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What's new from Guidelines 2010 to Guidelines 2015?

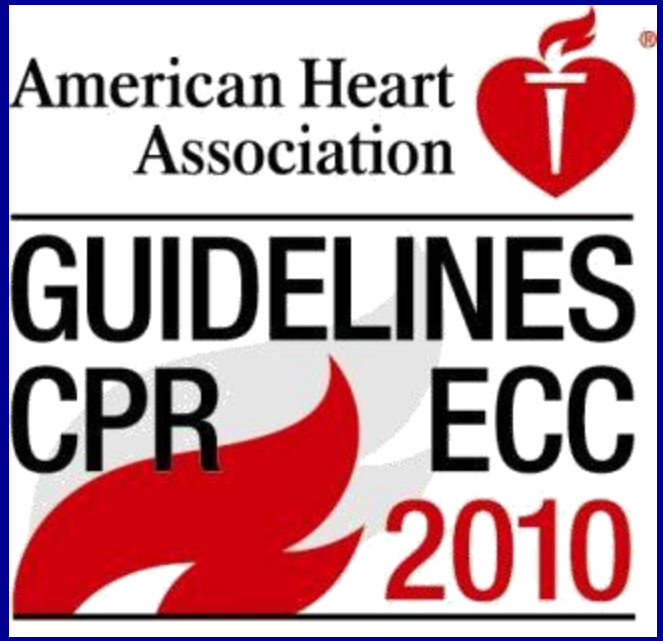
Monica E. Kleinman, MD

Chair, Emergency Cardiovascular Care Committee

American Heart Association

Department of Anesthesia/Critical Care Medicine

Children's Hospital Boston



Disclosure Information

FINANCIAL DISCLOSURE: No relevant conflicts

INTELLECTUAL CONFLICTS:
Co-author of several chapters in 2010 ILCOR Consensus on Science and Treatment Recommendations (CoSTR) and AHA Guidelines for Emergency Cardiovascular Care

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WHO statistics

- Cardiovascular diseases (CVDs) are the number one cause of death globally
- An estimated 17.3 million people worldwide died in 2008 from CVDs
- By 2030, almost 23.6 million people will die from CVDs, which are projected to remain the single leading cause of death

Contents lists available at ScienceDirect

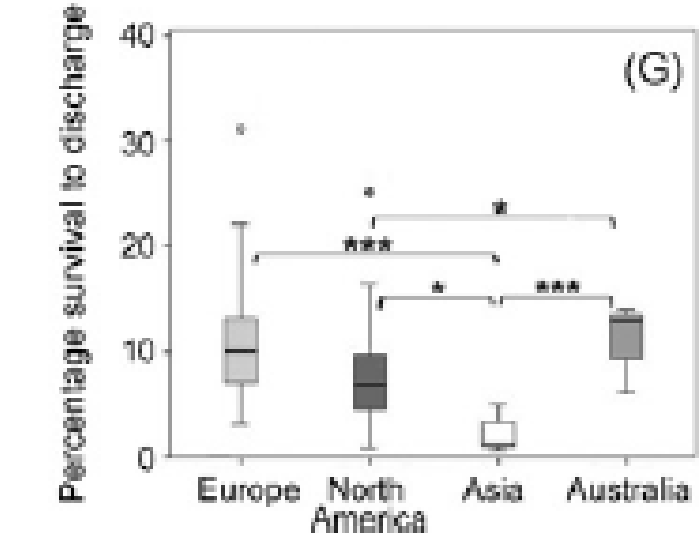
Resuscitation

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

Clinical paper

Global incidences of out-of-hospital cardiac arrest and survival rates: Systematic review of 67 prospective studies☆,☆☆

Jocelyn Berdowski[a,*], Robert A. Berg[b], Jan G.P. Tijssen[a], Rudolph W. Koster[a]



Resuscitation 2010;81:1479-1487

Predictors of Survival From Out-of-Hospital Cardiac Arrest

A Systematic Review and Meta-Analysis

Comilla Sasson, MD, MS; Mary A.M. Rogers, MS, PhD;
Jason Dahl, MD; Arthur L. Kellermann, MD, MPH

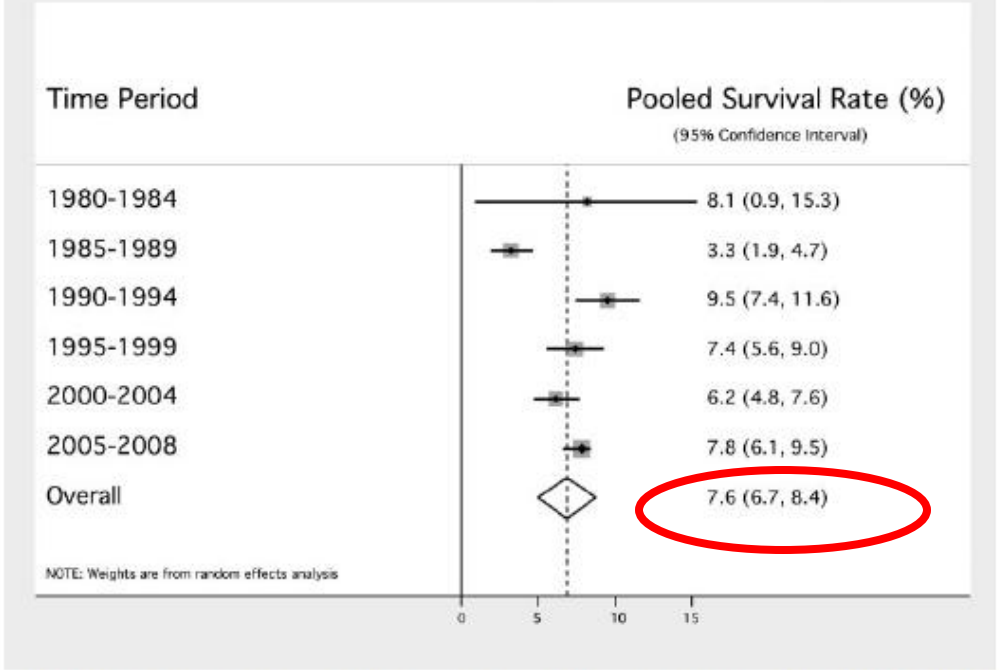


Figure 2. OHCA survival to hospital discharge by 5-year time periods (based upon final year of patient enrollment into study).

Sasson et. al. Circ Cardiovasc Qual Outcomes 2010;3:63-81

Regional Variation in Out-of-Hospital Cardiac Arrest Incidence and Outcome.

Table 5. Incidence and Outcome of Ventricular Fibrillation[a]

	Alabama (n = 65)	Dallas (n = 195)	Iowa (n = 135)	Milwaukee (n = 165)	Ottawa (n = 429)	Pittsburgh (n = 102)	Portland (n = 249)	Seattle (n = 297)	Toronto (n = 614)	Vancouver (n = 478)	Overall (n = 2729)
Adjusted incidence rate per 100 000	9.9	12.8	12.4	18.7	10.4	9.3	15.1	19.0	11.4	15.2	12.8
Adjusted mortality rate per 100 000	8.8	10.7	8.9	13.7	8.6	7.2	11.3	11.5	9.5	10.9	9.8
Case-fatality rate, %	89.2	82.7	72.9	74.0	83.1	77.5	73.9	59.8	83.0	71.7	76.5
Survival to discharge, %	7.7	9.5	22.7	26.0	14.8	21.5	22.5	39.9	15.7	25.0	21.0
Vital status data missing, %	3.1	7.9	4.4	0	2.1	1.0	3.6	0.3	1.3	3.3	2.5

[a] All rates were unequal across sites at $P < .001$.

SYSTEM of CARE

Nichol, G. et al. JAMA 2008;300:1423-1431

JAMA

CPR Milestones

1970s-1980s

EMS Systems
ACLS, Trauma

1992 Guidelines Conference

1992

International Liaison Committee on Resuscitation
ILCOR

2000

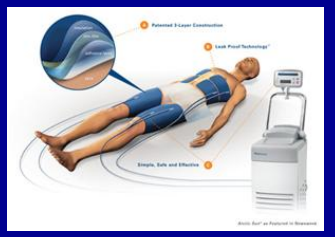
2000 Guidelines Conference

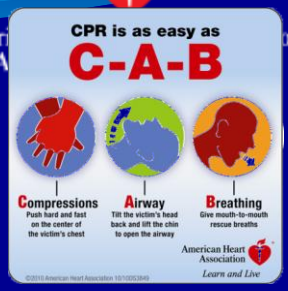
2005 Guidelines Conference

2005

2010 Guidelines Conference

2010





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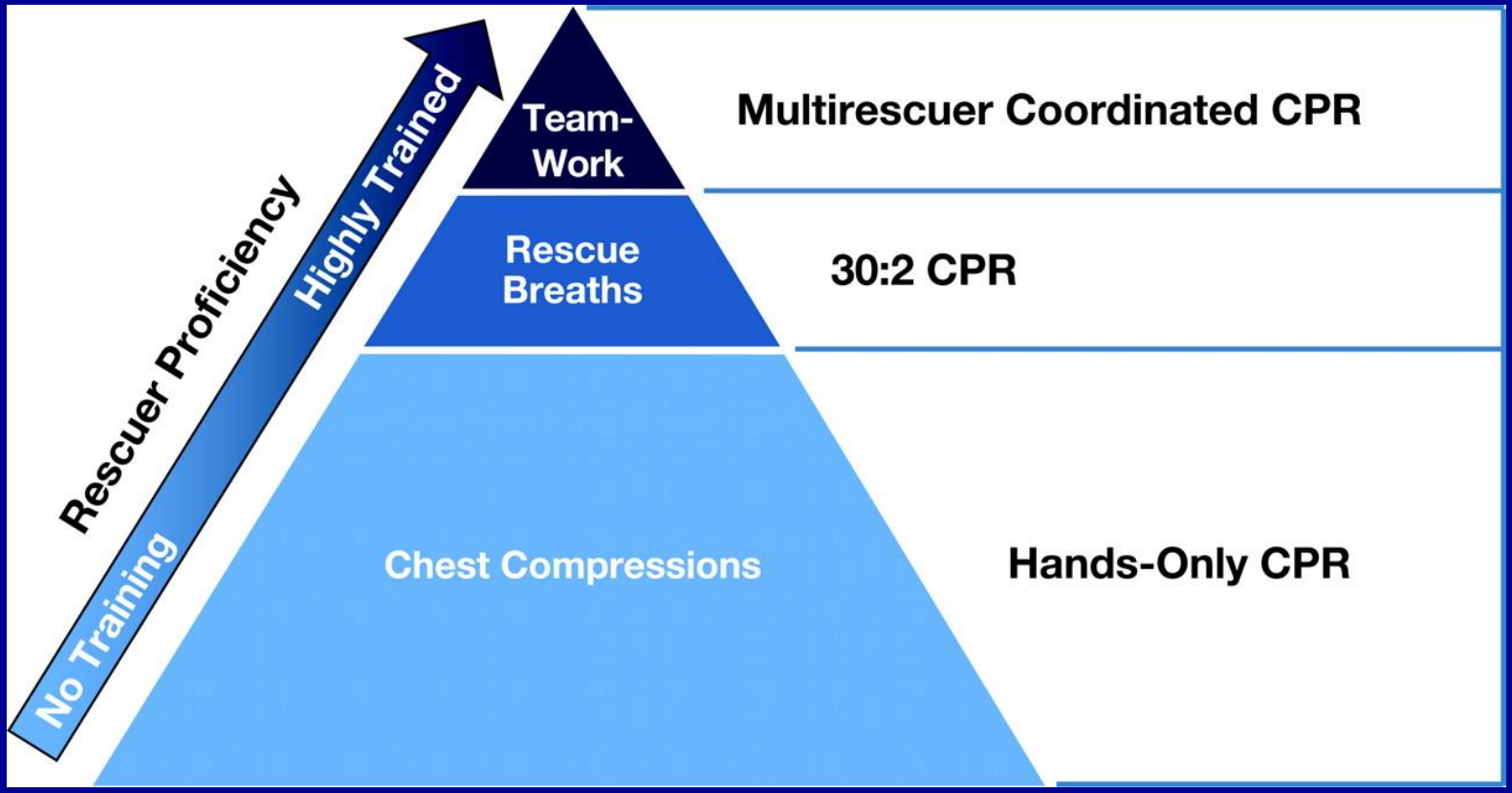
Major Changes in 2010

- Chest compressions first (CAB)
- Capnography to assess CPR quality
- No atropine for pulseless arrest
- Importance of organized post-cardiac arrest care
  - Avoid hyperoxia after return of spontaneous circulation
  - Therapeutic hypothermia

Basic Life Support



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

Circulation

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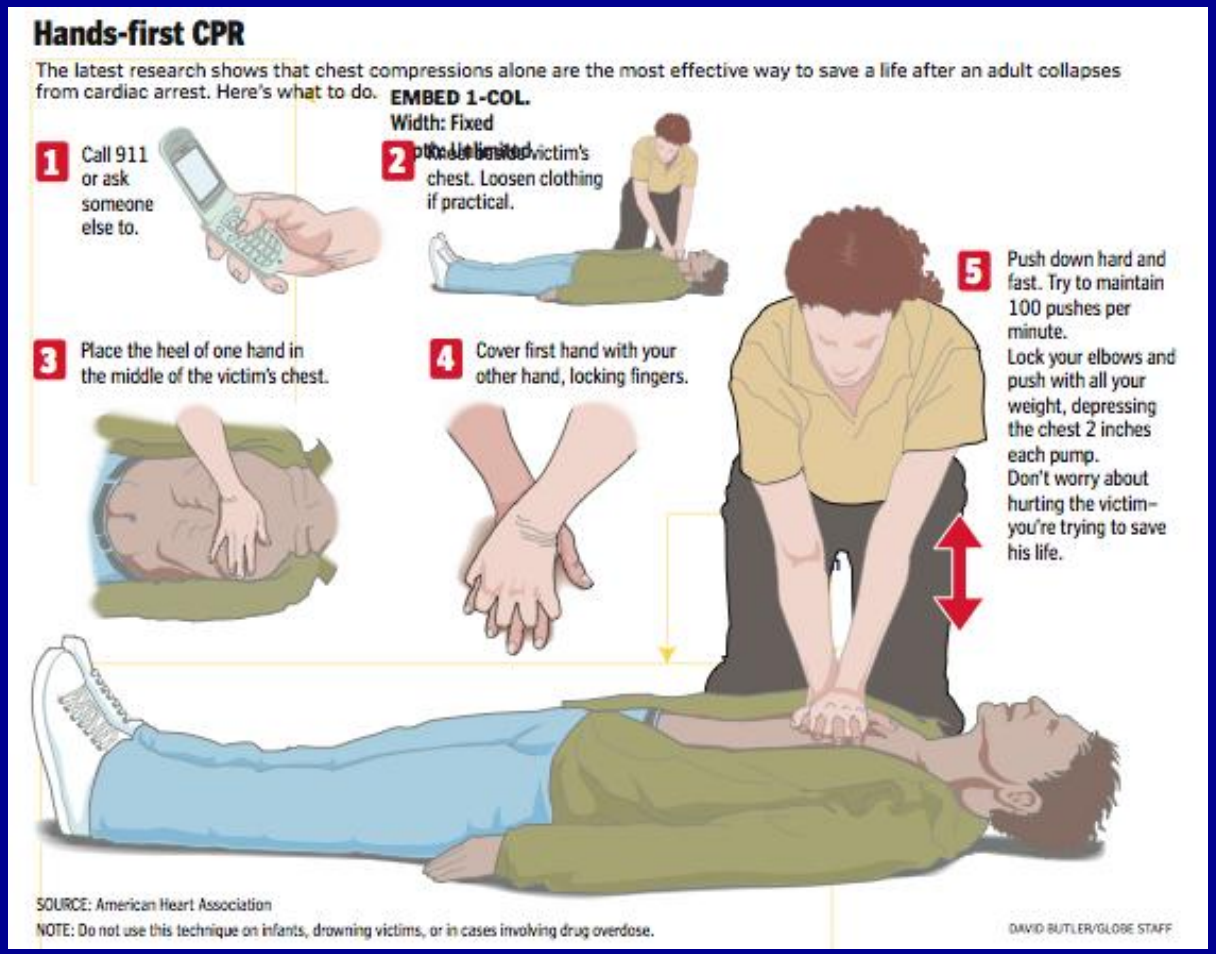
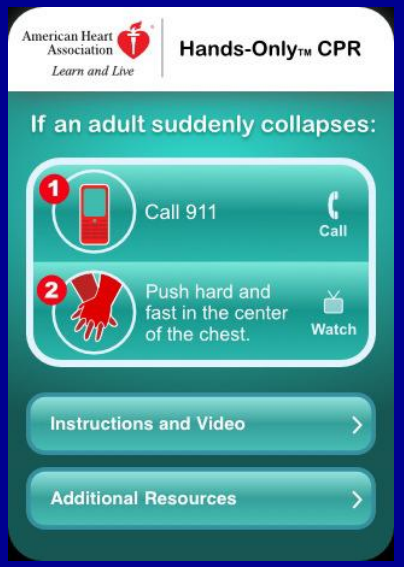
Hands-only CPR

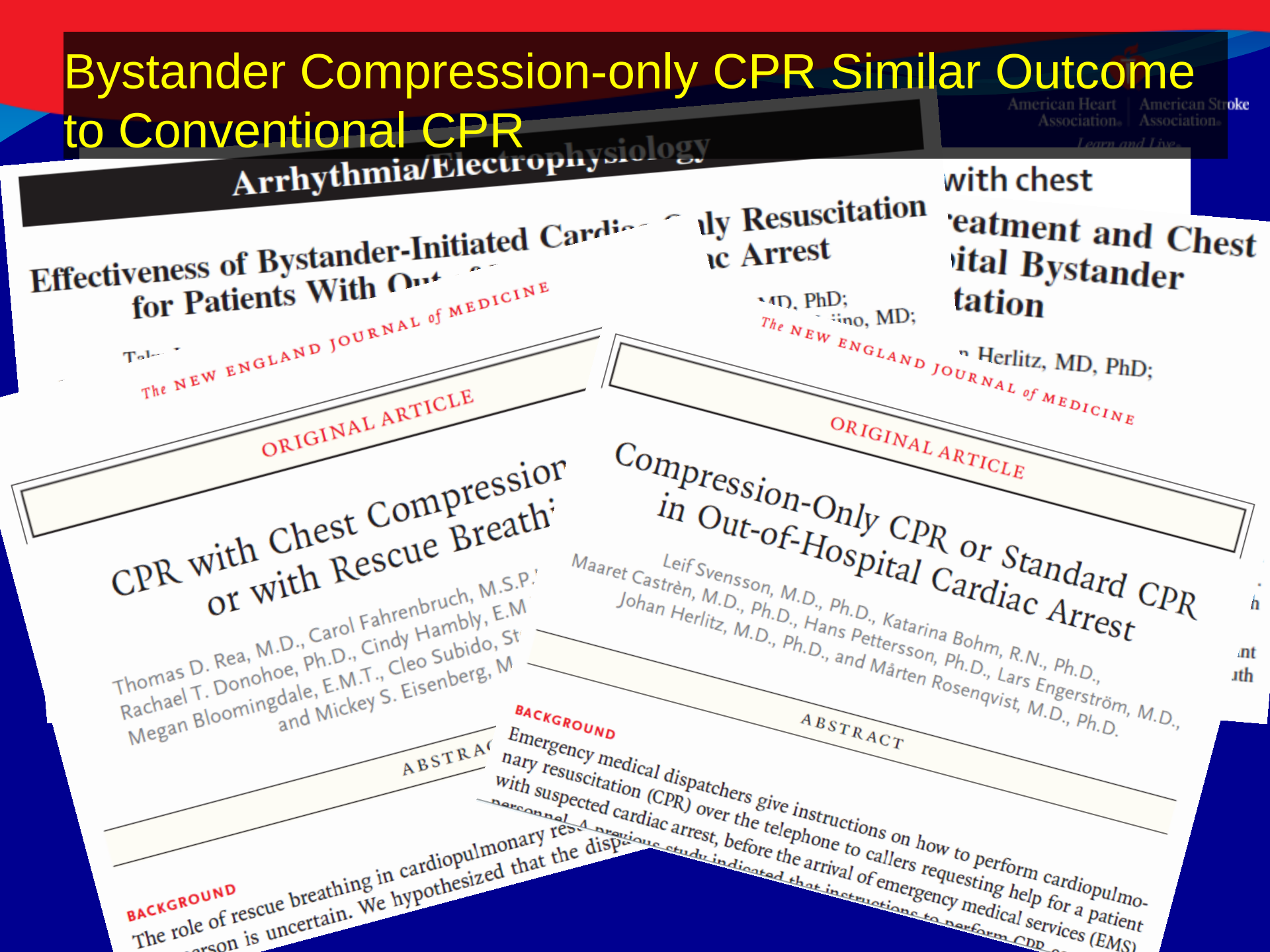




The Boston Globe

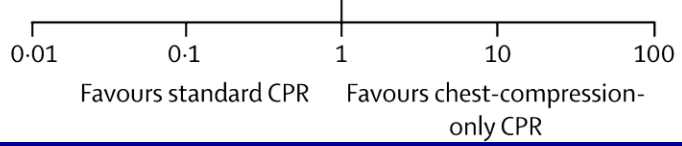
November 1, 2010

Bystander Compression-only CPR Similar Outcome to Conventional CPR



Meta-analysis of Survival to Discharge

	Chest-compression-only CPR	Standard CPR	Risk ratio (95% CI)	Z value	p value
Hallstrom et al (2000)[14]	35/240 (15%)	29/278 (10%)	1·40 (0·88–2·22)	1·43	0·15
Rea et al (2010)[15]	122/978 (12%)	105/956 (11%)	1·14 (0·89–1·45)	1·02	0·31
Svensson et al (2010)[16]	54/282 (19%)	44/297 (15%)	1·29 (0·90–1·86)	1·39	0·17
Overall	**211/1500 (14%)**	**178/1531 (12%)**	**1·22 (1·01–1·46)**	**2·06**	**0·040**



Hüpfl *Lancet* 2010; Oct 15

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Key topics for consideration in 2015

- Optimizing CPR quality
- Duration of CPR attempts
- Pharmacologic agents
- Optimizing post-resuscitation care

CPR Quality

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CPR Feedback Devices

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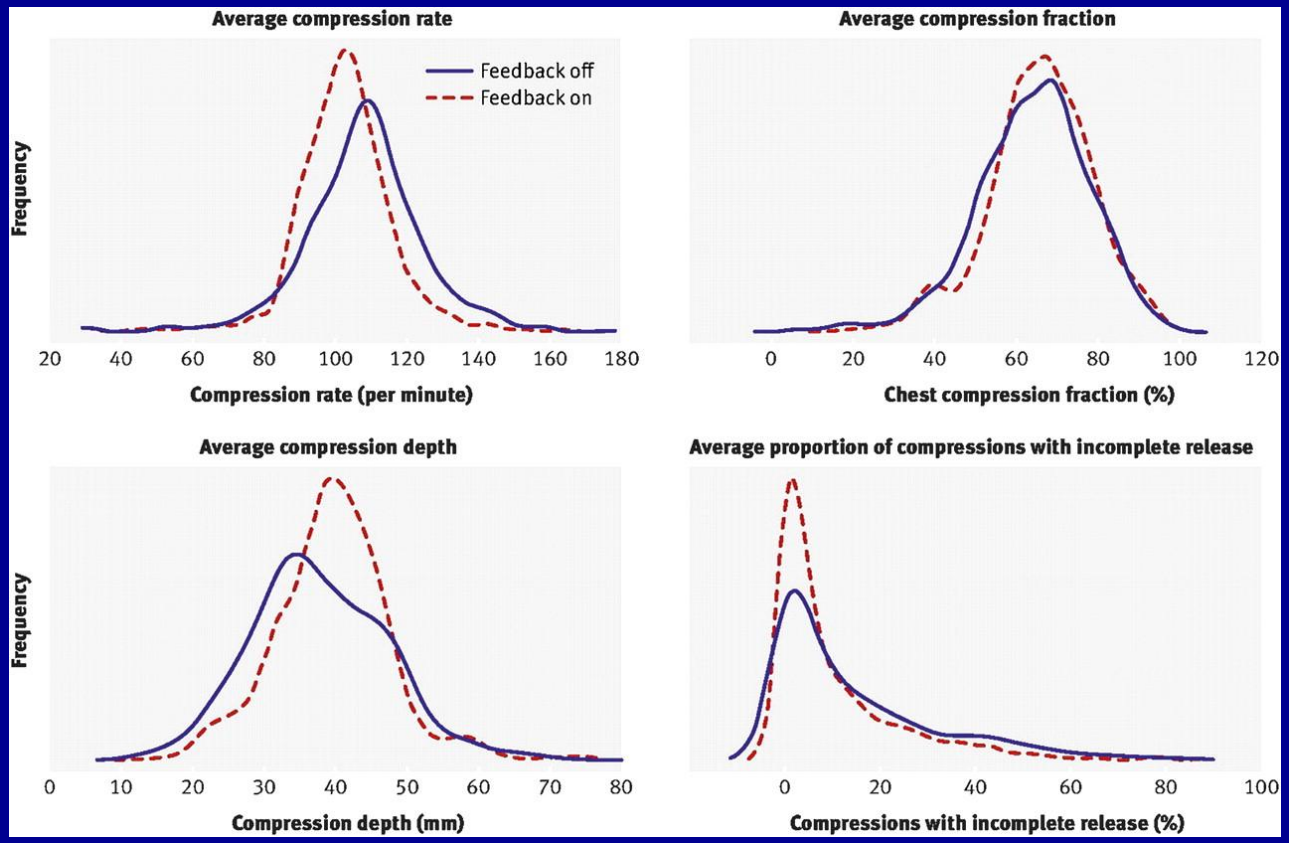
Frequency distribution of the rate, fraction and depth of chest compressions and the percentage of chest compressions with incomplete release during cardiopulmonary resuscitation stratified by whether monitor-defibrillators provided real-time feedback ('feedback on') or not ('feedback off').

Rate

Chest Compression fraction

Depth

Recoil



Perkins G D et al. Heart 2012;98:529-535

HEART

Duration of CPR

Duration of resuscitation efforts and survival after in-hospital cardiac arrest: an observational study

Zachary D Goldberger, Paul S Chan, Robert A Berg, Steven L Kronick, Colin R Cooke, Mingrui Lu, Mousumi Banerjee, Rodney A Hayward, Harlan M Krumholz, Brahmajee K Nallamothu, for the American Heart Association Get With The Guidelines—Resuscitation (formerly the National Registry of Cardiopulmonary Resuscitation) Investigators*

- 64,339 adult cardiac arrests
  - 48.5% ROSC
  - 15.4% survival to discharge
  - 80.6% of survivors with good neurologic status

Goldberger et. al. Lancet 2012

Duration of CPR efforts

	Return of spontaneous circulation*			Survival to discharge†		
	Adjusted risk ratio (95% CI)	Adjusted rate	p value	Adjusted risk ratio (95% CI)	Adjusted rate	p value
Quartile 1 (13994 patients at 113 hospitals)	1·00	45·3%	–	1·00	14·5%	–
Quartile 2 (18783 patients at 121 hospitals)	1·04 (0·99–1·09)	47·0%	0·116	1·05 (0·96–1·14)	15·2%	0·304
Quartile 3 (19106 patients at 107 hospitals)	1·08 (1·03–1·13)	48·8%	0·002	1·05 (0·96–1·14)	15·2%	0·280
Quartile 4 (12456 patients at 94 hospitals)	1·12 (1·06–1·18)	50·7%	<0·0001	1·12 (1·02–1·23)	16·2%	0·021

*p for trend <0·0001. †p for trend 0·031.

Table 3: Return of spontaneous circulation and survival to discharge in all patients, by hospital quartile

Goldberger et. al. Lancet 2012

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Medications for cardiac arrest

Contents lists available at ScienceDirect

Resuscitation

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

Clinical paper

Effect of adrenaline on survival in out-of-hospital cardiac arrest: A randomised double-blind placebo-controlled trial☆

Ian G. Jacobs[a,c,*], Judith C. Finn[a,c], George A. Jelinek[b], Harry F. Oxer[c], Peter L. Thompson[d,e]

Adrenaline

	Placebo (n = 262)	Adrenaline (n = 272)	OR (95% CI)	P value
ROSC pre-hospital	22 (8.4%)	64 (23.5%)	3.4 (2.0 – 5.6)	P<0.001
Survival to admission	34 (13.0%)	69 (25.4%)	2.3 (1.4 – 3.6)	P<0.001
Survival to discharge	5 (1.9%)	11 (4.0%)	2.2 (0.7 – 6.3)	P = 0.15
CPC 1 or 2	5 (100%)	9 (81.8%)	n/a	P = 0.31

Jacobs IG, Resuscitation 2011;82:1138 - 1143

Meta-analysis of adult RCTs - Vasopressin

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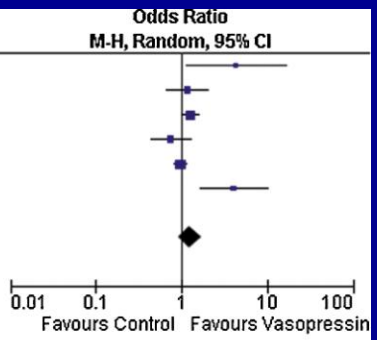
Study or Subgroup	Vasopressin Events	Total	Control Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Lindner 1997	14	20	7	20	5.1%	4.33 [1.15, 16.32]
Stiel 2001	45	104	38	96	15.9%	1.16 [0.66, 2.05]
Wenzel 2004	214	589	186	597	25.7%	1.26 [0.99, 1.61]
Callaway 2006	31	167	37	158	16.6%	0.75 [0.44, 1.27]
Gueugniaud 2008	299	1442	310	1452	27.5%	0.96 [0.81, 1.15]
Mentzelopoulos 2009	39	48	27	52	9.1%	4.01 [1.62, 9.93]
Total (95% CI)		**2370**		**2375**	**100.0%**	**1.25 [0.90, 1.74]**
Total events	642		605			

Heterogeneity: Tau² = 0.09; Chi² = 17.31, df = 5 (P = 0.004); I² = 71%
Test for overall effect: Z = 1.35 (P = 0.18)

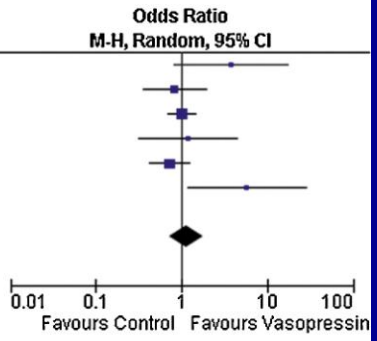


A

ROSC

Study or Subgroup	Vasopressin Events	Total	Control Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Lindner 1997	8	20	3	20	7.5%	3.78 [0.83, 17.25]
Stiel 2001	12	104	13	96	17.4%	0.83 [0.36, 1.93]
Wenzel 2004	57	578	58	588	32.2%	1.00 [0.68, 1.47]
Callaway 2006	5	167	4	158	9.2%	1.19 [0.31, 4.51]
Gueugniaud 2008	24	1439	33	1448	26.7%	0.73 [0.43, 1.24]
Mentzelopoulos 2009	9	48	2	52	6.9%	5.77 [1.18, 28.24]
Total (95% CI)		**2356**		**2362**	**100.0%**	**1.13 [0.71, 1.78]**
Total events	115		113			

Heterogeneity: Tau² = 0.13; Chi² = 9.28, df = 5 (P = 0.10); I² = 46%
Test for overall effect: Z = 0.51 (P = 0.61)

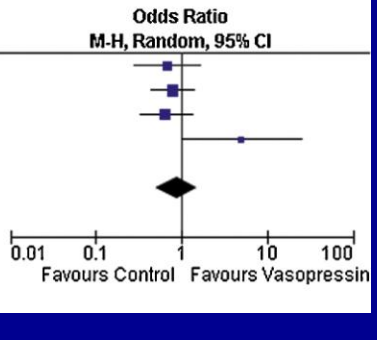


B

Survival to discharge

Study or Subgroup	Vasopressin Events	Total	Control Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Stiel 2001	10	104	13	96	23.9%	0.68 [0.28, 1.63]
Wenzel 2004	22	567	28	576	35.9%	0.79 [0.45, 1.40]
Gueugniaud 2008	13	1439	20	1448	30.1%	0.65 [0.32, 1.31]
Mentzelopoulos 2009	8	48	2	52	10.1%	5.00 [1.01, 24.87]
Total (95% CI)		**2158**		**2172**	**100.0%**	**0.87 [0.49, 1.52]**
Total events	53		63			

Heterogeneity: Tau² = 0.14; Chi² = 5.51, df = 3 (P = 0.14); I² = 46%
Test for overall effect: Z = 0.50 (P = 0.62)



C

Positive neuro outcome

Mentzelopoulus et. al. Resuscitation 2012;83:33-39

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Post-resuscitation care

- Oxygen
- Re-vascularization
- Temperature control
- Glucose
- Seizures

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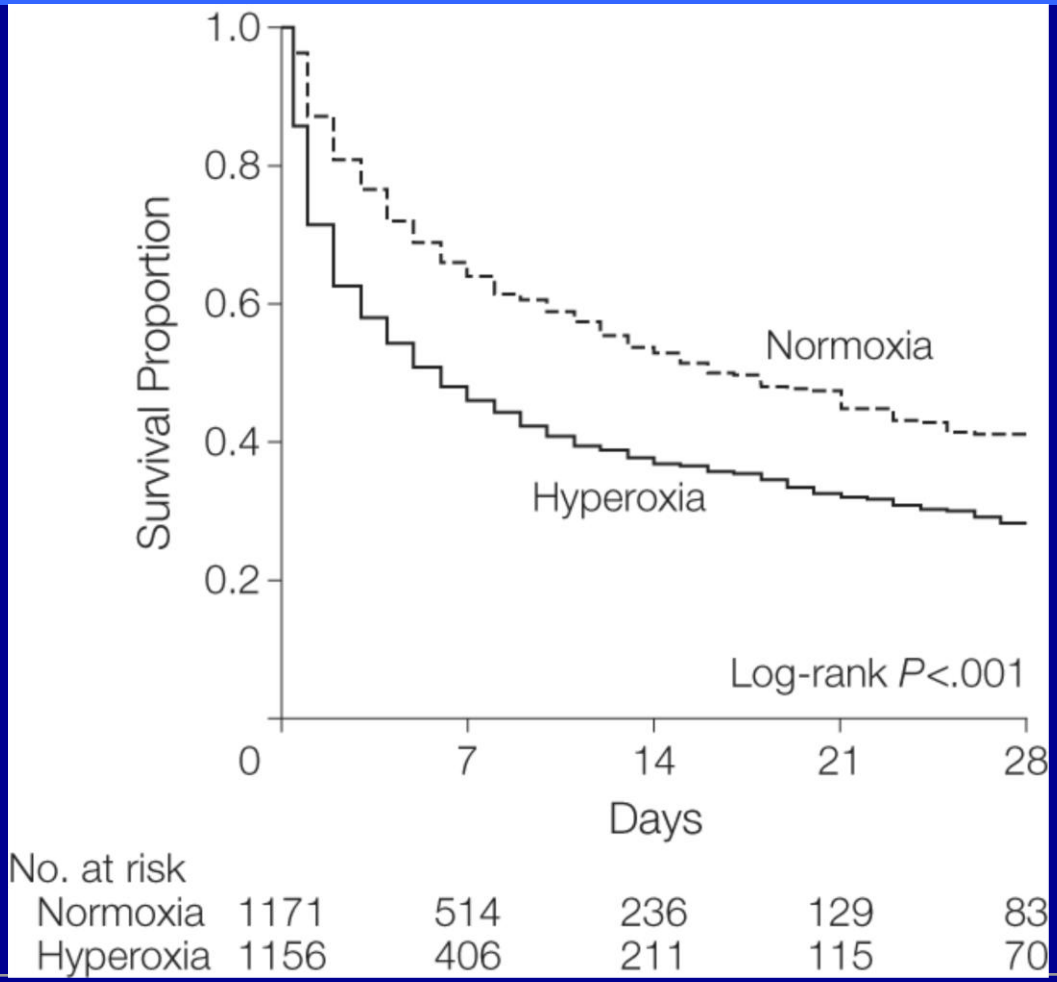
Association Between Arterial Hyperoxia Following Resuscitation From Cardiac Arrest and In-Hospital Mortality

- >6000 adult patients resuscitated from cardiac arrest prior to ICU admission
- Maximal PaO_2 on first arterial blood gas in the first 24 hours
  - Hypoxia <60 mm Hg
  - Hyperoxia >300 mm Hg
  - Normoxia 60 – 300 mm Hg

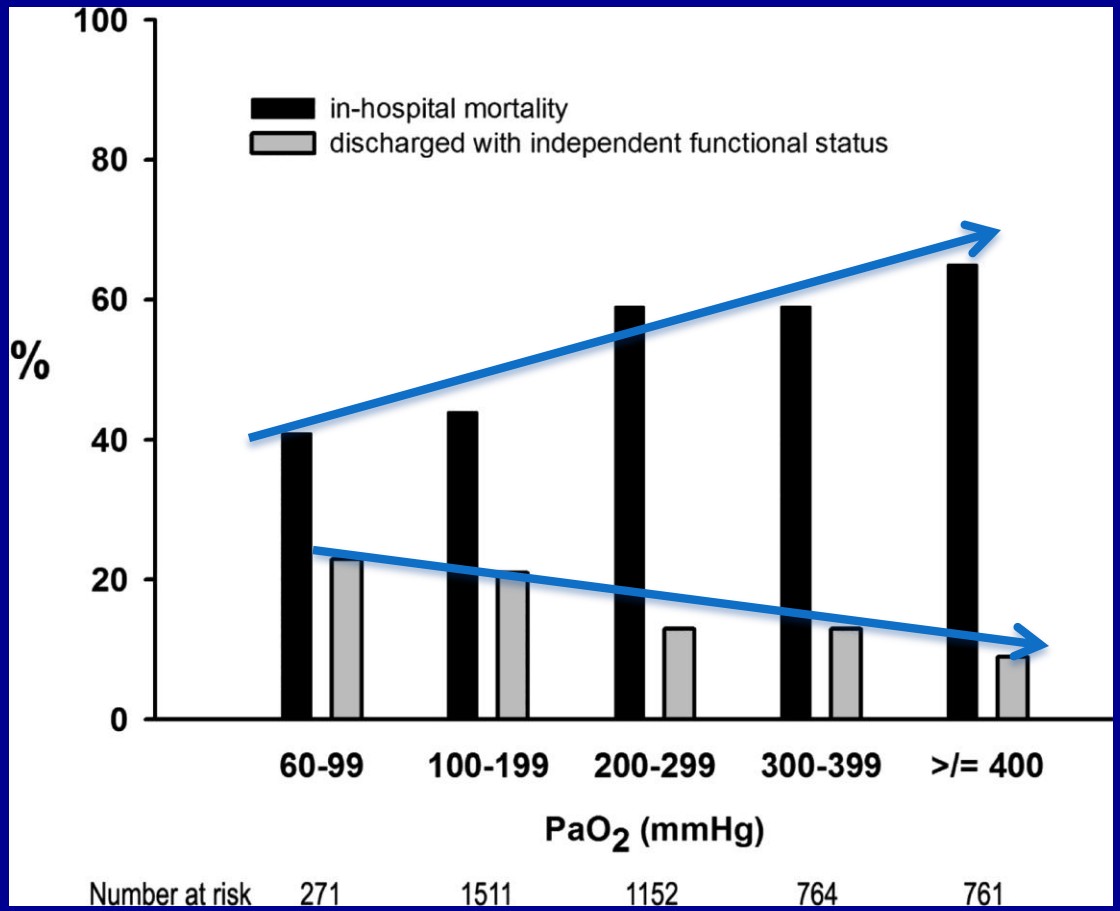
Kilgannon et. al. JAMA 2010; 303:2165-2171

From: **Association Between Arterial Hyperoxia Following Resuscitation From Cardiac Arrest and In-Hospital Mortality**

JAMA. 2010;303(21):2165-2171. doi:10.1001/jama.2010.707



Oxygen tension and outcomes post-arrest



Kilgannon J H et al. Circulation 2011;123:2717-2722

Contents lists available at SciVerse ScienceDirect

Resuscitation

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

Clinical paper

Hyperoxia, hypocapnia and hypercapnia as outcome factors after cardiac arrest in children☆

Jimena del Castillo[a], Jesús López-Herce[a,*], Martha Matamoros[b], Sonia Cañadas[c], Ana Rodriguez-Calvo[d], Corrado Cechetti[e], Antonio Rodriguez-Núñez[f], Angel Carrillo Álvarez[a], The Iberoamerican Pediatric Cardiac Arrest Study Network RIBEPCI[g]

- No association between mortality and PaO_2 in first 24 hours
- Increased mortality for $PaCO_2$ <30 mmHg or >50 mmHg after ROSC (50 and 59% vs. 33.1%, p= 0.02)

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Summary

- Cardiovascular diseases remain the leading cause of death worldwide
- Advances in resuscitation are essential to improve survival
  - CPR quality
  - CPR duration
  - Pharmacology
  - Post-resuscitation care

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Grazie!

monica.kleinman@childrens.harvard.edu