, EMS, hospital networks, and associated communication and transport systems.” Heart.org

“AHA’s Mission: Lifeline – A Call to Arms for Emergency Medicine” ACEP News Jan 2009

**RACE Pilot
1st STEMI
System**

**RACE
65 hospitals/
Multiple EMS Agencies**

**RACE - ER
Entire State**

**RACE CARS Goal:
Improve OOHCA
survival by 50% by 2015**

**Mission Lifeline
RACECARS**

2003

2005

2006

2007

2008

2009

2010

2011 - 2015

“Racing Against the Clock: A North Carolina-based project becomes a model for discovery-to-balloon”

Richard R. Rogoski 2008

“RACE: A Herculean attempt to improve STEMI care”

Nov 12, 2007 Lisa Nainggolan

Implementation of a Statewide System for Coronary Reperfusion for ST-Segment Elevation Myocardial Infarction

Abstract Despite 17 decades of evidence demonstrating benefits from prompt coronary reperfusion, significant evidence to show that many patients with ST-segment elevation myocardial infarction (STEMI) are treated too slowly or not at all.

Objective To establish statewide systems for emergency, accurate transportation to appropriate treatment facilities.

Design and Setting A quality improvement study that began in 2003 in a general and tertiary care setting, involving 65 hospitals and 100 emergency medical services (EMS) agencies. The study was conducted in North Carolina.

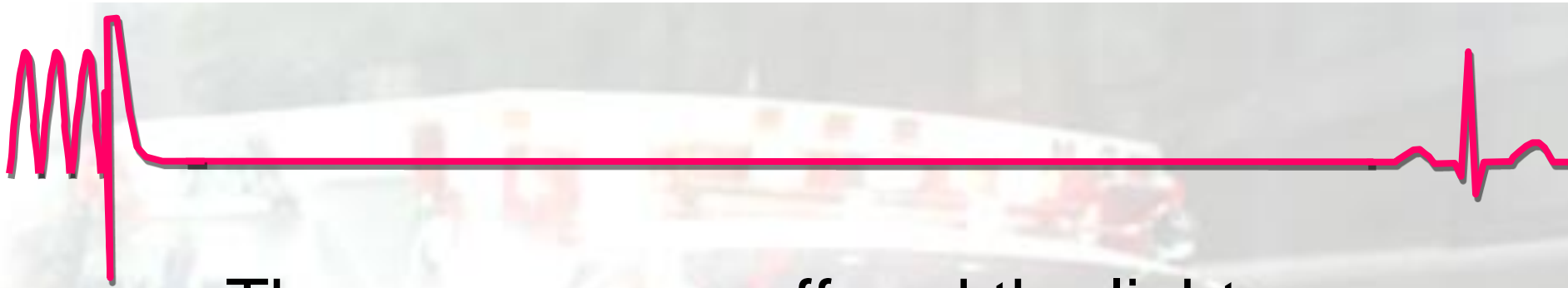
Results After implementation of the RACE program, the median time from symptom onset to reperfusion decreased from 120 minutes to 90 minutes. The percentage of patients receiving reperfusion within 90 minutes increased from 10% to 25%. The percentage of patients receiving reperfusion within 120 minutes increased from 20% to 40%. The percentage of patients receiving reperfusion within 150 minutes increased from 30% to 50%. The percentage of patients receiving reperfusion within 180 minutes increased from 40% to 60%. The percentage of patients receiving reperfusion within 210 minutes increased from 50% to 70%. The percentage of patients receiving reperfusion within 240 minutes increased from 60% to 80%. The percentage of patients receiving reperfusion within 270 minutes increased from 70% to 90%. The percentage of patients receiving reperfusion within 300 minutes increased from 80% to 100%.

“North Carolina’s RACE program cuts door-in door-out times for STEMI patients”

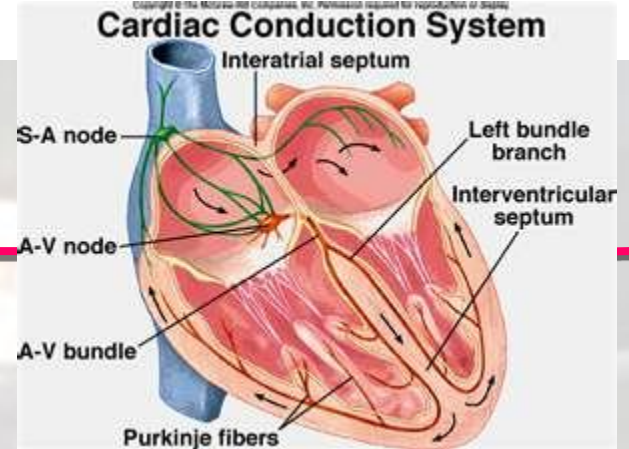
Jun 28, 2011 Reed Miller

Anatomy of a Cardiac Arrest



- 
- The power goes off and the lights go out. It's a common scene that plays out during hurricane and tornado seasons
 - The heart sustains an insult, the electricity is short circuited, the heart can't pump, and the body dies.

The Heart:



- is an electrical pump
- electricity is generated in special pacemaker cells in the upper chamber, or atrium, of the heart.
- this electrical spark is carried through pathways in the heart so that all the muscle cells contract at once and produce a heart beat.
- this pumps blood through the heart valves and into all the organs of the body so that they can do their work.
- this mechanism can break down in a variety of ways, but the final pathway in sudden death is the same:
- the electrical system is irritated and fails to produce electrical activity that causes the heart to beat.
- the heart muscle can't supply blood to the body, particularly the brain, and the body dies.



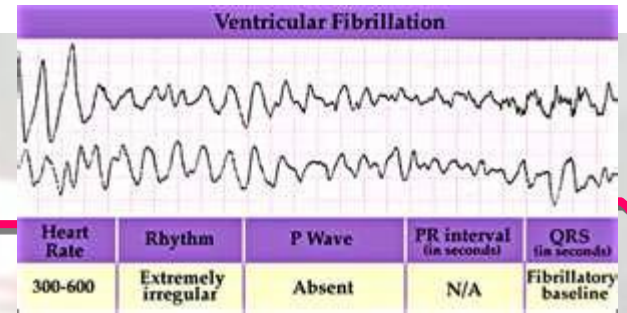
Causes of Cardiac Arrest:



- MI
- Vfib
- Pulmonary Embolus
- CHF
- Aortic Stenosis
- Cardiomyopathy
 - Hypertrophic cardiomyopathy in the young caused by heredity, large ventricles, during exercise decreases blood flow, heart becomes irritable,
- Less common causes of cardiac arrest include respiratory arrest (loss of breathing function), choking, trauma, electrocution, and drowning.

Ventricular Fibrillation

Vfib:



- when the normal, regular, electrical activation of heart muscle contraction is replaced by chaotic electrical activity that causes the heart to stop beating and pumping blood to the brain and other parts of the body.
- Permanent brain damage and death can occur unless the flow of blood to the brain is restored within **five** minutes.
- Heart attack is the most common cause of Vfib.

At Risk:

- Males < 40
- HTN
- DM
- with or without heart disease



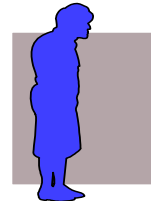
Smoking



Alcohol



Drug Abuse



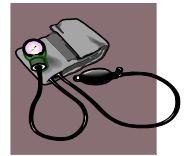
Age



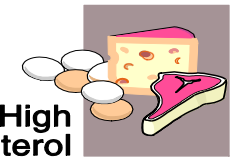
Gender



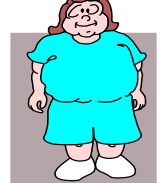
Stress



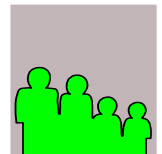
Hypertension



High Cholesterol



Obesity



Family History

Heart Risks

Death is best treated by prevention



Signs of Cardiac Arrest:

The presentation is not subtle



- Almost immediate loss of consciousness
- Not able to be aroused
- Fall or slump over
- No pulse
- No signs of normal breathing
- May have a seizure
- Body may appear bluish in color
- Body may be cool
- Loss of urinary and/or bowel control



Diagnosis of Cardiac Arrest:

- Also called Sudden Cardiac Arrest (SCA)
- Out of Hospital Cardiac Arrest (OOHCA)
- Other signs and symptoms precede sudden cardiac arrest.
 - fatigue, fainting, blackouts, dizziness, chest pain, shortness of breath, weakness, palpitations or vomiting.
- But sudden cardiac arrest often occurs with no warning.
- Diagnosis is based on the symptoms



Treatment:

- Immediate CPR
- Defibrillation
- Standard and well executed ACLS Protocols:
 - Airway
 - IV
 - Medications
 - Cooling
- Transport to Cardiac Arrest Center



Factors contributing to survival:

- Patient
 - Smoking, age, co-morbidity,
- Event
 - Rhythm, witnessed, location,
- System
 - Importance of bystander CPR time to CPR, time to defib,



Factors contributing to survival:

Effects of Location:

- 75% of cardiac arrests occur in home.
- Males 40 - 70 years of age
- 60% are witnessed by family member.
- Spouses & family most likely to do CPR: However, this group least likely to be trained in CPR.
- ***Research shows arresting in public increases survival by 50%!***

Factors contributing to survival:

RHYTHM

- Ventricular Fibrillation
 - 80% of adults with sudden (non-traumatic) cardiac arrest are found in VF.
 - Most likely to survive
- PEA/Asystole
 - Survival dismal
 - Some have survived



Factors Contributing to Survival:

- Two Critical Elements of Survival -before arrival of EMS
 - Time elapsed from collapse to initiation of CPR
 - Time elapsed from collapse to application of AED

System Factors:

- Time to CPR
 - Dispatcher-assisted telephone CPR
 - Agonal breathing recognition
 - High-performance resuscitation
 - Community CPR training
- Time to defibrillation
 - Rapid dispatch
 - Community PAD
 - Police defibrillation



The importance of ***bystander CPR***



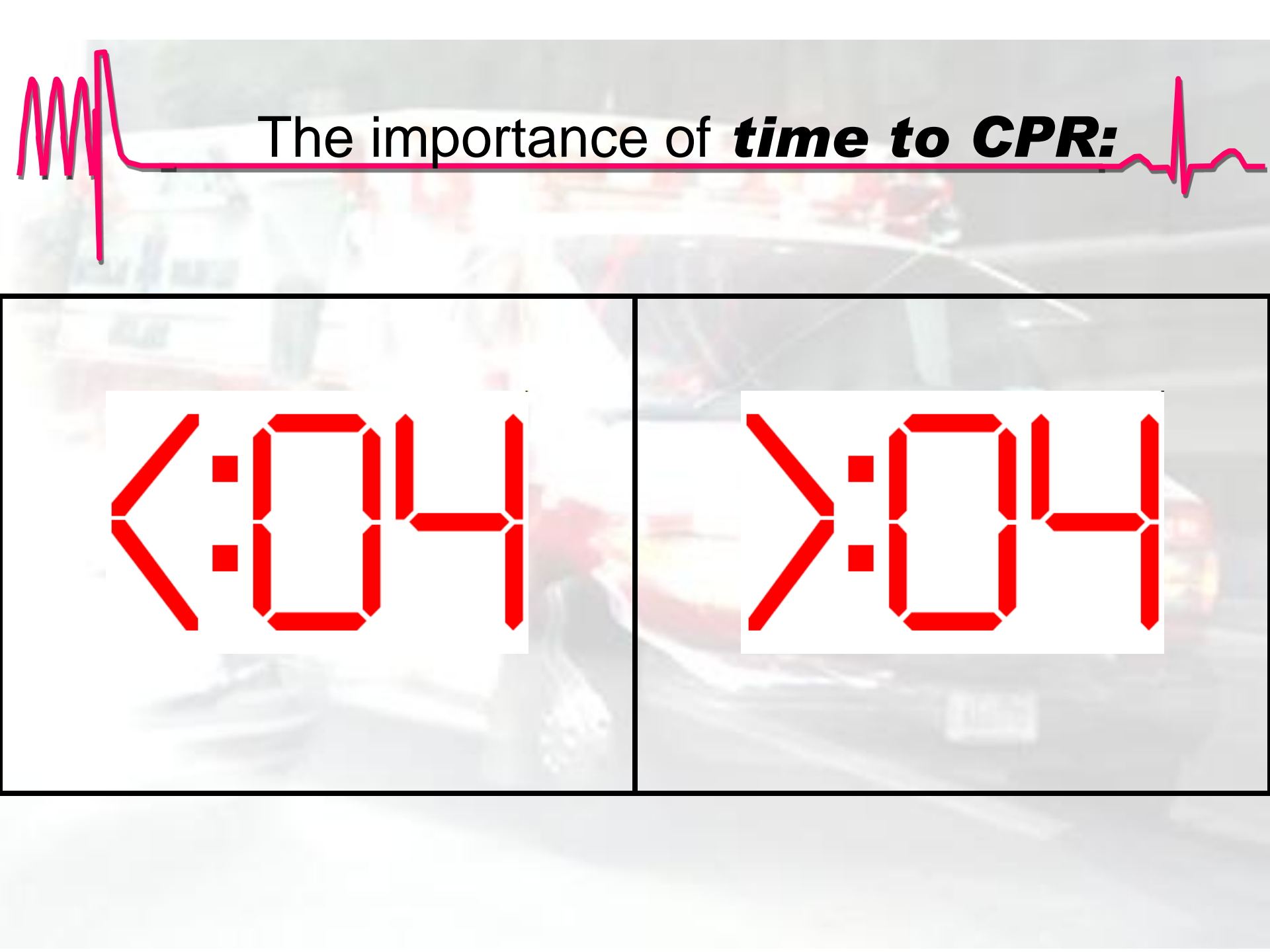


Effective CPR

- Maximizes cerebral and coronary perfusion pressures
- Boosts myocardial ATP levels
 - Improves chances of ROSC
 - (Ornato, 2006)



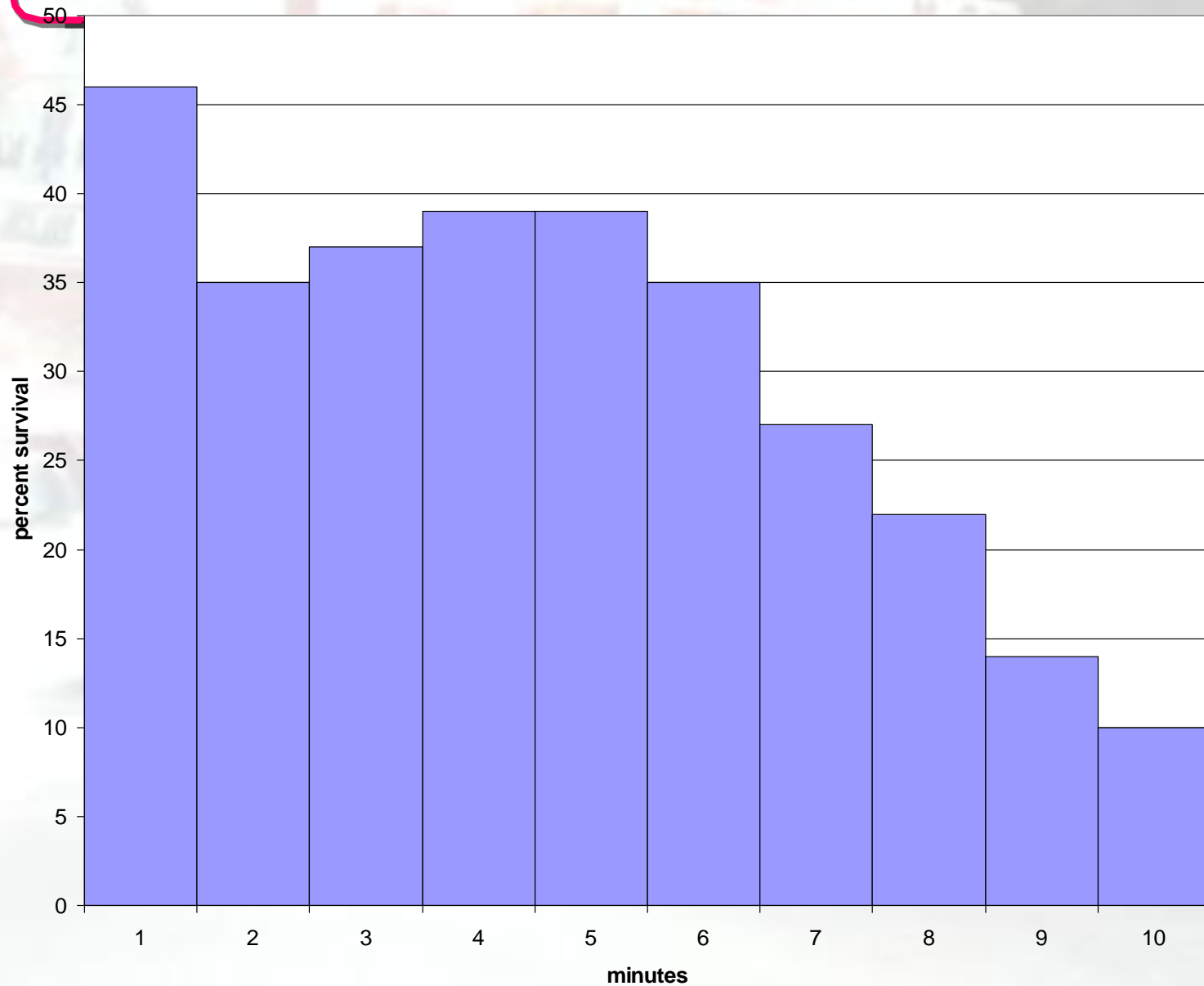
The importance of ***time to CPR***:



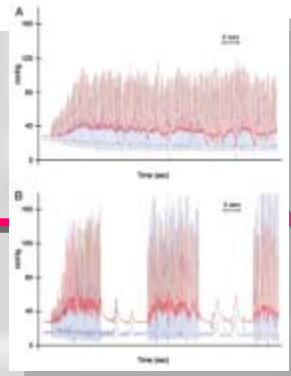
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Percent survival by time to CPR



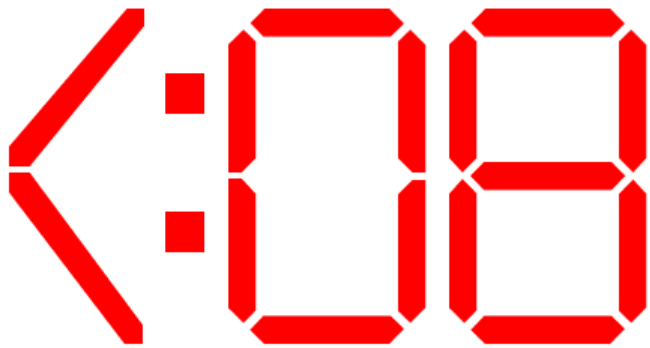
Chest compression only CPR:



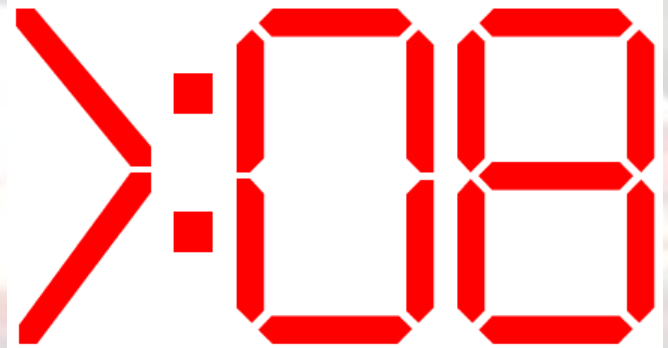
- Bystanders more willing to initiate
- Arterial blood is adequately oxygenated at onset of primary ***cardiac arrest***
- Less likely to cause regurgitation of stomach contents
- Rescue breathing interrupts critical chest compressions
- Easier to teach
- Observational evidence of improved survival



The importance of ***time to defibrillation***

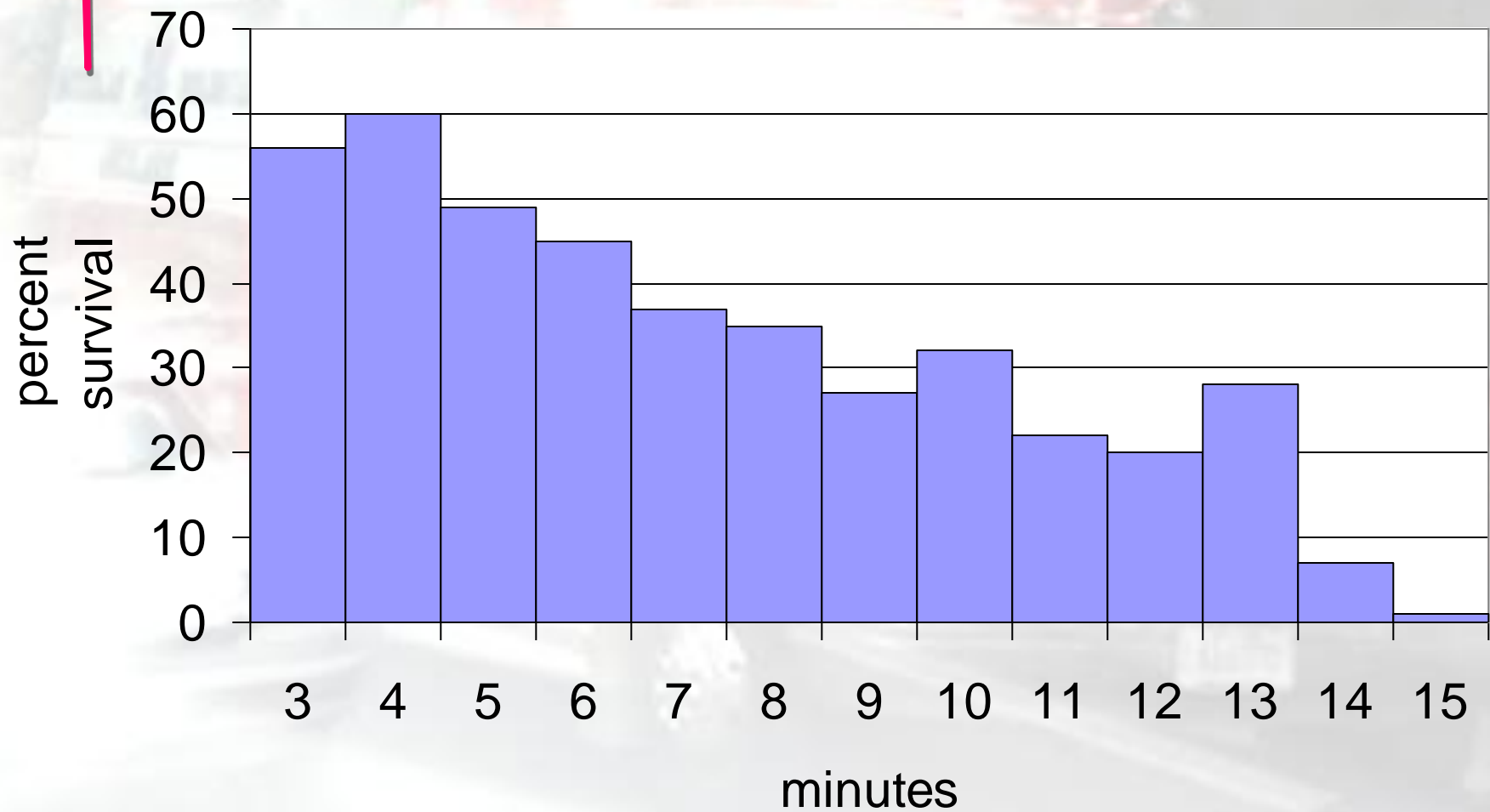


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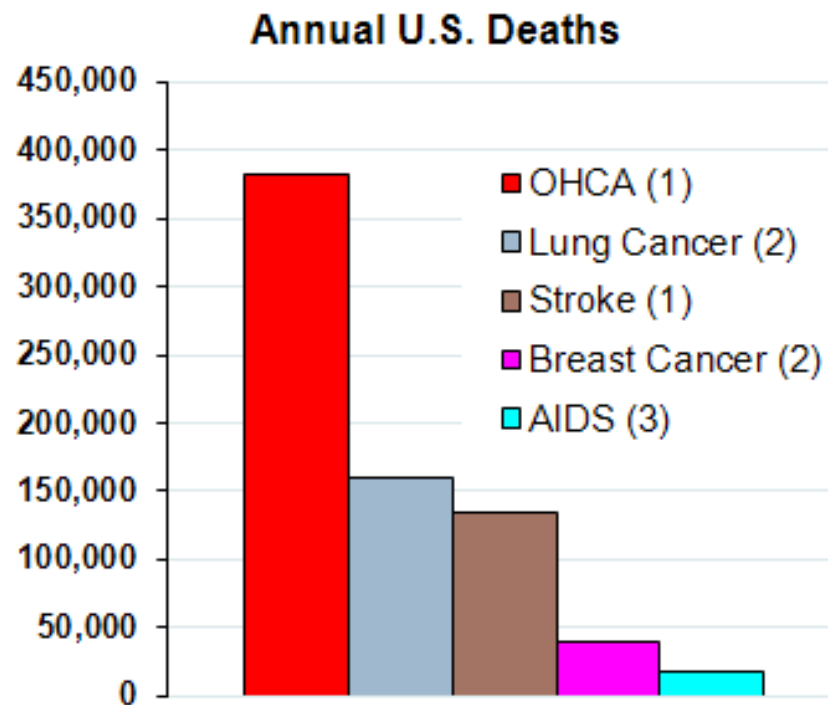


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Percent survival by time to first shock



Out-of-Hospital Cardiac Arrest: Overlooked Cause of Death



SCA Facts

Sudden cardiac arrest is a public health crisis, striking an estimated 295,000 Americans each year.
(Circulation,2012;125:e2)

- Nationally, 89% of those who suffer SCA die before reaching the hospital — a rate that hasn't changed significantly over several decades. (Circulation,2012;125:e2)
- SCA kills six times more Americans each year than breast cancer. And more than AIDS, lung, breast and prostate cancer combined.
- Your chances of survival fluctuate by as much as 500 percent, depending on where you live in the country. (JAMA,2008;300:1423)

(1) American Heart Association Heart Disease and Stroke Statistics – 2012 Update.

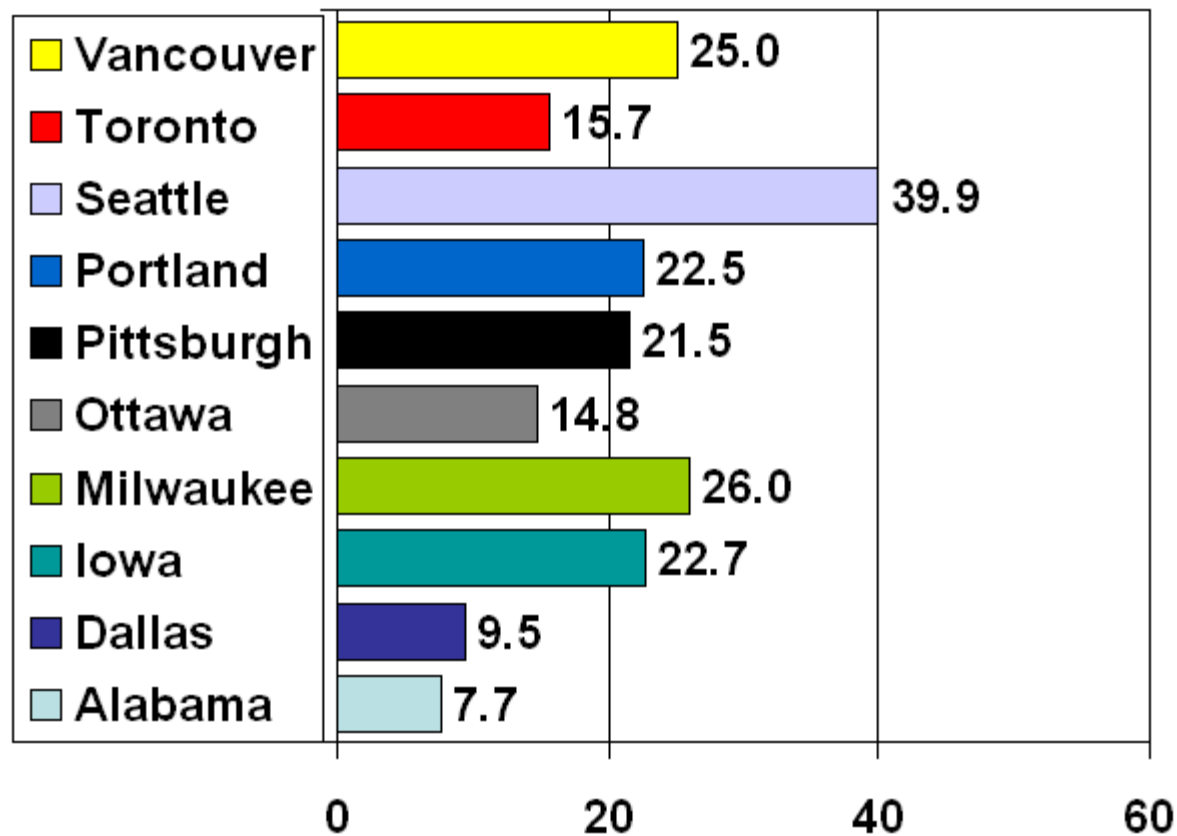
(2) Cancer.org - 2012.

(3) U.S. HIV & AIDS Statistic Summary. Avert.org.

Variation in survival VF arrest

Resuscitations Outcomes Consortium

Survival to discharge





HeartRescue Partners





HeartRescue Partners



Program Goals:

Goal 1: Improve Survival of Cardiac Arrest by 50% over 5 years in geographies we fund.

Goal 2: Increase and improve measurement of Sudden Cardiac Arrest.

Goal 3: Expand and improve national and global impact of the HeartRescue Project.

Program Results FY12- Q1FY13:

1. Partner programs now covering 50% or more of state populations, and reported on baseline and 2011 survival outcomes. **900 survivors reported in 2011.**
2. New partners in FY12 (AMR), and FY13 (University of Illinois)
3. All partners hosted 25 Resuscitation Academies and eLearning webinars reaching 1,000+ EMS/Hospital leaders with best practice education
4. Partners presented to 1,200 EMS leaders at 8 events to date.
5. 3 million people saved a life virtually with Save-a-Life Simulator on HeartRescueNow.com

Goals:

Program Goals

Improved Survival Rates

50% improvement in SCA survival in program states

- Partner grants



Improved Reporting

Increase and improve measurement of SCA nationwide

- Common data set and registry (CARES)
- SCA national index



Improved National and Global Impact

Expand nationally and internationally

- Expand grant program
- SCA Community Playbook



How to improve:

Improving SCA Survival

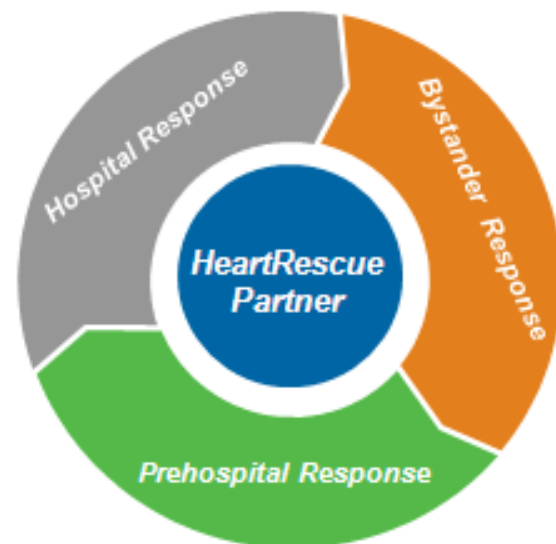
1: Bystander Response



2: Prehospital Response



3: Hospital Response





Cardiac arrest in North Carolina:

~ 5000-8000 per year (ED vs. EMS records)

NC Office of EMS Preliminary data

- Statewide Cardiac Arrests: 5,213
- EMS Return of Spontaneous Circulation: 1,845 (35%)
- Arrived at Emergency Department Alive: 1,034 (20%)
- Admitted to Hospital Alive: 589 (11%)
- Discharge from Hospital Alive :not available... likely under 5%



Cardiac arrest in North Carolina

From the CARES Registry:

Bystander CPR 23%

AED Use 1.3%

Public CPR training 3% / year

32% Survival Rate

(Utstein criteria)

Original CARES data from Wake, Durham and
Mecklenburg Counties



NC Success Stories:

- Pregnant Woman/School Teacher – Charlotte
- Legislator-Raleigh
- Police Officer - Yadkinville
- Baseball Coach-Winston-Salem
- Former Girl scout performs CPR-Durham
- Rural EMS: Stokes County Survival Rate 66%

Elements of success:

- Witnessed
- Recognition, 911
- Medical dispatch
- Bystander CPR
- 1st responder AED
- Hypothermia protocol





HeartRescue Flagship Premier Partner Program:

1st Chain: Community Response

- i. Early SCA Recognition
- ii. Early 911
- iii. Early and effective bystander CPR or CCC
- iv. Early Public Access to AED

2nd Chain: Pre-Hospital Response

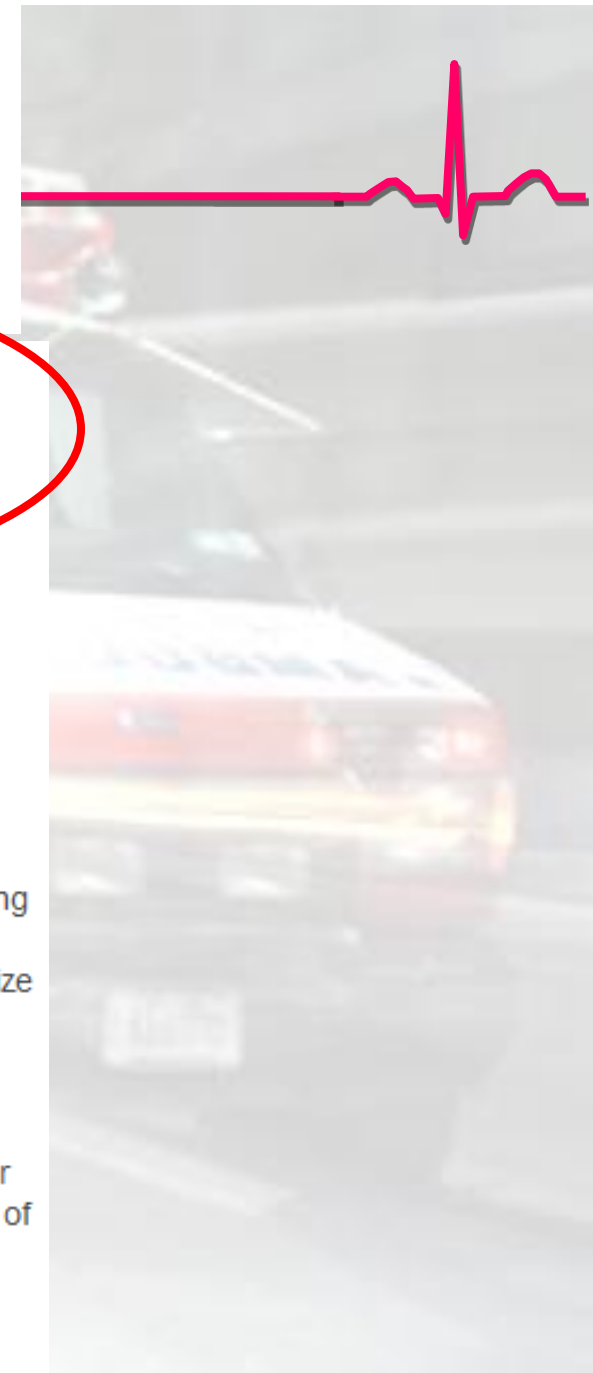
- i. Enhanced dispatch
- ii. Enhanced/high performance CPR or CCC
- iii. Defibrillation care (e.g. one shock therapy for VF patients)
- iv. Pre-hospital hypothermia
- v. Drug delivery (e.g. Intra-osseous drug delivery)

3rd Chain: Hospital Response

- i. Patient triage to Resuscitation Center of Excellence
- ii. Hypothermia as indicated by local protocol
- iii. 24/7 Cath Lab
- iv. Patient indicated therapies provided (e.g. ICD, PTCA, stent, CABG)
- v. Post survival patient and family education and support

In 2010, the American Heart Association updated its Guidelines for CPR and Emergency Cardiovascular Care for SCA victims. They include:


- Improving the recognition of SCA by 911 call takers and urging 911 call takers to instruct callers to begin chest compressions while awaiting EMS arrival.
- Providing high quality CPR with minimal interruptions in chest compressions and with controlled ventilations. Beginning CPR with compressions rather than ventilations (C-A-B instead of A-B-C) to emphasize the primary importance of chest compressions and to decrease barriers to starting CPR.
- Establishing OHCA Systems of Care - including linking with community AED programs, coordinating with receiving hospitals to optimize post-cardiac arrest care, and measuring survival to hospital discharge.
- Implementing quantitative waveform capnography for intubated patients to monitor endotracheal tube placement and the quality of the resuscitation.
- Working as a team during resuscitation with defined roles and clear communication





Sharing Best Practices

Improving EMS system factors can increase outcomes of SCA. These factors include:

- CPR
 - Time to CPR
 - Dispatcher-assisted telephone CPR
 - Recognition of agonal breathing
 - High-performance resuscitation by EMS
 - Community CPR training
 - Defibrillation
 - Time to defibrillation
 - Rapid dispatch
 - Community PAD
 - Police defibrillation
- 



SCA is a treatable disease. Improving survival rates requires measurement and a coordinated community response.

- Data collection standards currently exist to capture incidence and outcomes. Only through measurement can we make informed decisions and replicate best practices.
- Improving survival rates requires a collective community response by the general public, first responders, EMS services and in-hospital caregivers.
- Success begins with public bystanders. Communities with higher bystander CPR participation have higher SCA survival rates.
 - Eighty percent of SCA events occur in the home.
 - Everyone should recognize SCA and know how to call 911, start chest compressions and how to find and use an AED.



Data

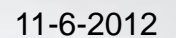
- The CARES Registry
- Collected by EMS
- Fields that involve 9-1-1
 - Were CPR instructions given
 - 911 to Dispatch
 - Dispatch to Arrival
 - 911 to Arrival



Your Role in Data

- See Play Book Pre Arrival
Institutions Review page 57-59
example
- Call to recognition of cardiac arrest
- Call to first compression
- Other
- Page 60 tape review and evaluation

Participation:





Dispatch CPR Instruction:

Dispatch Instruction			
Yes	No	Unknown	Blank
31%	24%	43%	1%

SO EASY A DOG CAN DO IT!



Improving outcomes in cardiac arrest

Conclusions:

- Cardiac arrest is common and the third leading cause of death.
- Victims of out of hospital cardiac arrest are unlikely to survive
- Simple interventions in the chain of survival are likely to improve survival
- Your role in EMD can help communities improve their survival rates!



Let's make NC the best
place in the country
to have a heart attack
or a cardiac arrest!

