


Evolution & Revolution in CPR:

Advancing to the Basics


Alexander L. Eastman, M.D., M.P.H
Assistant Professor of Surgery and Emergency Medicine
 University of Texas Southwestern Medical Center and
 the Parkland Memorial Hospital, Dallas, USA

Set Me Up for “A.C.L.S.”....

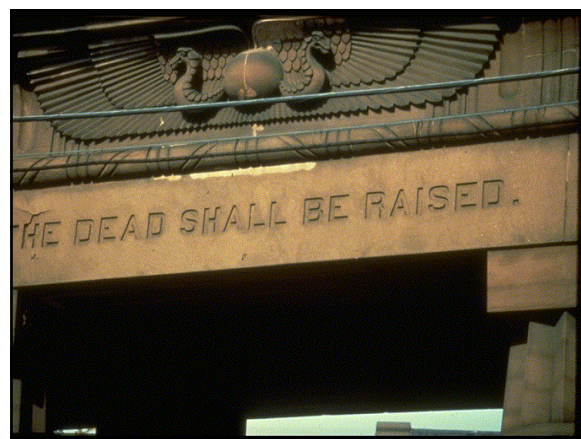


... “Alternate Clinical Life Style”

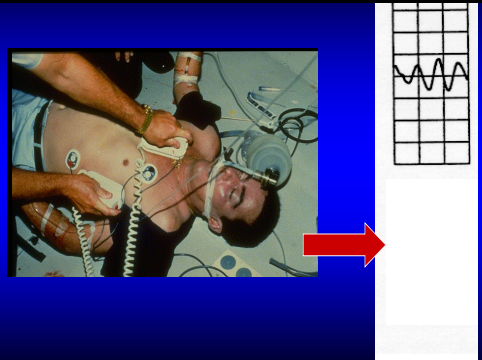
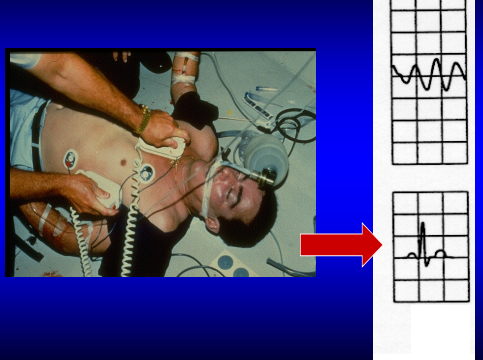
1 of Every 5 Persons Who Die in My Community ...



.....Will Die From Sudden Death Syndrome....



With Immediate Defibrillation...

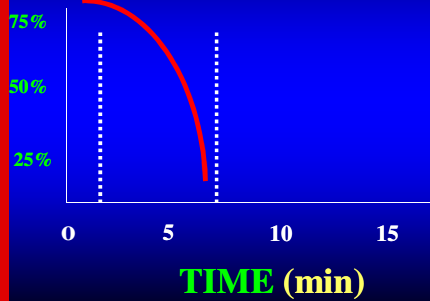



But ...

It Takes Time to Get a Defibrillator On-Scene !



VFib Survival Rates



Seattle CPR Program

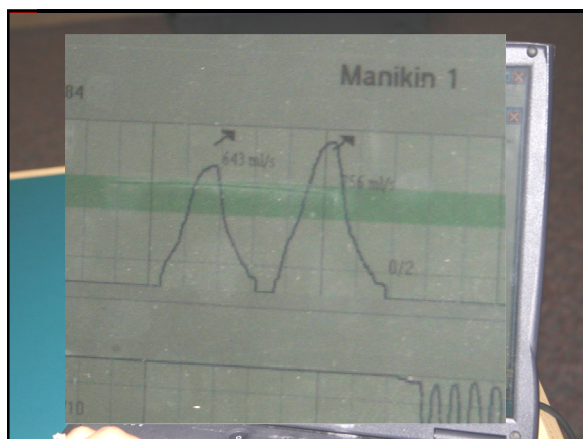
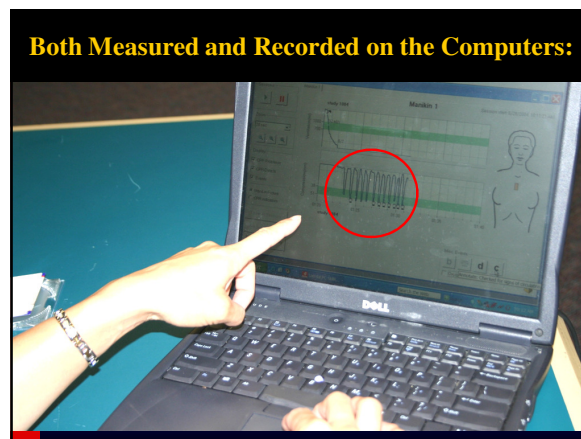
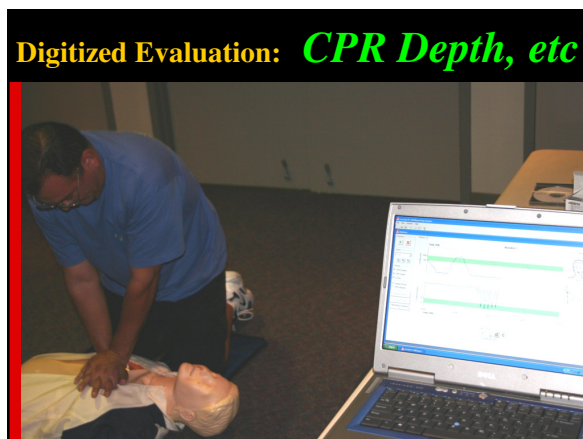
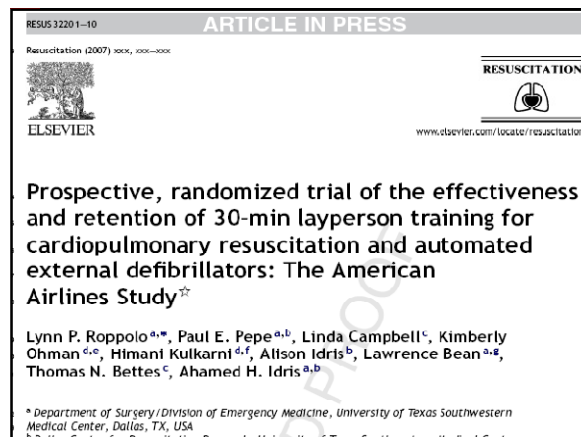
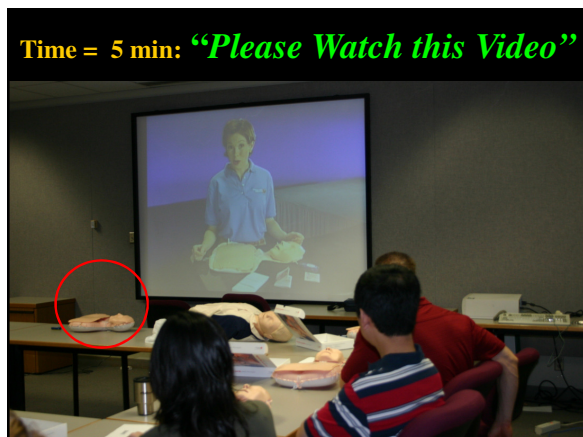


- Trained All School Children
Beginning in the Mid-1970's
- 200,000 Trained by 1982
- Today, CPR ~ 60% of Cases

Survival with Bystander CPR

*If Bystander Witnesses
and Performed CPR...
... > 40% Survived*

*Major Advance
in
Community-Wide
Training ...*



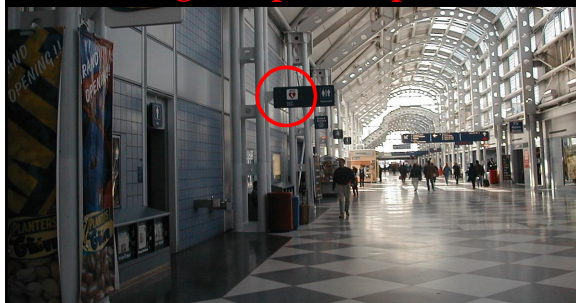
- Current Status for Dallas Alone:**
- 13,000+ Dallas City Employees
 - All New Employees Done (at no cost)
 - 20,000 School Employees (AED)
 - Large Corporations Joining
- Now Plan:*
- 17,000 7th Graders x 3 yrs
 - MULTIPLIER Effect (x 5 ?)
 - 250,000 persons trained in 3 years ?

AED Training in 5 min

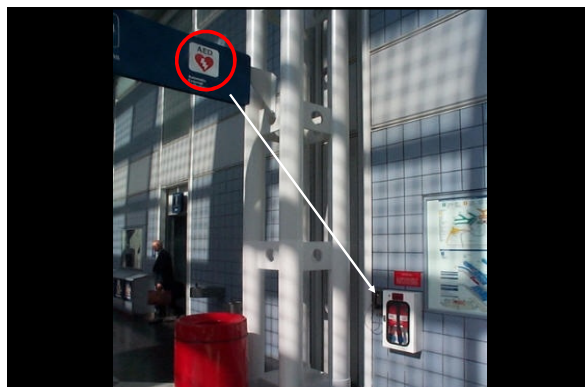


**Automated External
Defibrillators**

Defibrillation by the Public: The Chicago Airport Experience

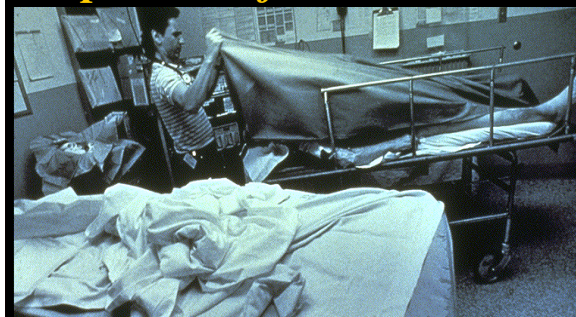


Caffrey, Willoughby, Pepe: *N Engl J Med* Oct 17, 2002; 347:1242-7



Tested Public Access to AEDs

Despite All of This....



Survival Rates Remain Low

Quality of Cardiopulmonary Resuscitation During Out-of-Hospital Cardiac Arrest

Lars Wik, MD, PhD
Jo Kramer-Johansen, MD
Helge Myklebust, BEng
Hallstein Sorebo, MD
Leif Svensson, MD
Bob Fellows, MD

Context Cardiopulmonary resuscitation (CPR) guidelines recommend target values for compressions, ventilations, and CPR-free intervals allowed for rhythm analysis and defibrillation. There is little information on adherence to these guidelines during advanced cardiac life support in the field.

Objective To measure the quality of out-of-hospital CPR performed by ambulance personnel, as measured by adherence to CPR guidelines.

Design and Setting Case series of 176 adult patients with out-of-hospital cardiac arrest.

“Chest compressions were not delivered half of the time, and most compressions were too shallow”.

Conclusions In this study of CPR during out-of-hospital cardiac arrest, chest compressions were not delivered half of the time, and most compressions were too shallow. Electrocardiographic analysis and defibrillation accounted for only small parts of intervals without chest compressions.

Stopping to Breathe... ...Interrupts Chest Compressions

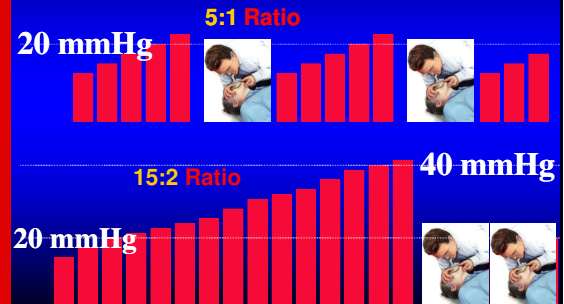


Coronary Perfusion Pressure

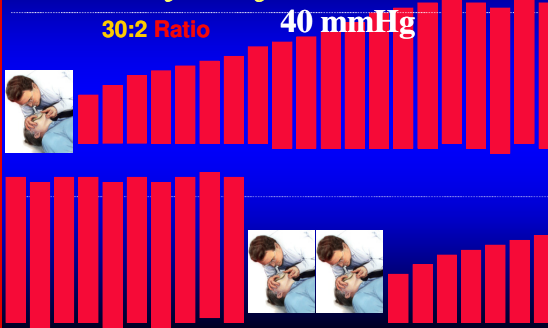
The Key Factor in Achieving ROSC

(Return of Spontaneous Circulation)

Chest Compressions & Coronary Perfusion Pressure



Chest Compressions & Coronary Perfusion Pressure

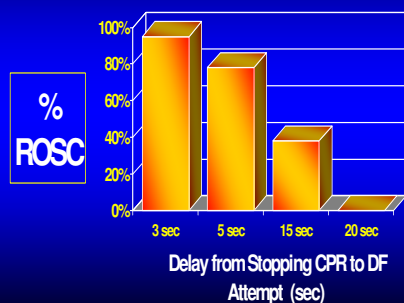


Compression to Shock Delays ...

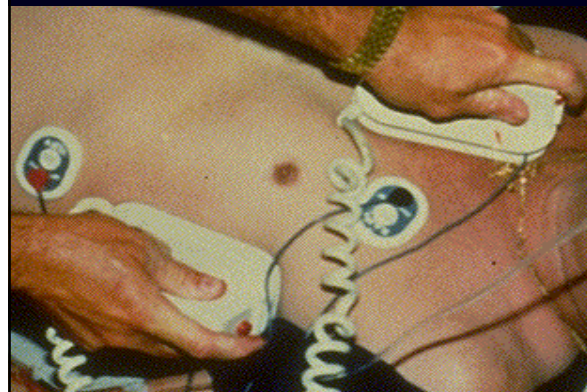


“Hands-Off” Interval

Yu et al, Circulation 2002; 106:368-72



Countershock Needs to Be Given ASAP !!



Lars Wik, et al...

Controlled Study:
3 min of CPR
Prior to Defibrillation Attempts...
= Increased Survival !

Key studies

Chest Compression Fraction Determines Survival in Patients With Out-of-Hospital Ventricular Fibrillation
(Circulation. 2009;120:1241-1247.)

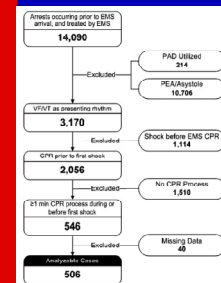


Figure 1. Study cohort and exclusions. EMS indicates emergency medical services; PAD, public access defibrillator; PEA, pulseless electrical activity; and VF-VT, ventricular fibrillation/tachycardia.

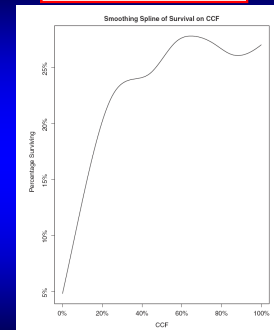
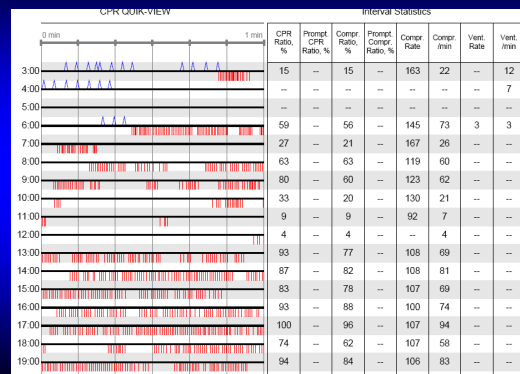
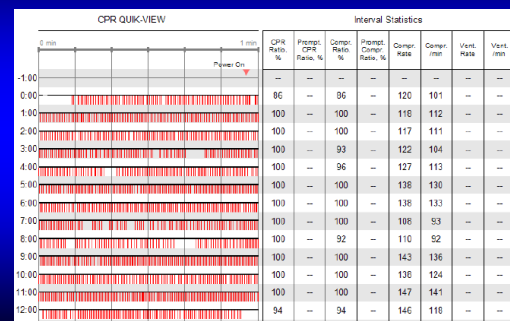


Figure 3. Smoothing spline representing the incremental probability of survival corresponding to a linear increase in chest compression fraction.

CPR 2006



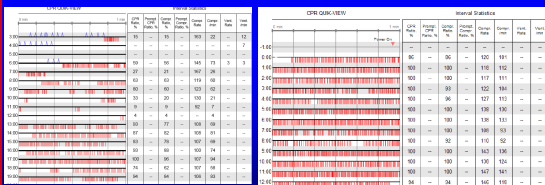
CPR 2009



Following Feedback, Re-Training and... More Re-Training:

2006

2009



Impact on Dallas Area Outcomes

	Survival to Hospital Discharge		Relative Percent Increase
	2006	2009	
Dallas	3.9%	6.0%	54%
Irving	7.0%	11%	57%
Mesquite	3.0%	6.0%	100%
Carrollton	4.2%	15.8%	376%

PPV...

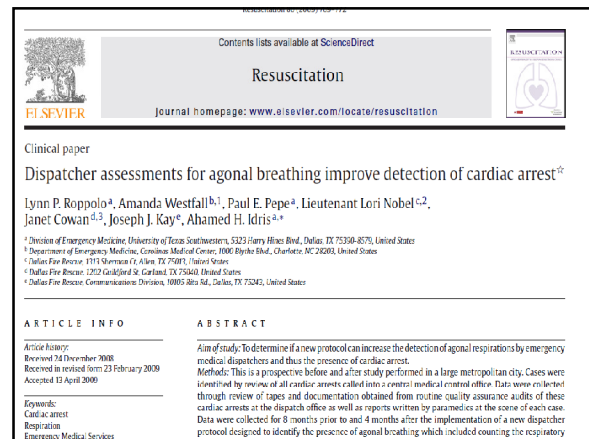
- Generates Positive Intrathoracic Pressure
- Pushes Lungs Open in a Maldistributive Manner
- Diminishes Venous Return and Cardiac Preload

Other Sources of Ventilation:

Chest Compressions
Gasping (Agonal Breaths)

Gasping May Enhance:

- **Oxygenation** (more lung inflation)
- **Ventilation** (more efficient breath)
- **Circulation** (more venous return)



Dispatch Assisted CPR Instructions



Compressions Alone
vs
Standard ABC's

Survival...



Compressions Alone
14.7%
vs
Standard ABC's
10.4%

Hallstrom et al. NEJM, 2000

Circulation American Heart Association
JOURNAL OF THE AMERICAN HEART ASSOCIATION
Learn and Live...


Hands-Only (Compression-Only) Cardiopulmonary Resuscitation: A Call to Action for Bystander Response to Adults Who Experience Out-of-Hospital Sudden Cardiac Arrest

A Science Advisory for the Public From the American Heart Association Emergency Cardiovascular Care Committee

Michael R. Sayre, MD; Robert A. Berg, MD, FAHA; Diana M. Cave, RN, MSN; Richard L. Page, MD, FAHA; Jerald Potts, PhD, FAHA; Roger D. White, MD

And That Brings Us to Some Recent Studies...

Resuscitation (2007) 75, 145–152
ELSEVIER
EXPERIMENTAL PAPER
Rhythm discrimination using motion artifact
Ronald D. Berger^{a,*}, James R. ...
^a Departments of Medicine, Biomedical Engineering, School of Medicine, 600N. Wolfe Street



Such as ...
“Noise Reduction Defibrillation”

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
Vital 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 did not receive MICR but received standard advanced life support.
Intervention Instruction for EMS personnel in MICR, an approach that includes an initial series of 200 uninterrupted chest compressions, rhythm analysis with a single shock, 200 immediate postshock chest compressions before pulse check or rhythm reanalysis, early administration of epinephrine, and delayed endotracheal intubation.

OUT-OF-HOSPITAL CARDIAC arrest is a major public health problem and a leading cause of death.¹⁻⁴ Unfortunately, in large metropolitan cit-

MICR Technique



- 200 Uninterrupted CC's
- Rhythm Analysis with 1 Shock
- 200 Immediate Post-Shock CC's Before Pulse / Rhythm Check
- Early Administration of Epi
- Delayed Endotracheal Intubation

Improved Survival with MICR !

survival to-hospital discharge	before MICR training	after MICR training
All	1.8% (4/218)	5.4% (36/668)
witnessed VF	4.7% (2/43)	17.6% (23/131)

Bobrow, B. J. et al. JAMA 2008;299:1158-1165.

In Summary ...

Not to Bury the Headline:



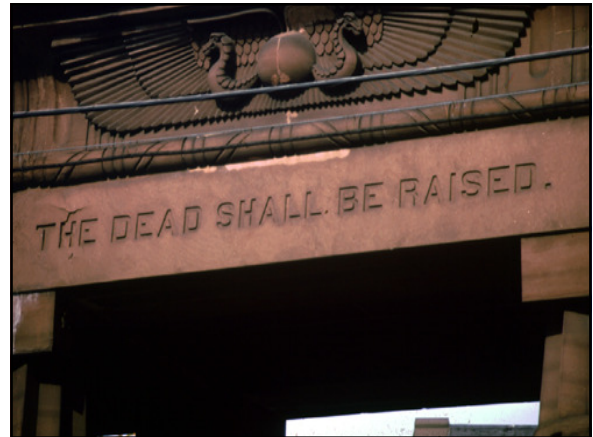
**Basic Out-Hospital Care
Can Saves Many Lives...**

But ...



We Can Do It Better !

***And on the Road
to the
22nd Century...***



**Teşekkür
ederim**