

## KEYWORDS

- Advanced cardiac life support
- Basic life support
- Ventricular tachycardia
- Ventricular fibrillation
- Pulseless electrical activity
- Asystole
- Buffers
- Automatic external defibrillator
- Cardiopulmonary resuscitation
- Brain death & persistent vegetative state.

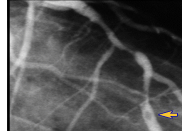


## CPR @ 9/2004- WHATS NEW?



Since 1960

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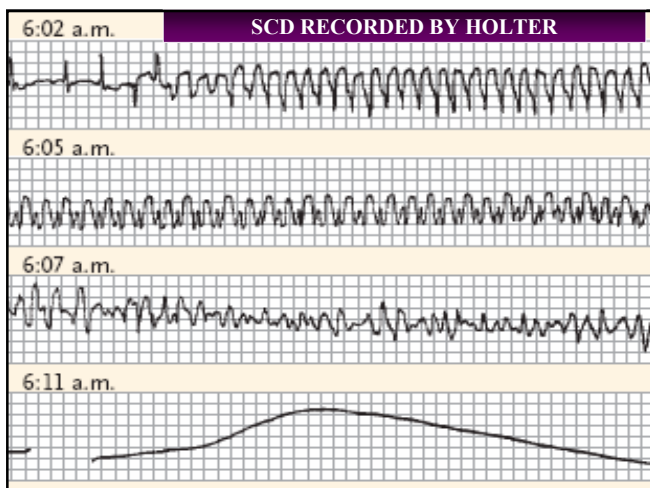
## Incidence

- 400,000 in USA die suddenly (1/1000/y)
- 375-750k have cardiac arrest and attempted resuscitation during hospitalization
- Most common cause CAD (ischemic or infarcted myocardium or electrolyte problem, mechanism poorly understood).
- CAD, CHF & LVH Resulting in VT/VF
- Age 69, Males 69%, >69% die (both in & out of hospital arrests)
- 0.3-1.5/1000 of population experiences every year out of hospital SCD in various reports.



## הערות מקדימות

1. הרצאה מעודכנת לשבוע האחרון.  
גירסא עדכנית עומדת לרשותכם.
2. תפקידנו כמחנכים:  
א. לשתף את תלמידנו בכל המידע  
העדכני העומד לרשותנו ע"י (הצלחות  
וכישלונות כאחד). העמדת כל מקור  
חינוכי לרשותם.
- ב. Peer review

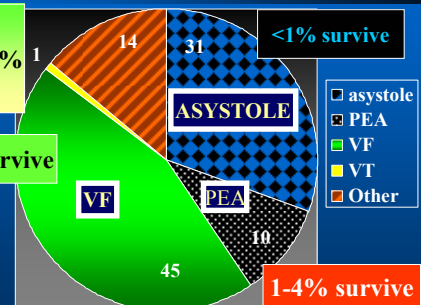


## WHAT?

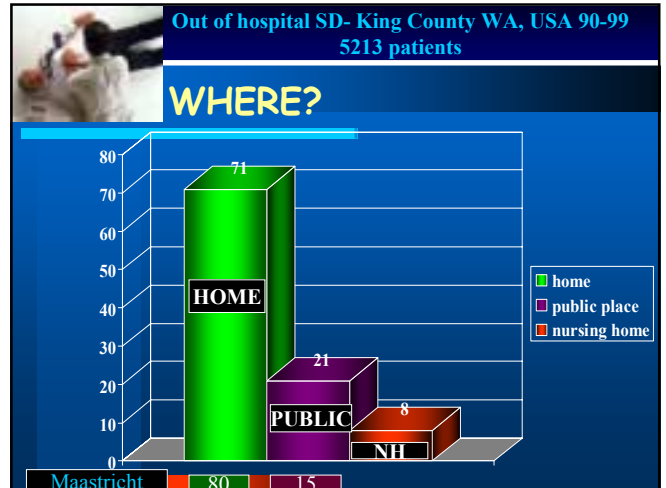
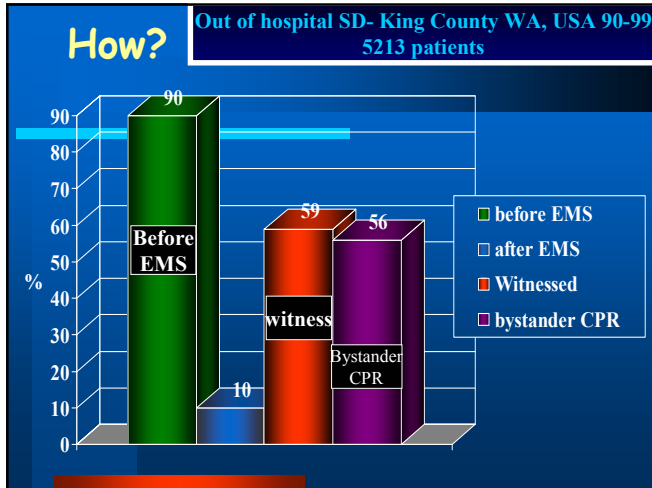
Out of hospital SD- King County WA, USA 90-99  
5213 patients

ROSC ≈ 30-35%  
Admitted ≈ 25-35%  
Discharge ≈ 5%

5-34% survive



VF 40-60%, ASYSTOLE 20-40% (late EMS)



### Core Training Objectives (2)

2. Manage 1st 10 minutes of arrest due to VF
  - BLS & AED + defibrillator
  - Airway support, ventilation & oxygenation
  - Vascular access
3. Correctly treat 4 arrest rhythms:
  - a. VF
  - b. VT
  - c. PEA
  - d. Asystole

**LEARN CPR**  
you can do it!

### Core Training Objectives (1)

1. Recognize & treat pre-arrest conditions (like ACS, stroke & respiratory failure).

### Errors are OK except failing to execute CC & defibrillation

**EARLY EDUCATION**

**BLS: Chest compression** **BLS/ACLS: Defibrillation**

### Core Training Objectives (3)

4. Managing death, brain death, anoxic encephalopathy, PVS

No other procedure in cardiology carries failure rate of 70-99%

## Hence it is our responsibility:

- To provide the required education (to patients, bystanders, on-duty personal, and medical staff).
- To optimize our local chain of survival.
- To emphasize CV prevention and not SCD prevention.

## EARLY EDUCATION BLS (SCHOOL, PEERS>40y)

### Education in Resuscitation

An ILCOR Symposium

Utstein Abbey

Stavanger, Norway

June 22-24, 2001

Circulation. 2003;108:2575-2594.

Writing Group

Douglas A. Chamberlain, CBE, MD (Cochair); Mary Fran Hazinski, RN, MSN (Cochair)

On behalf of the European Resuscitation Council, the American Heart Association, the Heart and Stroke Foundation of Canada, the Resuscitation Council of Southern Africa, the Australia and New Zealand Resuscitation Council, and the Consejo Latino-Americano de Resuscitación

### Theoretical Model of Factors in Patient Outcome

	Guidelines quality	Education of Patient care Givers & pts.	Function of Local chain of Survival	Patient Survival Relative to Theoretical Potential (Factors Multiplied)
Utopia	1	1	1	~1.00
Ideal?	0.9	0.9	0.9	~72%
Actual?	0.8	0.5	0.5	~20%
Attainable?	0.8	0.9	0.5	~32%

BLS for Layperson with duty to response & healthcare Providers

## HISTORY OF 1200 VICTIMS OF CARDIAC ARREST

Table 1. Cardiovascular History of the Patients.

Variable	Vasopressin Group (N=589)	Epinephrine Group (N=597)	P Value
	no./total no. (%)		
Coronary heart disease	40% 176/467 (37.7)	189/463 (40.8)	0.33
Hypertension	18% 84/475 (17.7)	82/474 (17.3)	0.88
Diabetes	17% 78/476 (16.4)	78/477 (16.4)	0.99
Left ventricular failure	13% 59/467 (12.6)	59/468 (12.6)	0.99
Peripheral vascular disease	13% 47/474 (9.9)	53/475 (11.2)	0.53
Cardiac arrhythmias	7% 35/467 (7.5)	29/468 (6.2)	0.43
Pacemaker	4% 20/474 (4.2)	18/474 (3.8)	0.74
Valvular heart disease	3% 13/468 (2.8)	14/468 (3.0)	0.85
Cardiomyopathy	2% 8/468 (1.7)	9/468 (1.9)	0.81

80% SCD patients are @ mild risk (warrant moderate measures)  
MI & SCD are the 1<sup>st</sup> Manifestations of CAD in >60% of pts.(101)

## EARLY PREVENTION



### 1.Unpredictable:

Most people who have SCD are @ low risk

### 2. Mostly primary:

Most those who had SCD do not get a 2<sup>nd</sup> chance

## Early Prevention

Table 2 Dilated cardiomyopathy

	Class I	Class IIa	Class IIb
Primary prevention	ACE-inhibitors Beta-blockers	Aldosterone receptor blockers	Amiodarone
Secondary prevention	ICD ACE-inhibitors Beta-blockers	Aldosterone receptor blockers	Amiodarone

ACE=angiotensin converting enzyme; VTs=sustained ventricular tachycardia; VF=ventricular fibrillation; ICD=implantable cardioverter defibrillator; EF=ejection fraction

PRIMARY PREVENTION BY ICD FOR DCM WITH LVEF <36%  
SHOULD BE INDIVIDUALIZED ON A CASE TO CASE BASIS.  
(More Valuable in NYHA III, wide QRS, males.)

European Heart Journal (2003) 24, 13-15

## Update of the guidelines on sudden cardiac death of the European Society of Cardiology

Silvia G. Priori\*, Etienne Aliot, Carina Blomstrom-Lundqvist, Leo Bossaert, Gunter Breithardt, Pedro Brugada, John A. Camm, Riccardo Cappato, Stuart M. Cobbe, Carlo Di Mario, Barry J. Maron, William J. McKenna, Anders K. Pedersen, Ursula Ravens, Peter J. Schwartz, Maria Trusz-Gluz, Panos Vardas, Hein J.J. Wellens, Douglas P. Zipes

Table 1 Primary prevention in post MI with or without HF	Class I	Class IIa	Class IIb
<b>POST MI</b>	Beta blockers ACE inhibitors Aspirin Lipid lowering drugs	PUFA Amiodarone	
<b>MI &amp; LVEF ▼</b>	Beta blockers ACE inhibitors Aldosterone receptor blockers	Amiodarone ICD (if EF<30%)	
<b>Hemodynamically Tolerated VT</b>		Amiodarone Beta blockers	ICD Ablation Surgery
<b>EF&lt;40+spont VTns/s Inducible @PES</b>	ICD		
<b>POST MI LVEF&lt;30 QRS, TWA, FC (MAD 2)</b>	ICD		
<b>ICD?</b>			

\* VTns=non sustained ventricular tachycardia; ICD=implantable cardioverter defibrillator; EF=ejection fraction; TWA=late potential; FC=fragmented QRS; MAD 2=multifactorial analysis of sudden death in the elderly  
European Heart Journal (2003) 24, 13-15

DRUG	Patients (n)	RR death/SCD	P
Sodium channel blockers during MI			
lidocaine	9155§	1.38 (0.98–1.95)	<0.05
after MI			
class Ia	6582§	1.19 (0.99–1.44)	0.07
class Ib	14 033§	1.06 (0.89–1.26)	0.50
class Ic*	2338§	1.31 (0.95–1.79)	0.10
Flecainide and encainide	1455*	3.6 (1.7–8.5)	0.0006
Beta-blockers <sup>2</sup>			
during MI	28 970§	0.87 (0.77–0.98)	0.02
after MI	24 298§	0.77 (0.70–0.84)	<0.001
carvedilol <sup>3</sup>	1959	0.77 (0.60–0.98)	0.03
in CHF		0.74 (0.51–1.06)	0.098
carvedilol	1094	0.44 (0.28–0.69)	<0.001
bisoprolol	2647	0.51 (0.28–0.92)	na
metoprolol	3991	0.66 (0.54–0.81)	<0.0001
metoprolol		0.56 (0.39–0.80)	<0.01
metoprolol		0.66 (0.53–0.81)	0.0009
metoprolol		0.59 (0.45–0.78)	0.0002
Amiodarone	6500§	0.87 (0.78–0.99)	0.03
		0.71 (0.59–0.85)	0.0003
Potassium channel blockers			
d-Sotalol	3121	1.65 (1.15–2.36)	<0.006
		1.77 (1.15–2.74)	0.008
Dofetilide in HCF	1518	0.95 (0.81–1.11)	≥0.05
Dofetilide in post MI		no significant reduction	
Calcium channel blockers	20 342§	1.04 (0.95–1.14)	<0.41

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DRUG (non-EP)	Patients (n)	RR death (95% CI)	RR SCD (95% CI)
ACEI			
AMI	100963	.94 (.8-.98)	
Post MI	15104	.83 (.71-.97)	.80 (.70-.92)
Aldosterone blocker	1663	.70(.60-.82)	.71(.54-.95)
Lipid lowering agents			
Statins	30817	.71(.64-.80)	
N-3 PUFA	11324	.70 (.56-.86)	.55(.40-.74)

The NEW ENGLAND JOURNAL of MEDICINE

### ORIGINAL ARTICLE

## Prophylactic Defibrillator Implantation in Patients with Nonischemic Dilated Cardiomyopathy

Alan Kadish, M.D., Alan Dyer, Ph.D., James P. Daubert, M.D., Rebecca Quigg, M.D., N.A. Mark Estes, M.D., Kelley P. Anderson, M.D., Hugh Calkins, M.D., David Hoch, M.D., Jeffrey Goldberger, M.D., Alaa Shalaby, M.D., William E. Sanders, M.D., Andi Schaechter, B.S.N., R.N., and Joseph H. Levine, M.D., for the Defibrillators in Non-Ischemic Cardiomyopathy Treatment Evaluation (DEFINITE) Investigators\*

### Recommendations for primary prevention of sudden cardiac death: drugs with electrophysiological properties in post-myocardial infarction patients\*

Drugs/interventions	Recommendations	Level of evidence	References
Amiodarone**	Class IIa	A***	[187,207-212]
Potassium channel blockers			
d-sotalol	Class III	B****	[188]
dofetilide	Class A	A	[189,190]
Calcium channel blockers	Class III	B	[182,219-222]
Sodium channel blockers	Class III	B	[180-182,191,192]

\*Beta-blockers have been included in the previous tables (drugs without electrophysiological properties).

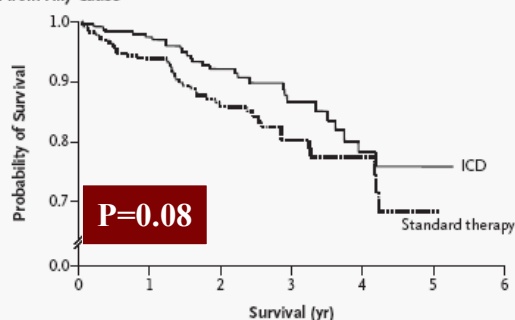
\*\*Data refer also to patient with CHF.

\*\*\*Reduces SCD, reduction of total mortality showed borderline significant reduction.

\*\*\*\*Worsen prognosis.

## DEFINITE- SURVIVAL

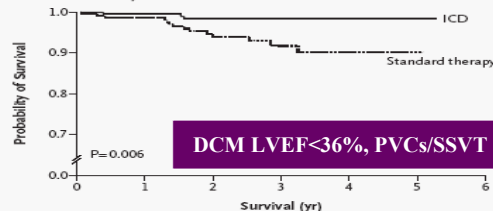
### A Death from Any Cause



DCM LVEF<36%, PVCs/SSVT

## DEFINITE- SCD FREE

### B Sudden Death from Arrhythmia



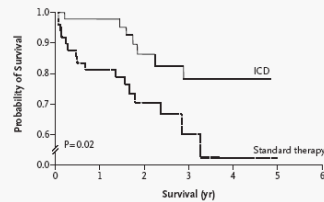
No. at Risk	229	210	131	67	32
Standard therapy group	229	210	131	67	32
ICD group	229	218	140	77	41

Figure 1. Kaplan-Meier Estimates of Death from Any Cause (Panel A) and Sudden Death from Arrhythmia (Panel B) among Patients Who Received Standard Therapy and Those Who Received an Implantable Cardioverter-Defibrillator (ICD).

In the ICD group, as compared with the standard-therapy group, the hazard ratio for death from any cause was 0.65 (95 percent confidence interval, 0.40 to 1.06) and the hazard ratio for sudden death from arrhythmia was 0.20 (95 percent confidence interval, 0.06 to 0.71).



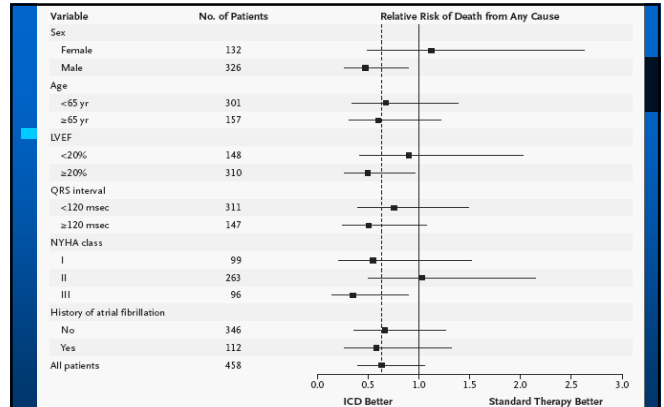
## DEFINITE- Survival NYHA 3



**Figure 3.** Kaplan-Meier Survival Curves among Patients with New York Heart Association Class III Heart Failure, According to Whether They Received Standard Therapy or an Implantable Cardioverter-Defibrillator (ICD).

As compared with patients who received standard therapy, patients who received an ICD had a relative risk of death from any cause of 0.37 (95 percent confidence interval, 0.15 to 0.90).

DCM LVEF<36%, PVCs/SSVT



**Figure 2.** Subgroup Analysis of the Relative Risk of Death from Any Cause among Patients Who Received an Implantable Cardioverter-Defibrillator (ICD), as Compared with Those Who Received Standard Therapy.

The dashed line indicates the hazard ratio for the overall population. None of the differences between subgroups were significant. LVEF denotes left ventricular ejection fraction, and NYHA New York Heart Association.

## Prevention By ICD

Disease	Setting	Recommendations	Level of evidence	Reference
Post-MI	Resuscitated VT/VF, Spontaneous sustained haemodynamically non-tolerated VT	Class I	A	[240,242]
Post-MI	Primary prevention — EF <40%, nST clinical, sVA at PES	Class I	B	[89,231]
BS	Secondary prevention	Class I	B	[375,376]
BS	Symptomatic for syncope/VT	Class I	B	[375,376]
HCM	Secondary prevention	Class I	B	[285,287]
LQTS	Secondary prevention — ICD+Beta-blockers	Class I	C	[353,358]
AS	Secondary prevention	Class I	C	[397]
MVP	Secondary prevention	Class I	OTFP	[331]
RVC	Secondary prevention	Class I	OTFP	[331]
DCM	Secondary prevention (+beta-blockers)	Class I	OTFP	[331]
CPVT	Secondary prevention (+beta-blockers)	Class I	OTFP	[331]
HCM	Primary prevention	Class IIa	B	[285,287]
DCM	Primary prevention	Class IIa	B	[241,352]
ARVC	Primary prevention — ventricular tachycardia	Class IIa	C	[331,532]
LQTS	Primary prevention — symptomatic with recurrences on beta-blockers	Class IIa	C	[353,365]
BS	Asymptomatic with inducible VT/VF	Class IIb	C	[375,376]
Post-MI	Spontaneous, sustained, well tolerated, monomorphic VT	Class IIb	C	[249]
Post-MI	Primary prevention (+beta-blockers)	Class IIb	OTFP	[331]
Post-MI	Primary prevention — EF <36%, late potentials, indication for CABG	Class III	B	[232]
RVC	Primary prevention — asymptomatic	Class III	C	[331,532]
BS	Asymptomatic with non-inducible VT/VF	Class III	C	[375,376]

RVC=Right Ventricular Cardiomyopathy.  
AS=Aortic Stenosis.  
BS=Brugada Syndrome.  
CPVT=Catecholaminergic Polymorphic Ventricular Tachycardia.  
DCM=Dilated Cardiomyopathy.  
HCM=Hypertrophic Cardiomyopathy.  
ICD=Implantable Cardioverter Defibrillator.  
LQTS=Long QT Syndrome.  
MVP=Mitral Valve Prolapse.  
Post-MI=Post Myocardial Infarction.  
OTFP=Opinion of the Task Force Panel.

European Heart Journal (2001) 22, 1374–1450

## Conclusions

On the basis of our results, the routine implantation of a cardioverter-defibrillator cannot be recommended for all patients with nonischemic cardiomyopathy and severe left ventricular dysfunction. However, our findings of a reduction in sudden death from arrhythmia and an apparent benefit of ICDs in subgroup analyses suggest that the use of these devices should be considered on a case-by-case basis.

## Prevention By Amiodarone

Disease	Setting	Recommendations	Level of evidence	Reference
Post-MI	Primary prevention	Class IIa	A*	[187,207–212]
Post-MI	Resuscitated VT/VF, spontaneous VT	Class IIa	C**	[239–242]
AS		Class IIa	OTFP	
HCM		Class IIb	B	[294,213,293]
DCM		Class IIb	B	[212,241]
RVC	Primary prevention	Class IIb	OTFP	
WPW		Class IIb	OTFP	

\*Reduced SCD, modest impact on total mortality.

\*\*As alternative to implantable defibrillators when the device is not implanted.

RVC=Right Ventricular Cardiomyopathy.

AS=Aortic Stenosis.

BS=Brugada Syndrome.

DCM=Dilated Cardiomyopathy.

HCM=Hypertrophic Cardiomyopathy.

Post-MI=Post Myocardial Infarction.

WPW=Wolff-Parkinson-White Syndrome.

OTFP=Opinion of the Task Force Panel.

European Heart Journal (2001) 22, 1374–1450

## Beta Blockers -Prevention

Disease	Setting	Recommendations	Level of evidence	Reference
Post-MI	Primary prevention — in presence of heart failure	Class I	A	[184,193,74,186,197,199,202,203]
Post-MI	Primary prevention — during and post-MI	Class I	A	[74,186,193,199,202,203]
DCM		Class I	B	[186]
LQTS	Primary prevention — symptomatic	Class I	B	[353,358]
LQTS	Secondary prevention — beta-blockers+ICD	Class I	C	[353,358]
Post-MI	Resuscitated VT/VF, spontaneous sustained VT*	Class IIa	C	[242]
LQTS	Primary prevention — asymptomatic	Class IIa	C	[358]
MB		Class IIa	C	[435]
CPVT	Primary prevention	Class IIa	C	[380]
CPVT	Secondary prevention (consider also ICD)	Class IIa	C	[380]
RVC	Primary prevention	Class IIb	C	[319]
HCM	Primary Prevention	Class III	C	[253,256,257,259]

\*: as alternative to implantable defibrillators when the device is not implanted.

RVC=Right Ventricular Cardiomyopathy.

CPVT=Catecholaminergic Polymorphic Ventricular Tachycardia.

DCM=Dilated Cardiomyopathy.

HCM=Hypertrophic Cardiomyopathy.

ICD=Implantable Cardioverter Defibrillator.

LCSD=Left Cardiac Sympathetic Denervation.

LQTS=Long QT Syndrome.

MB=Myocardial Bridging.

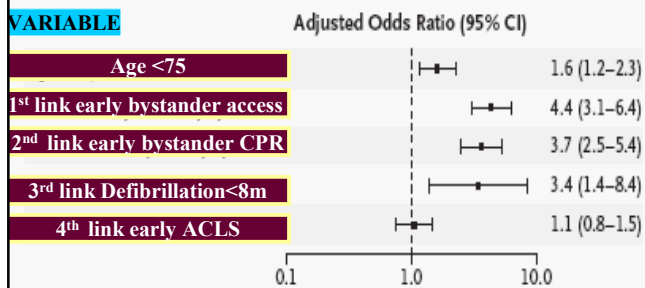
MVP=Mitral Valve Prolapse.

Post-MI=Post Myocardial Infarction.

Eur Heart J, Vol. 22, issue 16, August 2001

European Heart Journal (2001) 22, 1374–1450

## Factors Affecting Survival to Hospital D/C (OPALS study, n=5638)



**Figure 1.** Odds Ratios for Survival to Hospital Discharge Associated with Selected Factors.

## EARLY ACCESS & CPR

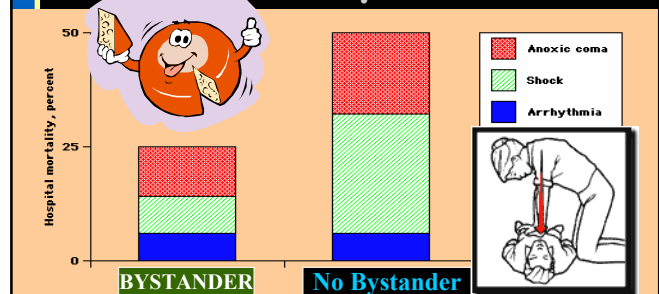


## EARLY DEFIBRILLATION

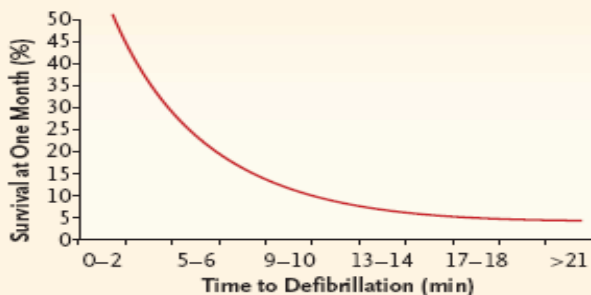


## Bystander CPR or Bystander Chest Compressions

### The Role of Bystander CPR



Bystander CPR ↑ prognosis due to ↓ coma & shock.  
(↑ Success becomes 49% when they use AEDs).



**Figure 2.** The Exponential Decline in the Rate of Survival after Sudden Cardiac Arrest as Time to Defibrillation Increases.

Defibrillation alone often results in successful resuscitation if delivered within four minutes of cardiac arrest.

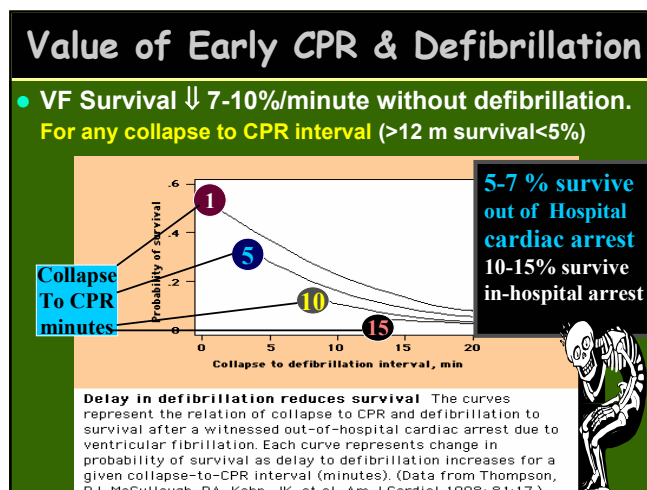
## Introduction-VF Over Time



THE RELATIVE VALUE OF EARLY DEFIBRILLATION  
(0-3m > 70-90% success rate)  
EXCEEDS THE VALUE OF ALL MEDICATIONS, AIRWAY  
MANAGEMENT & BIPHASIC SHOCK WAVES COMBINED

	Time from notification to defibrillation	Survival rate*
Rehabilitation centers	Immediate defibrillation (1-2 minutes)	90%
Model community	Early defibrillation (6 minutes)	45%
	Early defibrillation (7 minutes)	30%
Typical community	Delayed defibrillation (>10 minutes)	<5%

**NATURAL SOLUTION: TRAIN MORE BLS VOLUNTEERS & HAVE MORE DEFIBRILLATORS AVAILABLE, BUT.....**



**The NEW ENGLAND JOURNAL of MEDICINE**  
ESTABLISHED IN 1912 AUGUST 12, 2004 VOL. 351 NO. 7

### Public-Access Defibrillation and Survival after Out-of-Hospital Cardiac Arrest

The Public Access Defibrillation Trial Investigators\*

**BACKGROUND**  
The rate of survival after out-of-hospital cardiac arrest is low. It is not known whether this rate will increase if laypersons are trained to attempt defibrillation with the use of automated external defibrillators (AEDs).

**METHODS**  
We conducted a prospective, community-based, multicenter clinical trial in which we randomly assigned community units (e.g., shopping malls and apartment complexes) to a structured and monitored emergency-response system involving lay volunteers trained in cardiopulmonary resuscitation (CPR) alone or in CPR and the use of AEDs. The primary outcome was survival to hospital discharge.

### Use of Public AED for Prevention of SCD

*European Heart Journal* (2001) 22, 1374-1450

	Level of evidence	References
Use by EMS personnel	Class I	B [568]
Use by police	Class I	C [582,583]
Use in commercial aircraft	Class I	B [584]
Use by family members of high risk individuals	Class IIb	C [576,585]

Even if such exemplary programs were implemented on a widespread basis, the majority of victims of sudden death from cardiac causes — those who die at home — remain unprotected. The concept of therapy with AEDs at home, though attractive at first glance, remains unproven. In order to protect even half the victims of cardiac arrest, people with an annual risk of approximately 1 percent would require intervention. In addition to the cost implications, community-based strategies could not be used and first responders would be limited to the people available in each home.

**Table 2. Characteristics of the Events.\***

Characteristic	Total	CPR Only	CPR plus AED	P Value
<b>All events</b>				
No. of events	3413	1591	1822	0.001†
Incidence — no./unit/yr		1.81	2.02	
No. of units with ≥ 1 events		330	349	
<b>Adverse events — no. (%)</b>				
Serious		1 (0.1)	0	0.47‡
Mild or moderate		1 (0.1)	6 (0.3)	0.13‡
Volunteer system activated — mean % of events per unit		53.2±42.5	60.9±40.5	0.02§
<b>Patients</b>				
Age — yr				0.16§
Mean of unit means		52.6±18.6	54.7±18.7	
Range		12–100	8–95	
Male sex — %				0.99§
Mean per unit		50.7±35.5	50.8±35.8	
Range		0–100	0–100	

**Table 1. (Continued.)**

Characteristic	CPR Only	CPR plus AED	P Value
<b>Volunteers</b>			
Total no. of volunteers trained	8361	11,015	
Attrition rate — %/yr	18.7	18.8	0.52‡
No. per trained unit			<0.001§
Mean	17.6±15.3	23.0±17.3	
Range	1–149	1–115	
Age — yr			0.70§
Mean	39.8±9.0	39.6±9.4	
Range	17.3–72.0	19.4–69.1	
Male sex — %			0.50§
Mean	55.0±24.7	56.0±22.2	
Range	0–100	0–100	
High-school education or less — %			0.51‡
Mean	31.6±21.1	30.8±19.1	
Range	0–100	0–100	

**Table 3. Characteristics of the Out-of-Hospital Arrests of Cardiac Cause.\***

Characteristic	Arrest in Persons Dead on Arrival without Known Advance Directives	Arrest Treated by EMS†
<b>Arrests</b>		
No. of events	148	239
Public	9	167
Residential	139	72
Average interval between arrests per unit — yr	12.0	7.4
Public	168.9	9.1
Residential	1.8	3.5
No. of events — no. of units		
0 events	921	814
1 event	42	140
≥2 events	30	39
Public unit — no./total no. (%)	9/148 (6.1)	167/239 (69.9)
Volunteer system activated — no./total no. (%)	40/148 (27.0)	148/238 (62.2)
Witnessed — no./total no. (%)‡	4/82 (4.9)	136/188 (72.3)
Bystander CPR — no./total no. (%)	8/125 (6.4)	143/227 (63.0)

<b>Presumed out-of-hospital cardiac arrest</b>				
Total — no.	526	266	260	0.59†
Dead on arrival (no EMS treatment) — no.	231	133	98	0.04‡
With do-not-attempt-resuscitation orders	49	26	23	
Without do-not-attempt-resuscitation orders	182	107	75	
Cardiac cause	148	86	62	
Noncardiac cause	32	19	13	
Unknown cause	2	2	0	
Other event or an arrest of noncardiac cause — no.	56	24	32	0.22‡
Arrest of noncardiac cause treated by bystander CPR only¶	18	8	10	
Respiratory arrest treated by EMS‖	17	6	11	
Arrest of noncardiac cause treated by EMS**	21	10	11	
Treated arrest of cardiac cause — no.	239	109	130	0.09†
Probable or uncertain	4	2	2	
Definite	235	107	128	

\* Plus-minus values are means ±SD. EMS denotes emergency medical services.  
† The P value was calculated by log-linear (Poisson) generalized-linear-model regression at the unit level, with adjustments for the natural log of the expected number of cardiac arrests, the center, and the location (residential vs. public).  
‡ The P value was calculated by Fisher's exact chi-square test.  
§ The P value was calculated by the t-test with respect to unit-level summary measures.  
¶ Ventilations or compressions were given only by bystanders and not by EMS personnel.  
‖ Ventilations with or without intubation, but no cardiac compressions, were given.  
\*\* Among the causes of arrest were drowning, suicide, drug overdose, trauma, choking, and cerebrovascular accident.

**Table 4. Characteristics of the Definite Out-of-Hospital Cardiac Arrests.\***

Characteristic	CPR Only (N=107)	CPR plus AED (N=128)	P Value†
Volunteer response activated — no. (%)‡	57 (53.8)	89 (69.5)	0.06
Bystander CPR — no. (%)§	62 (62.0)	81 (64.8)	0.55
Shock delivered with non-EMS AED — no. (%)	2 (1.9)	44 (34.4)	<0.001
Interval between call to EMS and first rhythm assessment — min ¶	8.7±5.5	6.0±4.7	<0.001
Ventricular fibrillation or ventricular tachycardia as first rhythm — no. (%)	43 (47.3)	71 (57.7)	0.66
Interval between call to EMS and arrival of EMS — min	5.6±3.4	5.7 (3.3)	0.63
Patient admitted to hospital — no. (%)	29 (27.1)	50 (39.1)	0.07

<b>Patients</b>		
Age — yr		
Mean	75.7±13.8	69.8±15.2
Range	35–97	24–100
Male sex — no./total no. (%)	70/140 (50.0)	160/238 (67.2)
White race — no./total no. (%)‡	30/55 (54.5)	66/90 (73.3)
Sedentary before arrest — no./total no. (%)‡	28/34 (82.4)	61/177 (34.5)
Treated by EMS and had advance directives§	—	2/239 (0.8)

\* Plus-minus values are means ±SD. EMS denotes emergency medical services.  
† EMS-treated arrests include those classified as definite, probable, or uncertain.  
‡ This characteristic was determined according to the EMS incident report but frequently had not been recorded.  
§ The advance directive was found after the resuscitation attempt.

## EARLY ACLS



**Table 5. Number of Survivors of Out-of-Hospital Cardiac Arrest.**

Characteristic	CPR Only	CPR plus AED	P Value	
			Unadjusted	Adjusted
Definite cardiac arrests — no.	107	128	0.09*	
Residential units	37	33		
Public units	70	95		
Survivors of definite arrest — no.	15	30	0.03†	0.03*‡
Residential units	1	1		
Public units	14	29		
Survivors of definite or uncertain arrest — no.	16	31		0.03*‡
Cerebral performance category of survivors of definite arrest — no. (%)§			0.90¶	
Normal	10 (71.4)	22 (73.3)		
Mildly impaired	3 (21.4)	5 (16.7)		
Moderately impaired	1 (7.1)	3 (10.0)		



## BACKGROUND

The Ontario Prehospital Advanced Life Support (OPALS) Study tested the incremental effect on the rate of survival after out-of-hospital cardiac arrest of adding a program of advanced life support to a program of rapid defibrillation.

## METHODS

This multicenter, controlled clinical trial was conducted in 17 cities before and after advanced-life-support programs were instituted and enrolled 5638 patients who had had cardiac arrest outside the hospital. Of those patients, 1391 were enrolled during the rapid-defibrillation phase and 4247 during the subsequent advanced-life-support phase. Paramedics were trained in standard advanced life support, which includes endotracheal intubation and the administration of intravenous drugs.

## WHAT IS THE ROLE OF EARLY ACLS?

The NEW ENGLAND JOURNAL of MEDICINE  
N Engl J Med 2004;351:647-56.

ORIGINAL ARTICLE

12<sup>th</sup> AUG 2004

## Advanced Cardiac Life Support in Out-of-Hospital Cardiac Arrest

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**Table 1.** Baseline Characteristics of the 5638 Study Patients in the 12-Month Rapid-Defibrillation and the 36-Month Advanced-Life-Support Phases.\*

Characteristic	Rapid-Defibrillation Phase (N=1391)	Advanced-Life-Support Phase (N=4247)
Responses — no./total no. (%)		
Defibrillator to scene in ≤8 min	1161/1258 (92.3)	3576/3817 (93.7)
First responder preceded EMS to scene	401/1214 (33.0)	1454/3655 (39.8)
Advanced-life-support provider on scene	—	3981/4247 (93.7)
Advanced-life-support provider on scene in ≤11 min	—	3114/3601 (86.5)
Defibrillation shock — no. (%)		
Delivered by first responder	149 (10.7)	523 (12.3)
Delivered by EMS	414 (29.8)	1217 (28.7)
Endotracheal intubation — no. (%)		
Attempted	—	3848 (90.6)
Successful if attempted	—	3605 (93.7)
Intravenous-line insertion — no. (%)		
Attempted	—	3767 (88.7)
Successful if attempted	—	3354 (89.0)
Intravenous medications administered — no. (%)†		
Epinephrine	—	3583 (95.8)
Atropine	—	3267 (87.3)
Lidocaine	—	882 (23.6)
Dopamine	—	105 (2.8)
Bicarbonate	—	92 (2.5)
Fluid bolus	—	1588 (42.4)

**Table 1.** Baseline Characteristics of the 5638 Study Patients in the 12-Month Rapid-Defibrillation and the 36-Month Advanced-Life-Support Phases.\*

Characteristic	Rapid-Defibrillation Phase (N=1391)	Advanced-Life-Support Phase (N=4247)
Mean (±SD) age — yr	68.9±14.4	69.3±14.6
Male sex — no. (%)	936 (67.3)	2823 (66.5)
Population of community — no. (%)		
<30,000	22 (1.6)	55 (1.3)
30,000–99,999	318 (22.9)	846 (19.9)
100,000–199,999	304 (21.8)	946 (22.3)
200,000–500,000	473 (34.0)	1572 (37.0)
>500,000	274 (19.7)	828 (19.5)
Arrest witnessed by bystander — no. (%)	649 (46.7)	1737 (40.9)
Arrest witnessed by EMS personnel — no. (%)	119 (8.6)	411 (9.7)
Initial cardiac rhythm — no./total no. (%)		
Ventricular fibrillation or tachycardia	480/1357 (34.5)	1339/4094 (31.5)
Pulseless electrical activity	350/1357 (25.8)	1036/4094 (25.3)
Asystole	527/1357 (38.8)	1719/4094 (42.0)
CPR by bystander — no. (%)	220 (15.8)	612 (14.4)
CPR by first responder — no. (%)	470 (33.8)	1679 (39.5)

**Table 2.** Survival and Functional Outcomes of Patients from the Two Study Phases.\*

Outcome	Rapid-Defibrillation Phase (N=1391)	Advanced-Life-Support Phase (N=4247)	Absolute Increase (95% CI)	P Value
	no. (%)	no. (%)	percentage points	
ROSC	180 (12.9)	766 (18.0)	5.1 (3.0 to 7.2)	<0.001
Admission to hospital	152 (10.9)	621 (14.6)	3.7 (1.7 to 5.7)	<0.001
Survival to hospital discharge	69 (5.0)	217 (5.1)	0.1 (–1.2 to 1.5)	0.83
Survivors cerebral performance	54 (78.3)	145 (66.8)	—	0.73
	score	score		
Survivors' Health Utility Index, Mark III, at one year			—	0.67
Median	0.84	0.79		
Interquartile range	0.49–0.97	0.43–0.91		

\* CI denotes confidence interval, and dashes denote not applicable.

† There were 69 survivors in the rapid-defibrillation phase, and 217 in the advanced-life-support phase.

**ROSC & HOSPITAL ADMISSION↑ BUT HOSPITAL D/C SAME**

**Table 3. (Continued.)**

Characteristic	Rapid-Defibrillation Phase (N=1391)	Advanced-Life-Support Phase (N=4247)
Interval — min‡		
From call receipt to crew notification		
Median	0.7	0.6
Interquartile range	0.5–1.1	0.4–0.9
From crew notification to vehicle arrival at scene		
Median	4.2	4.2
Interquartile range	3.3–5.3	3.2–5.4
From crew notification to fire-department vehicle at scene		
Median	4.6	4.5
Interquartile range	3.5–6.0	3.5–5.8
From crew notification to ambulance (basic life support) at scene		
Median	5.2	6.4
Interquartile range	4.0–6.9	4.6–8.7
From crew notification to ambulance (advanced life support) at scene		
Median	—	6.3
Interquartile range	—	4.7–8.3
From vehicle arrival to patient's side		
Median	1.0	0.9
Interquartile range	0.5–2.0	0.5–1.7
From patient's side to first analysis§		
Median	1.7	1.6
Interquartile range	1.0–2.5	0.9–2.5
From first analysis to shock delivered¶		
Median	0.2	0.3
Interquartile range	0.2–0.3	0.2–0.4
From patient's side to departure from scene		
Median	9.0	22.2
Interquartile range	7.3–11.3	16.8–28.3
From departure from scene to arrival at hospital		
Median	4.0	4.8
Interquartile range	2.7–5.6	3.3–6.5

‡ Dashes denote not applicable, and EMS emergency medical services.

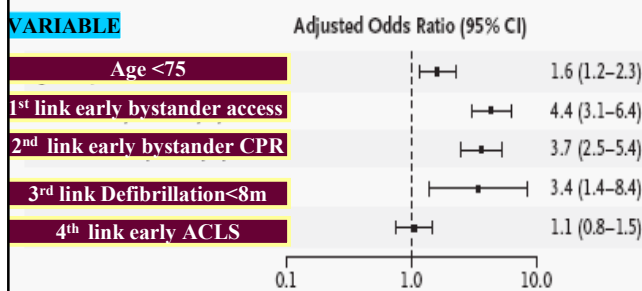
§ Intravenous medications were administered to 3742 patients in the advanced-life-support phase.

¶ Arrests witnessed by EMS personnel were excluded.

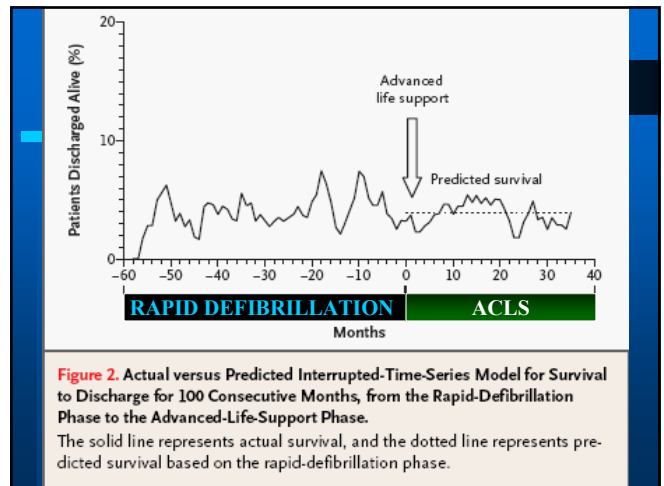
§ The median time was recorded for 138 patients in the rapid-defibrillation phase and for 2053 in the advanced-life-support phase.

¶ The median time was recorded for 386 patients in the rapid-defibrillation phase and for 1033 in the advanced-life-support phase.

## Factors Affecting Survival to Hospital D/C (OPALS study, n=5638)



**Figure 1.** Odds Ratios for Survival to Hospital Discharge Associated with Selected Factors.



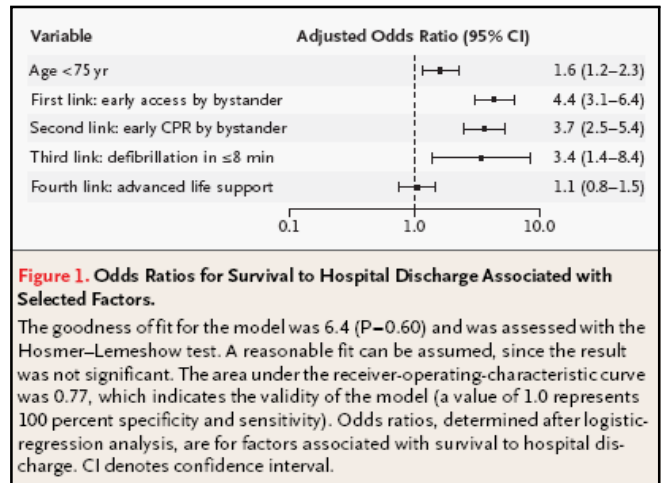
**Figure 2.** Actual versus Predicted Interrupted-Time-Series Model for Survival to Discharge for 100 Consecutive Months, from the Rapid-Defibrillation Phase to the Advanced-Life-Support Phase.

The solid line represents actual survival, and the dotted line represents predicted survival based on the rapid-defibrillation phase.

## CONCLUSIONS

### CONCLUSIONS

The addition of advanced-life-support interventions did not improve the rate of survival after out-of-hospital cardiac arrest in a previously optimized emergency-medical-services system of rapid defibrillation. In order to save lives, health care planners should make cardiopulmonary resuscitation by citizens and rapid-defibrillation responses a priority for the resources of emergency-medical-services systems.



**Figure 1.** Odds Ratios for Survival to Hospital Discharge Associated with Selected Factors.

The goodness of fit for the model was 6.4 ( $P=0.60$ ) and was assessed with the Hosmer–Lemeshow test. A reasonable fit can be assumed, since the result was not significant. The area under the receiver-operating-characteristic curve was 0.77, which indicates the validity of the model (a value of 1.0 represents 100 percent specificity and sensitivity). Odds ratios, determined after logistic-regression analysis, are for factors associated with survival to hospital discharge. CI denotes confidence interval.

## BLS & ACLS- no change

- **Responsiveness**
- **Activate EMS & Call for AED/defibrillator**
- **CPR (ABC)-**
- **Defibrillate?**
- **Evaluate, Drugs & Airway protection**

## המשחק מכור!- התוצאה נקבעת עוד בטרם נישקתה שריקת הפתיחה של ACLS

- WHERE?**
- WHAT (rhythm & cause)?**
- WHO WITNESSED ?**
- BYSTANDER CPR?**
- EARLY DEFIBRILLATION?**



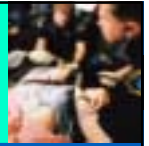
בהחייאה צריך זוג כפות ידיים וזוג כפות דפיברילטור

## What Should Be Done 1<sup>st</sup> CPR or Defibrillation?

- 200 pts. Out of hospital VF (Oslo Norway 1998-2001), age 70, 87% Male, observed 92%, bystander CPR 59%, collapse to ambulance arrival 12m)
- Randomized to standard care (n=96) vs. CPR 1<sup>st</sup> for 3 min (n=104).
- PEP- survival to hospital discharge
- SEP- admission with ROSC
- Sub-analysis (prespecified) response time of >5m

L. Wik et al JAMA 2003; 289:1389-95

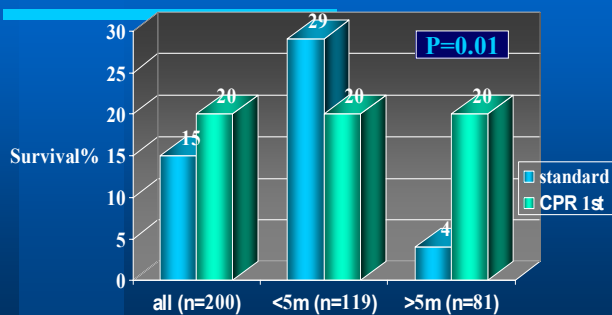
## Phases of Cardiac Arrest- G. Ewy



- **Electrical phase** (< 4 min) Defibrillate 1<sup>st</sup> - 70% success
- **Hemodynamic phase**- (4-10 min ) you must do chest compression and not shock 1<sup>st</sup> (Empty LV results in PEA 20 vs 4% survival in favor of chest compressions)
- **Metabolic phase**- (>10m)

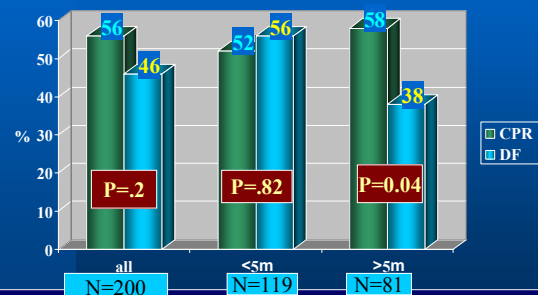
## Standard ACLS vs. CPR 1<sup>st</sup>

### 1 year survival



L. Wik et al JAMA 2003; 289:1389-95

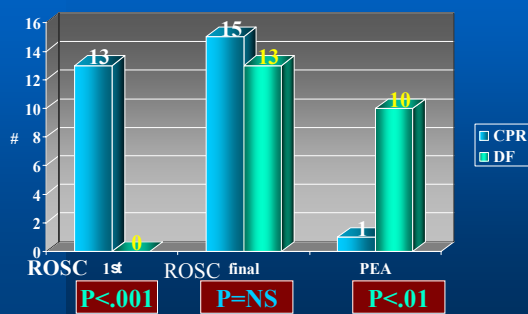
## ROSC- according to ambulance response time.



L. Wik et al JAMA 2003; 289:1389-95

## ROSC (initially & finally) & PEA

RA Berg et al, Crit Care Med 2004;32:1352-57

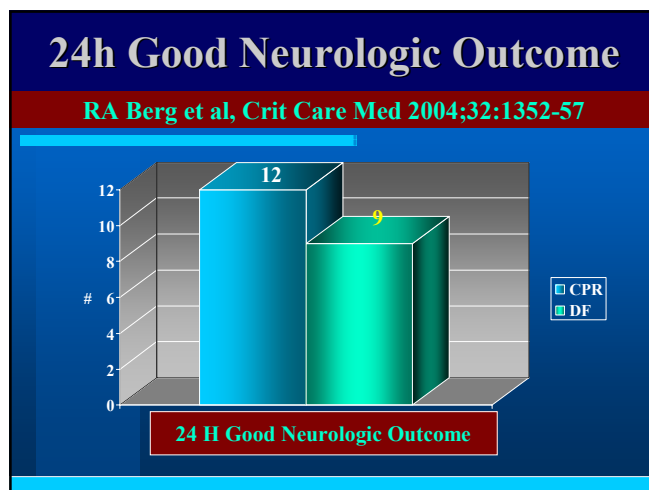
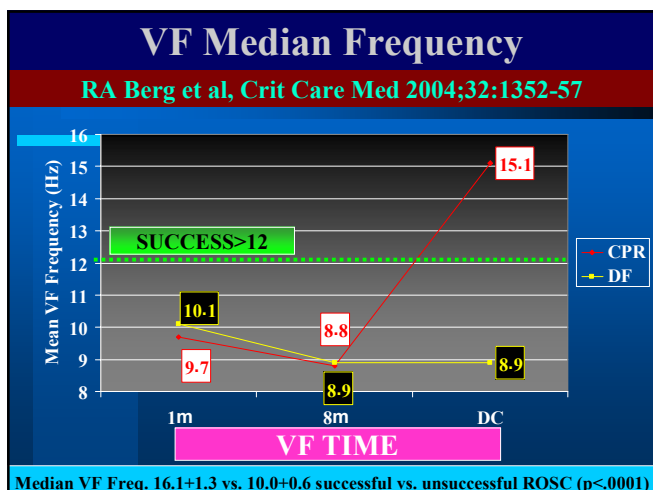


NO ROSC WITH DF ONLY

## 90 s CPR 1<sup>st</sup> vs. Immediate Defibrillation in Swine Model

- 30 swines 8 min untreated VF assigned to standard protocol vs. CPR 1<sup>st</sup> for 90 sec.
- PEP: ROSC (1<sup>st</sup> defibrillation & final)
- SEP: Good neurologic outcome, VF frequency.

RA Berg et al, Crit Care Med 2004;32:1352-57

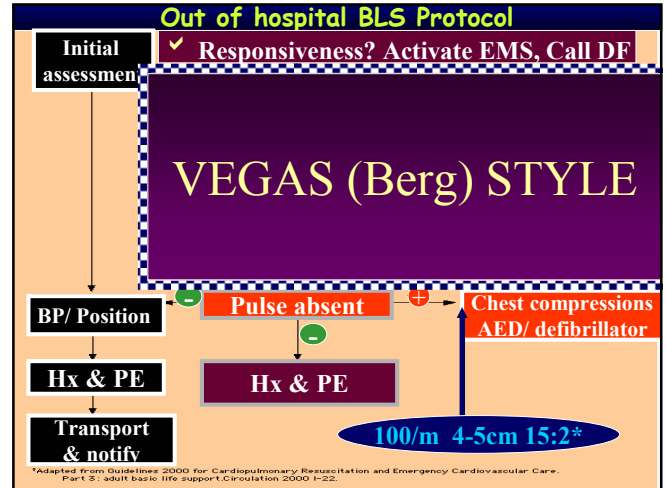
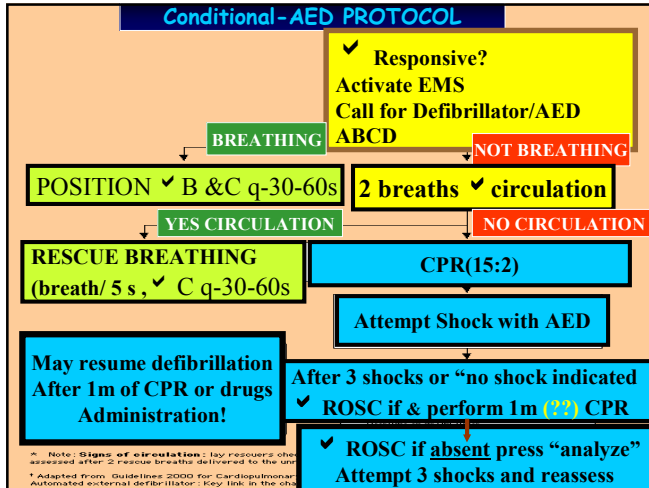


- ### Suggestions
- RA Berg et al, Crit Care Med 2004;32:1352-57
- Prolonged VF (>5-8 min) mandates CPR prior to defibrillation.
  - 90-180 sec CPR increased VF median frequency from 8 to 15 Hz and resulted in higher defibrillation success rate. (VF-Median frequency >12 predictor of ROSC)
  - After a set of failed defibrillations maybe CPR time should be extended to 3 min (not 1 min)
- Cobb LA, JAMA 1999;281:1182-88<sup>L</sup>. Wik JAMA 2003; 289:1389-95

- ### Conclusions
- RA Berg et al, Crit Care Med 2004;32:1352-57
- Pre-countershock CPR after 8m VF improves immediate defibrillation outcome.
  - 90 sec CPR increased VF median frequency from 8 to 15 Hz and resulted in higher defibrillation success rate. (VF-Median frequency >12 predictor of ROSC)
  - This data is supported by other animal models and human research of Cobb\* and Wik<sup>s</sup>.
- Cobb LA, JAMA 1999;281:1182-88<sup>L</sup>. Wik JAMA 2003; 289:1389-95

- ### Chest Compression Only CPR
- If you are unwilling to do mouth to mouth breathing- **chest compression only CPR is much better than doing nothing and actually as good as combined (chest compression & mouth to mouth breathing ) CPR.**
  - Survival chest compression only BLS increased survival from 13 to 25% due to simplicity and lack of interference with chest compression (Arizona data). Half the time dedicated to ventilation (compression interference. 16 seconds /2 breaths)
- Many centers teach and advice bystander CC only.

- ### BASIC LIFE SUPPORT
- 
- ✓ **RESPONSIVENESS**
  - **ACTIVATE EMS & CALL AED / Crash cart**
  - ✓ **AIRWAY** (tilt chin, jaw thrust only **????**)
  - ✓ **BREATHING** (if Ø ⇒ 2 breaths# **????**)
  - ✓ **CIRCULATION** (if Ø ⇒ chest compressions+)
  - **DEFIBRILATOR / MONITOR** **NEW**
- ## RAC-ABCD



### Basic Life Support (continued)

- Infant's mouth-to-nose:** equally effective to mouth-to-mouth/nose.
- Pulse check should not be taught to lay rescuers.** (concern regarding time wasted and 10% incorrect assessment holding CPR & AED) Instead will look for signs of ROSC (breathing & moving)
- Relief of FBAO** (by blind finger sweep) **not performed by lay rescuers in unresponsive victims.** (<1% chokers, chest compressions as effective as abdominal thrusts in FBAO relief)
- Chest compressions location:** in the center of chest "right between the nipples" FOR SIMPLICITY.
- Chest compression rate 100/m** (not 80-100 for better BP & flow)
- Adult 1 & 2 rescuer Compression:Ventilation ratio is 15:2** [not 5:1(except PALS) less interruptions, less gastric aspiration]

Resuscitation 2001; 48: 199-221

### Basic Life Support (2001)

- Authorization to attach & activate AED by non-traditional responders** (police, security, firemen & lay responders) remove state & local regulatory issues. ( Early defibrillation for adult victims in public places has been reaffirmed, and exceeds the value of any other intervention.)
- Special conditions for "phone fast"** (1m CPR & phone) instead of "phone 1st": near-drowning (submersion), choking, poisoning/ OD, Trauma, respiratory arrest, child.
- Bag Mask Ventilation:** is a fundamental skill for all BLS providers.
- Smaller TV for mouth to mouth/mask ventilation:** (400-600 instead of 800-1200) reduces risk of aspiration.

Resuscitation 2001; 48: 199-221


### Airway Devices \*

- Bag mask ventilation** with self inflating valved bag and cricoid pressure can be as effective as tracheal intubation for oxygenation, ventilation and prevention of aspiration for short ventilation periods (<15m) when used by skilled BLS providers (p-95)
- Unrecognized/incorrect esophageal intubation or tube dislodgment** occurs in 8-25% of cases.(p-100)
- Tracheal intubation confirmation:** Primary: PE, seeing tube pass via vocal cords, 5 point auscultation, bilateral chest expansion, tube condensation. Secondary: esophageal detector devices, end tidal CO<sub>2</sub> detectors. (p-101)
- Use Manufactured tracheal tube holder:** From prevention of tube dislodgment (p 101) and not strings & tapes.
- End tidal CO<sub>2</sub> for detection of tube dislodgment.** (capnometer single reading, capnography continuous reading) (p-101)

**\*NEVER INCORPORATED**

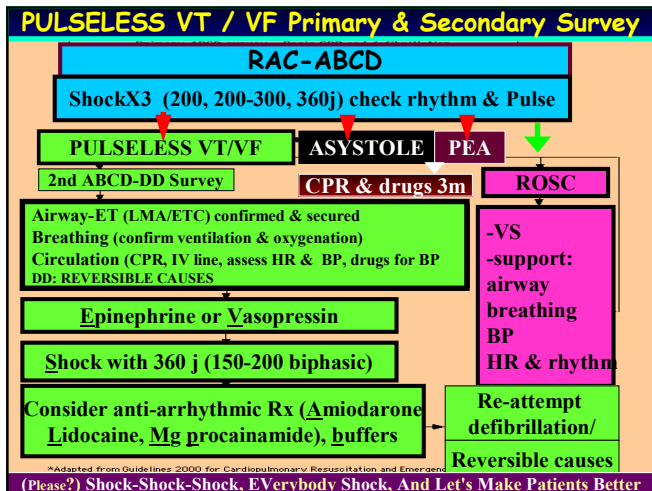
### Basic Life Support (continued)

- CPR without mouth-to-mouth ventilation:** for a single rescuer not willing to perform mouth to mouth. (ideal is ventilation:compressions 15:2) results not much different
- AED encouraged for Cardiac Arrest** age>8 Wt.>25Kg
- Infants chest compressions by two thumbs encircling hands** (better than 2 finger)
- Mouth to mouth ventilation volume increased** 700-1000 ml/breath delivered over 2 seconds.



Resuscitation 2001; 48: 199-221

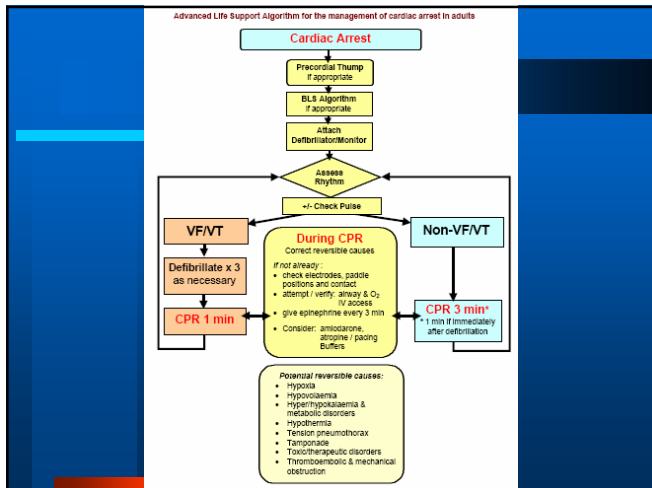




### Airway Devices

- 4 New adult alternative airway devices:
  - Esophageal tracheal combitube (ETC) -IIa
  - Laryngeal mask airway (LMA) -IIa
  - Pharyngotracheal lumen airway (PTL)
  - Cuffed oropharyngeal airway (COPA)
- LMA & ETC share:**
  - inserted blindly placed orally past oropharynx (not in trachea).
  - protect from aspiration
  - superior to bag mask technique in ventilation and oxygenation.
  - almost equivalent to tracheal intubation (surprise?)
- Traditionally BLS provider used bag-mask, and ACLS providers used tracheal intubation. **The new guidelines support the optional use of ETC & LMA use for both BLS and ACLS providers.**

**\*NEVER INCORPORATED**



### Regular Algorithm in ACLS

**Responsiveness** → **CPR** → **Cardiogram / Color Pulse (pressure) Respiration / response**

**Activation Emergency System (101)**

**Crash Cart order Defibrillator/**

**Airway Breathing (ventilation) Circulation (chest compressions) Defibrillation / Drugs / DD / Pacing Evaluate CPR Fail DD (SHs / 5Ts)**

**Drugs / DD / Pacing:**

- Adrenaline
- Atropine
- Vasopressin (IIB to I)
- Amiodarone (IIB)
- Lidocaine (IIB)
- Mg Sulfate
- Procainamide (IIB)

**5Ts:**

- Hypovolemia
- hypoxia
- hypothermia
- hyper/hypokalemia

**Hydrogen**

**Tablets (OD) tamponade tension PTX thrombosis acs/pe**

### Advanced Cardiac Life Support

- Universal algorithm (ILCOR)** [for treating all 4 cardiac arrest conditions (VF, Pulseless VT, Asystole & PEA) in one algorithm] is adopted. (assuming most events are salvagable are pulseless VT/VF)
- VF / Pulseless VT algorithm** . New guidelines changes. [Drug therapy (amines, anti-arrhythmics, buffers) less emphasized (IIB data)]

**-Box 1: 4 conditions for phone fast (instead of phone 1st):** submersion/drowning, OD, Trauma, respiratory arrest.

**-Box 2: Place airway device ASAP** (ETC, LMA or tracheal intubation) & confirm airway device placement.

**-Box 3: IV Epinephrine 1mg (?) Vasopressin 40u for refractory pulseless VT/VF.** The most effective dose of E remains 1mg Q-3-5m. Higher doses are suspected to be harmful (neurological outcomes) & not more effective (should be rarely if ever used after failure with standard doze)

### ACLS DRUGS

**VT/ VF/ PEA/ ASYSTOLE**

**Circulatory Support:**

- Dopamine
- Noradrenaline
- Dobutamine

**SVT:**

- Digoxin
- Adenosine
- Amiodarone
- CCBs: diltiazem verapamil
- Beta blockers

**Anti-anginal:**

- Nitrates
- Beta blockers
- CCBs

**Others:**

- Bicarbonate
- Calcium
- Furosemide

## ACLS: VF/ Pulseless-VT algorithm (fig 3.)

**-box 3- Vasopressin 40mg IV** the new equivalent (IIb) to adrenaline 1mg (no scientific proof p146 ?) for refractory VF/ Pulseless VT.  $T_{1/2}$  of 10-20m allow single dose. (Adrenaline 1mg q-3-5m will be started in 5-10m if there is no response to Vasopressin.) 4th shock administered 30-60 seconds after A or V bolus.

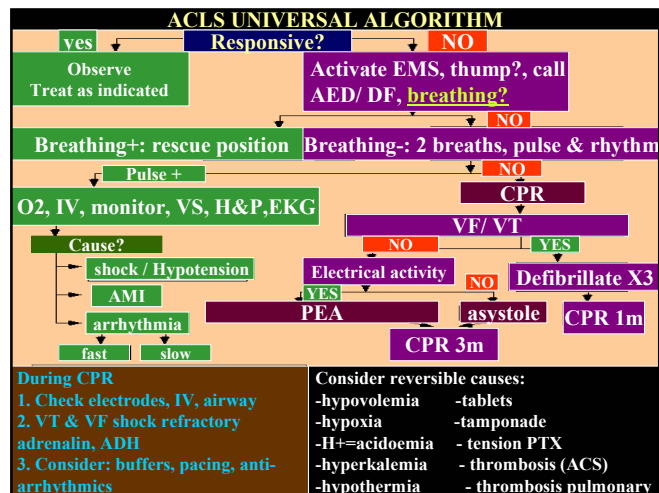
**A. Amiodarone (300mg bolus/ 2<sup>nd</sup> bolus 150mg)- added as 1st line antiarrhythmics for "shock refractory VF/VT".** (IIb) The alternative as 1st line drug is Lidocaine (1-1.5 mg/kg bolus may repeat q-3-5m up to 3mg/kg) or 2<sup>nd</sup> line procainamide.

**B. Bretylium- Eliminated.** Combination of ADE profile, delayed onset of action, and limited effectiveness eliminated Bretylium from ACLS protocols.

**C. Lidocaine- Still alternative for shock refractory VT/VF.** After being eliminated as arrhythmia prophylaxis in AMI over 8 years.

**D. Magnesium-** (1-2g IV) for 2 indications: Torsade de-pontes (IIb) and VT/VF or other arrhythmia with known or suspected hypomagnesemia (IIb).

**E. Procainamide** (30 mg/m up to 17 mg/kg) acceptable for VT & WCT but not recommended prolonged loading.



## Vasopressin (40 IU bolus)

- ADE: vasoconstriction  $\Rightarrow$  HTN, ischemia.
- Dose: 40 u IV single bolus.
- Not available on MICUs & hospital
- 1 RCT\* (double blind n=200) study showed no superiority over adrenaline (PEP: 1h/ hospital survival neuro-status).
- 1 RCT showed survival benefit in out of hospital VF#

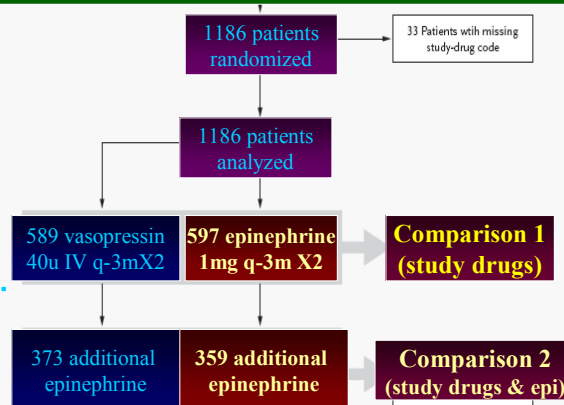
\*Stiell IG et al, Lancet 2001; 358:105 # Linner KH Lancet 1997 535

## Vasopressin (Theory)

- Human SCD survivors had higher Vasopressin levels than those who did not survive.
- $\uparrow$  Cerebral & coronary blood flow & O2 delivery during SCD to improve outcome.
- Indications: shock refractory VT/VF, or septic shock. (not for PEA / asystole!!!!) Adrenaline like hemodynamic effects

\*Stiell IG et al, Lancet 2001; 358:105 # Linner KH Lancet 1997 535

### RCT 33 centers Swiss/Austrian/German



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### A Comparison of Vasopressin and Epinephrine for Out-of-Hospital Cardiopulmonary Resuscitation

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for the European Resuscitation Council Vasopressor during Cardiopulmonary Resuscitation Study Group\*

**Table 2. Base-Line Characteristics of the Patients.\***

Characteristic	Vasopressin Group (N=589)	Epinephrine Group (N=597)	P Value
Age — yr	66.5±14.4	65.9±14.2	0.45
Male sex — no./total no. (%)	402/580 (69.3)	421/591 (71.2)	0.47
Arrest witnessed — no./total no. (%)	448/583 (76.8)	472/592 (79.7)	0.53
CPR by bystander or family member — no./total no. (%)	111/589 (18.8)	107/597 (17.9)	0.68
Suspected cause of cardiac arrest — no./total no. (%)			
Myocardial infarction	262/454 (57.7)	249/449 (55.5)	0.49
Primary arrhythmia	99/455 (21.8)	109/452 (24.1)	0.40
Pulmonary embolism	64/456 (14.0)	53/455 (11.6)	0.28
Additional treatments given during CPR — no./total no. (%)			
Sodium bicarbonate	198/587 (33.7)	205/596 (34.4)	0.81
Atropine	139/587 (23.7)	151/597 (25.3)	0.51
Lidocaine	114/589 (19.4)	114/597 (19.1)	0.90
Amiodarone	75/589 (12.7)	88/597 (14.7)	0.32
Fibrinolysis	54/589 (9.2)	45/597 (7.5)	0.31

**Table 1. Cardiovascular History of the Patients.**

Variable	Vasopressin Group (N=589)	Epinephrine Group (N=597)	P Value
	no./total no. (%)		
Coronary heart disease	176/467 (37.7)	189/463 (40.8)	0.33
Hypertension	84/475 (17.7)	82/474 (17.3)	0.88
Diabetes	78/476 (16.4)	78/477 (16.4)	0.99
Left ventricular failure	59/467 (12.6)	59/468 (12.6)	0.99
Peripheral vascular disease	47/474 (9.9)	53/475 (11.2)	0.53
Cardiac arrhythmias	35/467 (7.5)	29/468 (6.2)	0.43
Pacemaker	20/474 (4.2)	18/474 (3.8)	0.74
Valvular heart disease	13/468 (2.8)	14/468 (3.0)	0.85
Cardiomyopathy	8/468 (1.7)	9/468 (1.9)	0.81

**Table 3. Data on Outcomes in All 1186 Patients and on Cerebral Performance in 115 Patients at Hospital Discharge.\***

Variable	Vasopressin Group (N=589)	Epinephrine Group (N=597)	P Value	Odds Ratio (95% CI)
<b>Comparison 1 (study drugs)</b>				
All patients	no./total no. (%)			
Spontaneous circulation restored with study drugs	145/589 (24.6)	167/597 (28.0)	0.19	1.2 (0.9–1.5)
Hospital admission	214/589 (36.3)	186/597 (31.2)	0.06	0.8 (0.6–1.0)
Hospital discharge	57/578 (9.9)	58/588 (9.9)	0.99	1.0 (0.7–1.5)
Ventricular fibrillation	≈40%			
Spontaneous circulation restored with study drugs	82/223 (36.8)	106/249 (42.6)	0.20	1.3 (0.9–1.8)
Hospital admission	103/223 (46.2)	107/249 (43.0)	0.48	0.9 (0.6–1.3)
Hospital discharge	39/219 (17.8)	47/245 (19.2)	0.70	1.1 (0.7–1.8)
Pulseless electrical activity	≈15%			
Spontaneous circulation restored with study drugs	21/104 (20.2)	17/82 (20.7)	0.93	1.0 (0.5–2.1)
Hospital admission	35/104 (33.7)	25/82 (30.5)	0.65	0.8 (0.5–1.6)
Hospital discharge	6/102 (5.9)	7/81 (8.6)	0.47	1.4 (0.5–4.7)
Asystole	≈45%			
Spontaneous circulation restored with study drugs	42/262 (16.0)	44/266 (16.5)	0.87	1.0 (0.7–1.6)
Hospital admission	76/262 (29.0)	54/266 (20.3)	0.02	0.6 (0.4–0.9)
Hospital discharge	12/257 (4.7)	4/262 (1.5)	0.04	0.3 (0.1–1.0)
Cerebral performance among all patients who survived to discharge	<b>X3 hospital d/c (best reported)</b>			
Good cerebral performance	15/46 (32.6)	16/46 (34.8)	0.99	
Moderate cerebral disability	7/46 (15.2)	12/46 (26.1)	0.30	
Severe cerebral disability	9/46 (19.6)	7/46 (15.2)	0.78	
Coma or vegetative state	15/46 (32.6)	11/46 (23.9)	0.49	

**Table 2. Base-Line Characteristics of the Patients.\***

Variable	Vasopressin Group (N=589)	Epinephrine Group (N=597)	P Value
Initial cardiac rhythm — no./total no. (%)			
Ventricular fibrillation	223/589 (37.9)	249/597 (41.7)	0.18
Pulseless electrical activity	104/589 (17.7)	82/597 (13.7)	0.06
Asystole	262/589 (44.5)	266/597 (44.6)	0.98
Intervals — min†			
Duration of untreated cardiac arrest (before basic life support provided)	7.9±6.4	7.9±6.4	0.94
Time from basic life support			
To first defibrillation attempt	7.0±6.8	7.7±7.6	0.18
To endotracheal intubation	7.6±6.2	7.9±6.8	0.39
To intravenous cannulation	8.2±6.7	8.5±7.0	0.37
To first injection of study drug	9.6±6.6	10.2±7.4	0.15
To second defibrillation attempt	12.9±7.6	13.9±8.1	0.14
To second injection of study drug	13.3±6.8	13.9±7.9	0.16
To third defibrillation attempt	17.7±8.4	18.4±9.5	0.37
To standard protocol with epinephrine	17.5±7.9	17.6±8.3	0.91
To hospital admission	51.6±17.3	49.0±18.1	0.14

\* Plus-minus values are means ±SD. CPR denotes cardiopulmonary resuscitation.  
† Intervals are given separately for the duration of untreated cardiac arrest and the periods from the provision of basic life support to each treatment procedure because bystanders may not have been able to judge the intervals accurately, owing to emotional stress.

**Comparison 1 (study drugs)**

Asystole			
Spontaneous circulation restored with study drugs	42/262 (16.0)	44/266 (16.5)	0.87 1.0 (0.7–1.6)
Hospital admission	76/262 (29.0)	54/266 (20.3)	0.02 0.6 (0.4–0.9)
Hospital discharge	12/257 (4.7)	4/262 (1.5)	0.04 0.3 (0.1–1.0)

**Comparison 2 (study drugs & epi)**

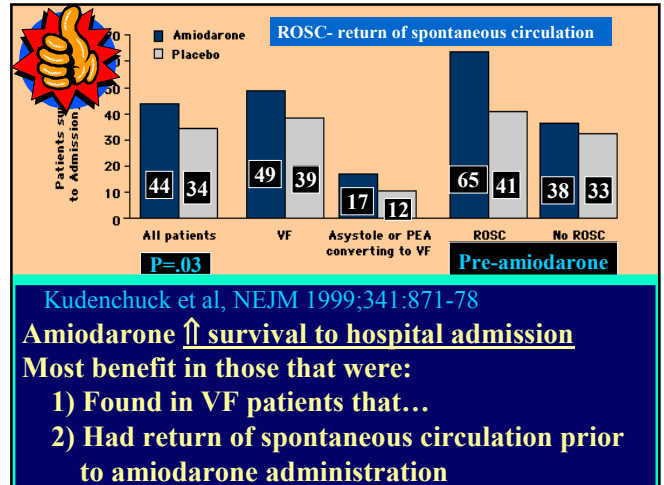
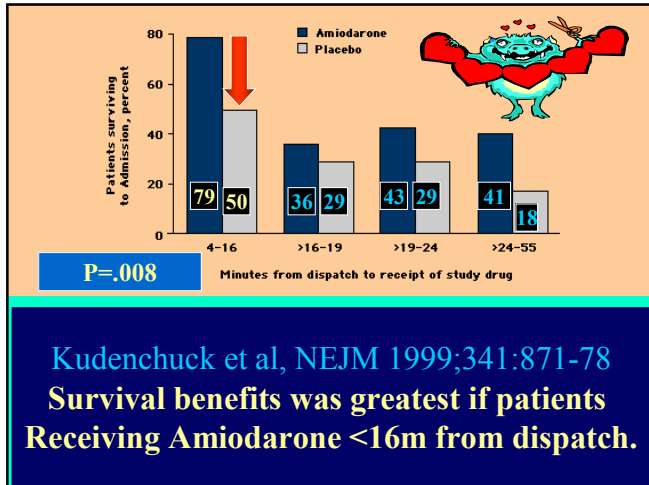
Asystole			
Spontaneous circulation restored	61/187 (32.6)	39/181 (21.5)	0.02 0.6 (0.4–0.9)
Hospital admission	42/187 (22.5)	24/181 (13.3)	0.02 0.5 (0.3–0.9)
Hospital discharge	7/184 (3.8)	0/179	0.008

In conclusion, the effects of vasopressin were similar to those of epinephrine in the management of ventricular fibrillation and pulseless electrical activity, but vasopressin was superior to epinephrine in patients with asystole. The use of vasopressin followed by epinephrine may be more effective than the use of epinephrine alone in patients with refractory cardiac arrest.

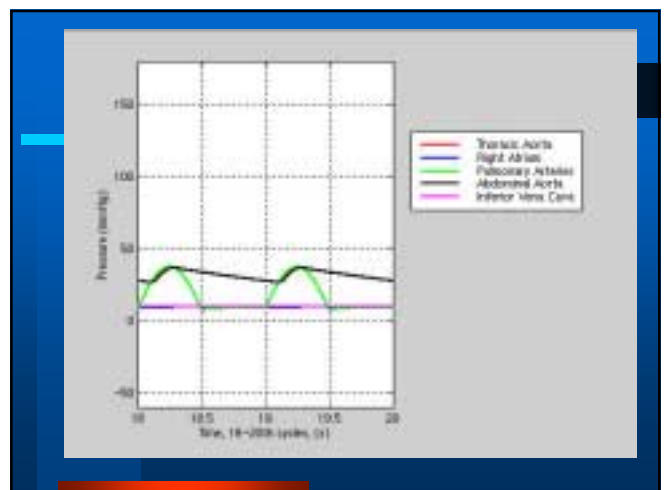
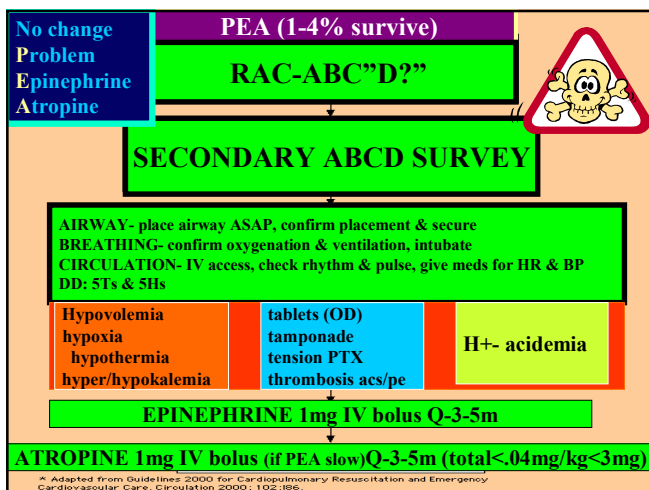
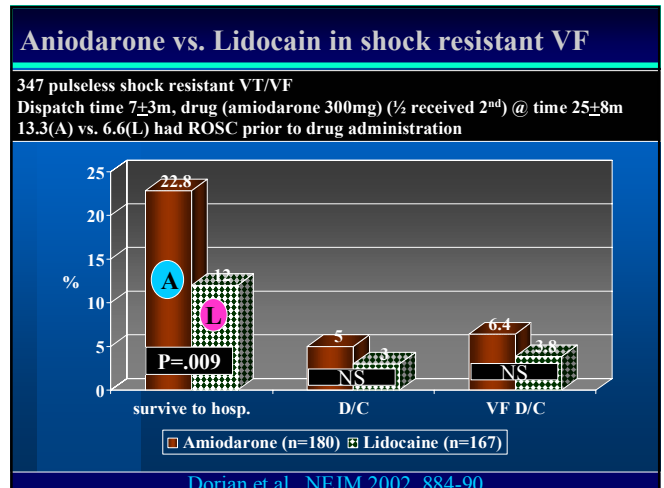
**Table 4. Data on Outcomes in 732 Patients Who Initially Received Vasopressin or Epinephrine and Subsequently Received Additional Treatment with Epinephrine and on Cerebral Performance in 29 Patients at Hospital Discharge.\***

Variable	Vasopressin Group (N=373)	Epinephrine Group (N=359)	P Value	Odds Ratio (95% CI)
<b>Comparison 2 (study drugs &amp; epi)</b>				
All patients	no./total no. (%)			
Spontaneous circulation restored	137/373 (36.7)	93/359 (25.9)	0.002	0.6 (0.4–0.8)
Hospital admission	96/373 (25.7)	59/359 (16.4)	0.002	0.6 (0.4–0.8)
Hospital discharge	23/369 (6.2)	6/355 (1.7)	0.002	0.3 (0.1–0.6)
Ventricular fibrillation				
Spontaneous circulation restored	58/122 (47.5)	40/122 (32.8)	0.02	0.5 (0.3–0.9)
Hospital admission	37/122 (30.3)	25/122 (20.5)	0.08	0.6 (0.3–1.1)
Hospital discharge	13/121 (10.7)	6/121 (5.0)	0.09	0.4 (0.2–1.2)
Pulseless electrical activity				
Spontaneous circulation restored	18/64 (28.1)	14/56 (25.0)	0.70	0.8 (0.4–1.8)
Hospital admission	17/64 (26.6)	10/56 (17.9)	0.25	0.6 (0.2–1.4)
Hospital discharge	3/64 (4.7)	0/55	0.10	
Asystole				
Spontaneous circulation restored	61/187 (32.6)	39/181 (21.5)	0.02	0.6 (0.4–0.9)
Hospital admission	42/187 (22.5)	24/181 (13.3)	0.02	0.5 (0.3–0.9)
Hospital discharge	7/184 (3.8)	0/179	0.008	
Cerebral performance among all patients who survived to discharge				
Good cerebral performance	8/20 (40.0)	2/5 (40.0)	1.00	
Moderate cerebral disability	2/20 (10.0)	2/5 (40.0)	0.17	
Severe cerebral disability	2/20 (10.0)	1/5 (20.0)	0.50	
Coma or vegetative state	8/20 (40.0)	0/5	0.14	

**Dramatic benefit in ROSC, hospital admission & d/c (outcome OK)**

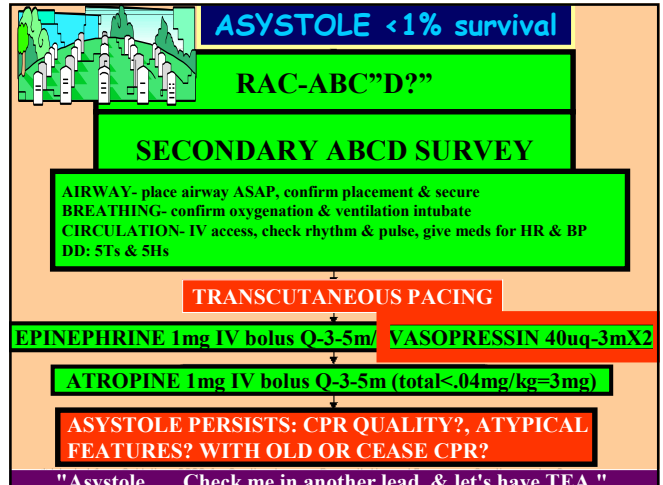
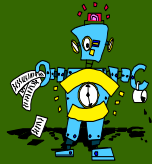


- ### ♥ Controversies ♥
- **Active compression decompression**- (plunger CPR) no survival ↑ in 2 RCT (n=1633) (not warranted)
  - **High dose Adrenaline**- 3 RCT (n=2700) ↑ return of spontaneous circulation, no ↑ survival & ↑ hospital D/C (HD not recommended)
  - **Na Bicarbonate & Buffers**- 1 RCT (n=502) no survival or hospital D/C benefits (use only for pre-existing metabolic acidosis, certain drug OD (ASA & TC), or hyperkalemia, agent of choice Na Bicarbonate).
  - **Mouth to mouth ventilation**- 1 RCT (n=520) no ↑ in survival or hospital d/c if mouth to mouth ventilation done. (m to m ventilation not mandatory)



## ACLS-PEAS & Asystole (cont)

- **Asystole** (fig. 5)- Atropine Adrenaline & pacing still main treatment.
- box 1- DNAR (look for advanced directive, living will 1-2% survive!)
- box 3-Withhold or cease therapy (p-154) criteria developed for cease effort protocol (Confirm Dx by connecting gain ↑).
- Protocols for leaving body at the scene.
- Persisting asystole: (Document asystole for 5-10 m)
- 1) Was intubation & ventilation achieved?
- 2) Was VF adequately shocked?
- 3) IV access & atropine & adrenaline given?
- 4) Reversible causes checked & ruled out?



## BRADYCARDIA (relative or absolute? Symptoms?)

### PRIMARY & SECONDARY ABCD SURVEY

**Secondary ABCD Survey**  
- Assess secondary ABCs (invasive airway management needed?)  
- Oxygen, IV access, monitor, fluids  
- Vital signs, pulse oximeter, monitor BP  
- Obtain and review 12-lead ECG  
- Obtain and review portable chest x-ray  
- Problem-focused history  
- Problem-focused physical examination  
- Consider causes (differential diagnoses)

#### SIGNS & SYMPTOMS of BRADYCARDIA?

NO

YES

**2nd or 3rd degree AVB**

No

**Observe**

**ATROPINE .5-1mg q-3m (not infranodal)**  
- Pacing (transcutaneous) TCP  
- Dopamine 5-20 µg/kg/m  
- Epinephrine 2-10 µg/m

**Pacing transcutaneous bridging to transvenous**

\* Adapted from Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 2000 102:1-156.

## ACLS- bradycardia (algorithm 7)

- **Bradycardias** (fig 6) - no changes occurred in bradycardia handling . Sequence of atropine, transcutaneous pacing, dopamine & epinephrine (BUT NO ISUPREL) remained intact and unmodified.
- Atropine remains the agent of choice for symptomatic sinus or nodal bradycardia (I) less effective in nodal (supra-his) AVB (IIa) but should not be used in infranodal mobitz II block. (dose 0.5-1mg q-3-5 m to total of 3 mg) or denervated hearts (transplants)
- Simultaneous transvenous or transcutaneous pacing should be started (I)
- Transvenous pacing if 2nd or 3rd AVB, or symptomatic bradycardia post atropine persists. Temporary transcutaneous pacing may bridge to transvenous pacing

## STABLE MONOMORPHIC OR POLYMORPHIC VT

### MONOMORPHIC

Note!  
May go directly to cardioversion

### POLYMORPHIC

NORMAL

LOW LVEF

NORMAL

QT?

prolonged

**Amiodarone**  
**Sotalol**  
**Pronestyl**  
**Lidocaine**

**Rx ischemia & K**  
**BB, Lido, Amio,**  
**Procain., Sotalol**

**RX: K & Mg**  
**Mg**  
**Pacing**  
**Isoproterenol**  
**Lidocaine**

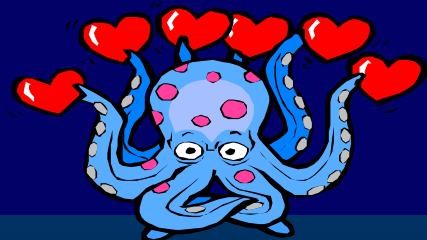
**HF/ LVEF<40%**

**Amio or Lido**  
**Synchronized D/C**

\* Adapted from Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 2000; 102:1-165.

## Tachycardias

- **Wide complex tachycardia** (regular & irregular),
- **narrow complex tachycardia** (regular & irregular), (fig 7-9)- selection of anti-arrhythmics based on hemodynamic stability, arrhythmia type, LVEF. Low threshold for cardioversion/defibrillation.





## Post -Resuscitative Care (p-166)

- Active rewarming (mildly hypothermic patients) (IIb)
- Active hypothermia post arrest (?) investigated.
- Febrile hyperthermic patients- anti-pyretics (IIa)
- Hypo or hyperglycemia are detrimental.
- Hyperventilation reduces cerebral blood flow may harm and should be avoided unless brain herniation is imminent.
- Treat hypotension consider arrhythmic prophylaxis
- Aspiration prevention & Rx
- Revascularization?



## Advanced Cardiac Life Support (cont)

- **Stable VT-** (polymorphic or monomorphic)
- Amiodarone 1st line Procainamide 2nd. (Lidocaine not 1st line)
- **Stable Wide complex tachycardia:**
- Amiodarone 1st, Sotalol IV 2nd (not available).
- **AF** (stable?/WPW?/ LVEF?/ >48h) considerations
- **Narrow Complex SVT-** (Dx & LVEF important for Rx)
- Adenosine 1st line for AVNRT AVRT

## Anoxic coma

- ▢ **Cortex**
- ▢ **Basal ganglia**
- ▢ **Cerebellum**
- ▢ **Brainstem** (oculocephalic, cold caloric, dysconjugated gaze)

החולה בשוק- מתי להתחיל/לחדש  
לחיצות חזה?

- לד"ס > 50 pulse pressure > 15
- חולה מחוסר הכרה
- קצב בלתי מאורגן
- שוק ממושך
- היעדר תגובה לאינוטרופים ול-IABP

## Best chance of recovery

Time of exam	Findings
< 6 hours from onset	<ul style="list-style-type: none"> <li>• Pupillary light reflex present</li> <li>• GCS motor &gt; 1</li> <li>• Spontaneous EOM WNL</li> </ul>
1 day	<ul style="list-style-type: none"> <li>• GCS motor &gt; 3 (flexor response or response to pain or suction)</li> <li>• GCS eye improved &gt; 1 from initial</li> </ul>
3 days	<ul style="list-style-type: none"> <li>• GCS motor &gt; 3</li> <li>• Spontaneous EOM WNL</li> </ul>
One week	<ul style="list-style-type: none"> <li>• GCS motor = 6</li> </ul>
2 weeks	<ul style="list-style-type: none"> <li>• Oculocephalic WNL</li> </ul>

## Glasgow Coma Scale

	1	2	3	4	5	6
<b>Eye Opening</b>	Never	Pain stimuli	To-Voice	Spont.		
<b>Verbal Response</b>	None	Unintelligible sounds	Inappropriate words	confused	oriented	
<b>Motor Response</b>	None	Extensor response	Flexor response	Withdraw from pain	Localize pain	Follow commands

@24h

## Improving neurologic outcome:

- Hypothermia (33°C) 1<sup>st</sup> 12h\* (PEP d/c home or rehab 49 vs 26% p=.046 adjusted OR 5.25) ↓ICP, glutamate (free radicals precursor), reduce ischemia.
- Good medical therapy (brain edema, ventilation, glucose, temperature, etc)
- Hyperbaric Rx- No
- CCBs- No
- Corticosteroids- No
- Barbiturates (thiopental), Sedation, CCBs (nimodipine), Lidoflazine- No
- NOS inhibitors ? (in research)
- Baba Sali / Baruch water ?

\*Bernard SA & 9 centers-European group NEJM -2002; 346: 549-563

## Poor chance of recovery

Time	Findings
< 6 h	• No pupillary light reflex present
1 day	• GCS motor < 4 (withdraw from pain) • Spontaneous eye movements not orienting nor conjugate roving
3 days	• GCS motor < 4 (withdraw from pain)
1 week	• GCS motor < 6 • At < 6h Spontaneous EOM not orienting nor conjugate roving
2 weeks	• Oculocephalic not WNL • At 3 <sup>rd</sup> day GCS motor < 6, GCS eye < 4 • 2 week GCS eye not improved at least 2 points from initial

## קביעת מוות מוחי (מ"מ)-חוזר מנכ"ל 1996

1. הפסקת חיות אדם יכולה להקבע ע"י אחת מ-2 אלו:  
הפסקת פעולת הלב והנשימה או הפסקת פעולת המוח.
2. הפסקה מוחלטת ובלתי הפיכה של פעולת המוח היא מוות ע"פ דין. (מ"מ יקבע לאחר ששני רופאים המוסמכים ע"י מנהל ביה"ח קבעו וחתמו בנפרד על מ"מ)
3. האבחנה כי קיים מ"מ (ע"פ סטנדרטים מקובלים ומהימנים) היא עניין לרפואה ולרופא.
4. לאחר קביעת מ"מ ניתן וצריך להפסיק טיפול רפואי, להודיע על פטירה, ולהוציא תעודת פטירה.
5. אם יש צורך ואפשרות (ורשות) בנטייל איבר מן הגופה לשם השתלה, תמשכנה הפעולות הרפואיות בנפרט, עפ"י צרכי פעולה זאת ולשם קיום חיוניות האברים.

## Prediction of Neurological Outcome

- High degree of uncertainty.
  - Those that recover have a good QOL
1. Brain death (brainstem areflexia + apnea) (15%)
  2. Persistent unconsciousness (50%)
  3. Persistent disability (15%)
  4. Complete recovery (speech @ 24h) (20%)

## מבחנים הכרחיים לקביעת מוות מוחי

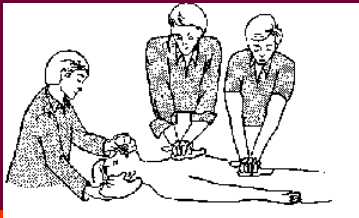
1. חוסר הכרה עמוק (אינו פוקח עיניים, נע עצמונית, מגיב לגירוי, או מפרנס)
2. לא ניתן להפיק החזרי גזע מוח: (תגובת אישוניים לאור, קרנית, אוקולו-ווסטיבולרי, אוקולו-צפאלי, הקאה, שיעול)
3. פרוטוקול להעדר נשימה עצמונית
4. מבחני עזר (למקרים מיוחדים: ספק לגבי אבחנה סיבתית, אין אפשרות לערוך את אחד המבחנים הכרחיים, נזק אנוקסי מוחי >24 שעות מהאירוע):
  - אנגיוגרפיה של כלי דם מוחיים - היעדר זרימה
  - אנגיוגרפיה עם איזוטופים (היעדר זרימה <6 שעות לאחר האירוע)
  - BERA - (חוסר תגובות לגירויים <6 שעות מהאירוע, ללא חרשות קודמות חבלה בבסיס גולגולת)
  - דופלר טרנס-קרניאלי - היעדר זרימת דם למוח ב-4 הכלים הגדולים למשך >30 דקות

## מבחנים לקביעת מוות מוחי-חוזר מנכ"ל 1996

1. אבחנה סיבתית למוות מוחי - חד משמעית (חבלה, דמום, נזק אנוקסי, גידול בראש)
2. לשלול גורמים היכולים להטעות [T>32°, ל"ד, תרופות מדכאות מע"מ, הפרעה מטבולית קשה (אורמיה אי ספיקת כבד)]
3. בנוכחות עדות להעדר זרימת דם למוח <30 דקות לא יהוו הגורמים בצהוב הורית נגד לקביעת מוות מוחי.
4. מבחנים הכרחיים כולם חייבים להתמלא.

## Circulatory & Ventilation Adjuncts (105-7)

- **Plunger-CPR** (IIb)-alternative to standard CPR
- **Interposed abdominal compression CPR** for in hospital CPR. (IIb)
- **Vest CPR** [alternative for hemodynamic support (6h) and standard CPR] (IIb)
- **Mechanical piston CPR** [alternative to standard CPR]. (IIb)
- **Direct cardiac Massage CPR** (IIb) after failed standard CPR but less than 30m trial.



## Toxicology

- **Cocaine**- ACS, CVA, HTN & arrhythmogenic
- Avoid Beta-blockers (III) use nitrate 1st line (I) and benzodiazepines (IIa)
- Alpha blockers may cause hypotension & arrhythmias and reserved to non-responders to nitrates & benzodiazepines.
- **Tricyclic anti-depressants**-Hypotension & V-arrhythmias
- Induce systemic alkalemia 7.50-7.55 (IIa)
- lidocaine (?) Procainamide (?)
- **Opiates**: respiratory failure- Mechanical ventilation before naloxone (IIa) will reduce catecholamines arrhythmias and pulmonary edema.

## PALS

- **Intraosseous access acceptable for age>6** (if IV not obtained in 3 attempts or 90 seconds.)
- **Vagal maneuvers** (especially ice water- diving reflex) added to Algorithm of narrow complex tachycardia that is hemodynamically stable, provided they do not delay adenosine or cardioversion if hypoperfusion occurs.
- **Amiodarone (IV)** added to algorithms of wide & narrow complex tachycardias & VF.
- **AEDs for age>8, wt.>25.**

## Stroke (p204)

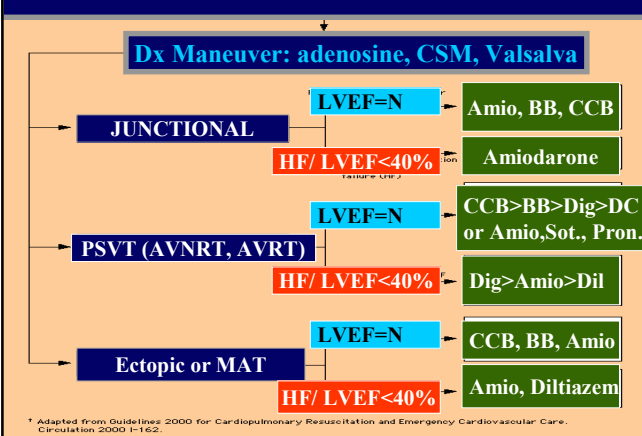
- **tPA**- within 3h of non-hemorrhagic stroke meeting fibrinolytic criteria (I). Use of the drug for patients with 3-6h from onset is not established (?)
- **Stroke within 3h**- EMS protocol & transfer to 24 h CT hospital, rapid hospital triage warranted (like MI), and ability to care for CVA patient.
- **Prourokinase** may have a role in stroke 3-6 h from onset (?)



## Ethical Concerns in ACLS

- **Family presence during CPR?** (recommended provided it is done by planning, staff acceptance & designated staff members)
- **DNAR** (Do not attempt resuscitation [living will, advanced directive, anklet /bracelet] in field & hospital must be honored and doing otherwise is unethical & prohibited by law)
- **Certification of death in the field** (no transport for none-traumatic cardiac arrest victim who failed ACLS in field)
- **Criteria for pronouncing the patient dead via telecommunication:** Quality ACLS attempt with no response and no special conditions (hypothermia, toxic or drug overdose)
- **Survivor support plans:** Leaving the body, reporting death, support, obtaining death certificate, transfer to funeral homes,

## REGULAR NARROW COMPLEX TACHYCARDIA (stable)



## 1. איזה מן התרופות הבאות ניתן לתת במצב של shock refractory VF ?

- א. ברטיליום
- ב. אטרופין
- ג. וזופרסין
- ד. פרונסטיל
- ה. מגנזיום

## 2 - מה הכי נכון?

- א. בהחייאה בסיסית במבוגר היחס בין הנשמות: לחיצות חזה רצוי הנו אחת לחמש.
- ב. נפחי הנשמה רצויים עם אמבו הם 1000-1200 מ"ל
- ג. אדם לא מקצועי העוסק בהחייאה לא יטרח לנקות את חלל הפה מגוף זר בטרם יתחיל בהנשמה.
- ד. אדם בודד בהחייאה ישמור על יחס של חמש לחיצות חזה על כל הנשמה.
- ה. במצב של טביעה ניתן לדחות את הקריאה לעזרה, כחמש דקות לטובת ניסיון החיאה ראשוני.

## 3. מה הכי נכון?

- 1. לחיצות חזה נעשות בתינוק בן חצי שנה בעזרת אצבעות 2 ו-3 של היד הדומיננטית.
- 2. בפרוטוקולים של החייאה בילדים אין אישור להשתמש באמידורון.
- 3. ההנשמה הטובה ביותר לתינוק היא הנשמה מפה לאף ופה. לא מומלץ להנשים מפה לאף.
- 4. ניתן להשתמש בדפיברילטור אוטומטי בזמן BLS במידה והילד מעל גיל 8 או מעל 25 ק"ג.
- 5. בהחייאת ילד רצוי להזעיק את כוחות ההצלה רק לאחר ניסיון טיפולי של מספר דקות.

## 3. מה נכון? טיפול הבחירה בחולה עם תעוקת חזה על רקע מנת יתר של קוקאין הנה:

- א. חוסמי ביתא
- ב. חוסמי אלפא
- ג. מורפין
- ד. ניטריטים תוך ורידיים
- ה. ניטרופרוסיד

## 4. אילו מהתנאים לא נדרשים לקביעת מוות מוחי יומיים לאחר החייאה "מוצלחת"?

- א. דופלר קרניאלי פתולוגי (היעדר זרימה <30 דקות) או בדיקת עזר אחרת המוכיחה היעדר זרימת דם למוח.
- ב. לא ניתן להפיק החזרי גזע מוח.
- ג. היעדר נשימה ספונטנית
- ד. קיימת אבחנה סיבתית ברורה למוות המוחי.
- ה. החולה בחוסר הכרה עמוק ללא כל תנועות או פרכוסים.

## 5. איזה מן המצבים הבאים טופל בצורה נכונה?

- א. חולה עם VT פולימורפי ללא הארכת QT - איזופרל ומגנזיום
- ב. חולה עם שבץ מוחי איסכמי (המיפלגיה ימנית) מלפני 45 דקות וב-CT ראש אין דימום-סטרפטוקינאז.
- ג. חולה עם אסיסטולה-איזופרל
- ד. חולה עם חסם הולכה מדרגה שלישית ברמה של הצרור של היס-אטרופין 1 מ"ג בולוס תוך ורידי
- ה. חולה עם VF שעמיד לשוקים חשמליים חוזרים - פרוקור 300 מ"ג תוך ורידי.

**תודה על תשומת הלב !!!**



**ובהצלחה!!!**

## 6. מה הכי נכון?

1. לחיצות חזה נעשות בתינוק בן חצי שנה בעזרת אצבעות 2 ו-3 של היד הדומיננטית.
2. בפרוטוקולים של החייאה בילדים אין אישור להשתמש באמידרון.
3. ההנשמה הטובה ביותר לתינוק היא הנשמה מפה לאף ופה. לא מומלץ להנשים מפה לאף.
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5. בהחייאת ילד רצוי להזעיק את כוחות ההצלה רק לאחר ניסיון טיפולי של מספר דקות.