WAKE COUNTY
NORTH CAROLINA

Resuscitation Duration

How Long Should We Attempt Resuscitation and Expect Neurologically Intact Survival?

William F. Buckley and Art Buchwald

"Dear Bill, I don't like to brag, but I have just received a PLATINUM card from Hertz. There is no where you can go after platinum except may plutonium. I'm really afraid to carry the card in my pocket because in case of a stickup it would be the first one the thieves would go for.

William F. Buckley and Art Buchwald

Rumor has it that the underworld will now kill for a Platinum card. You and I have both come a long way in the the journalism profession, but I don't know how much higher you can go in life that to become the owner of a Platinum Hertz card.

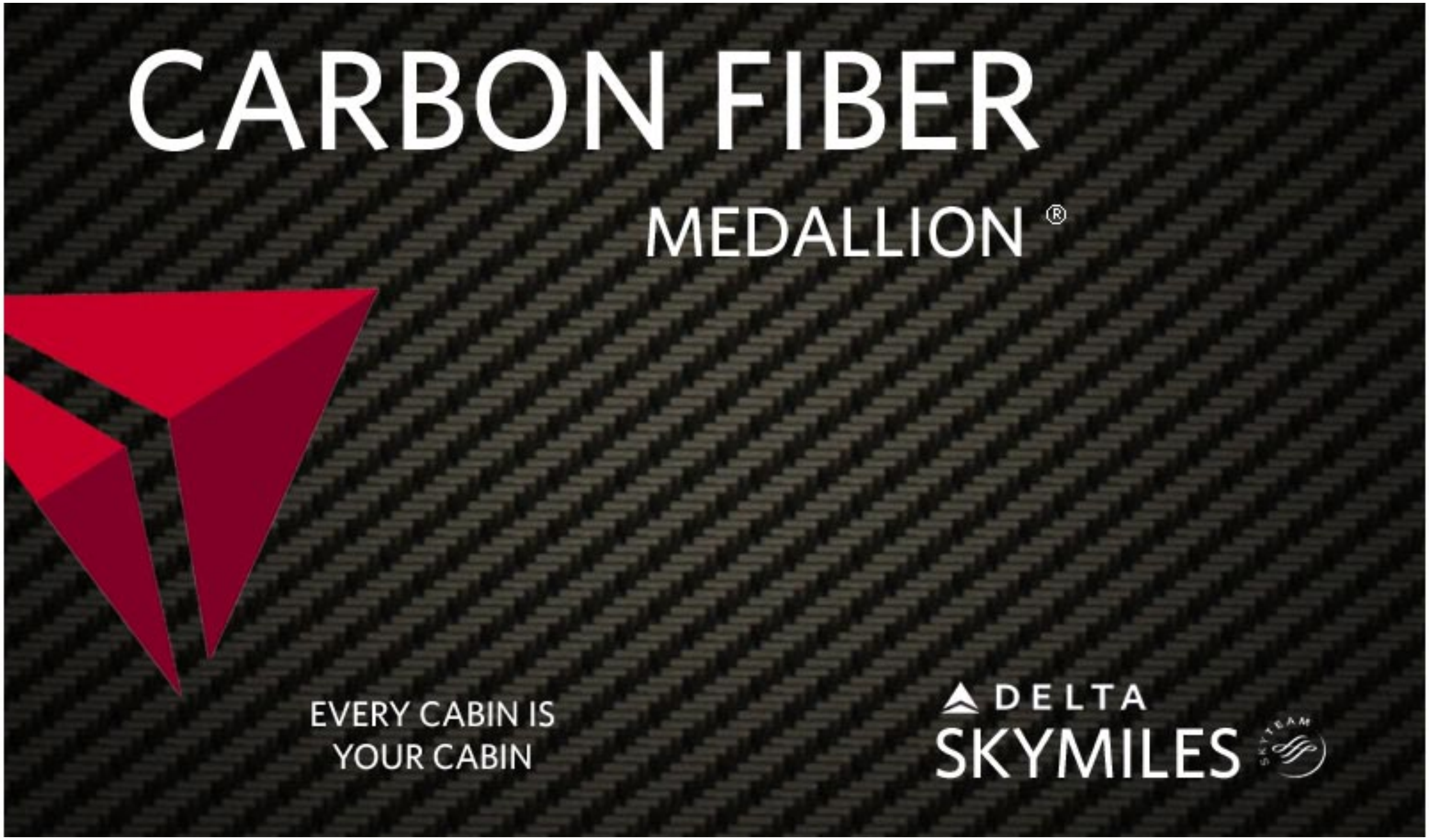
William F. Buckley and Art Buchwald

I would say we have achieved the American Dream."

Sincerely, Art Buchwald
Washington DC
August 24, 1984

Delta Loyalty Program

Proposed Delta Loyalty Program



How I Feel Today

40 is the new 20

Public Health Announcement

In wine there is wisdom

In beer there is strength

In water there are bacteria

The Plan

History of project

- Question to be answered
- SAS role in helping to answer the question

Results

Implications of Results


FUTILITY
They Say That Just One Person Can Make a Big Difference.
Sometimes They're Wrong.

ARTICLE IN PRESS

EMERGENCY MEDICAL SERVICES/ORIGINAL RESEARCH

Improved Out-of-Hospital Cardiac Arrest Survival After the Sequential Implementation of 2005 AHA Guidelines for Compressions, Ventilations, and Induced Hypothermia: The Wake County Experience

Hinchey et al. Annals of EM 2010;56:348-57

WAKE COUNTY
NORTH CAROLINA

Wake County Experience

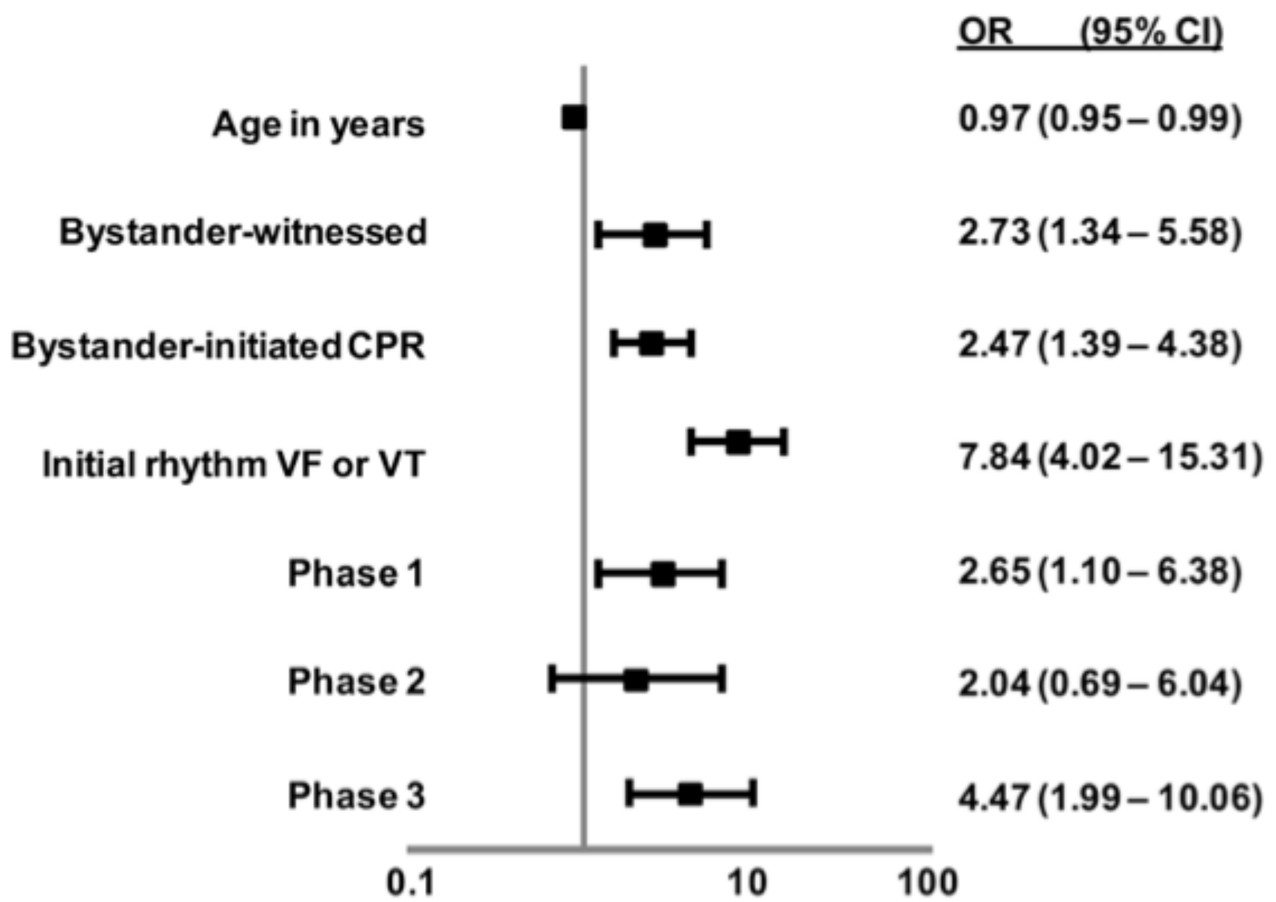
Community-wide approach to improving resuscitation outcomes

Observational cohort with prospective data collection and observation:

- Continuous compressions
- Controlled ventilations/working codes "on-scene"
- Therapeutic temperature management

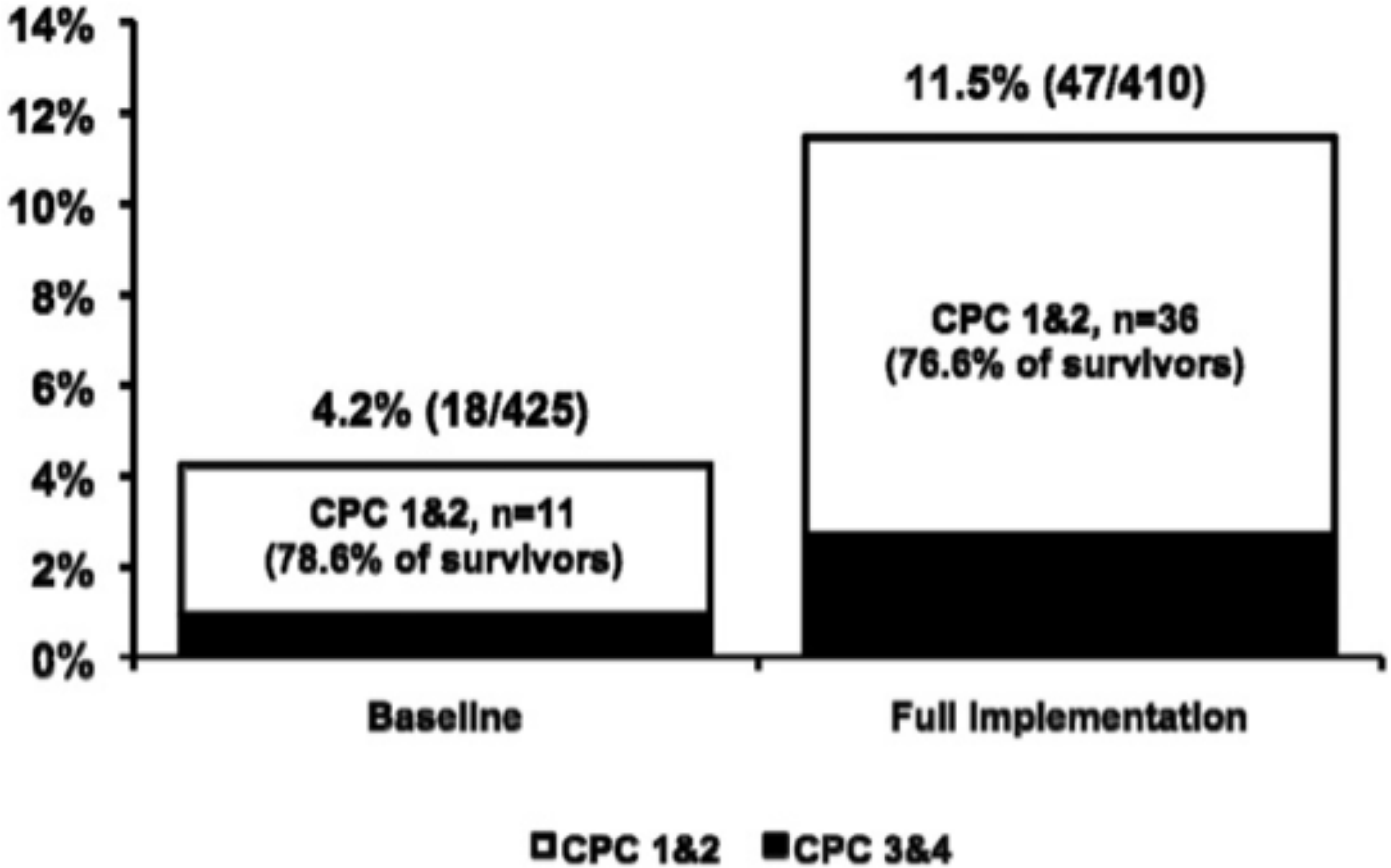
Characteristics	Baseline (N=425)	Phase 1 (N=369)	Phase 2 (N=161)	Phase 3 (N=410)	Absolute Increase* % (95% CI)
Witnessed arrest					
Bystander witnessed	n=154 8 (5.2)	n=134 14 (10.4)	n=61 8 (13.1)	n=136 31 (22.8)	17.6 (9.7 to 25.5)
EMS witnessed	n=51 6 (11.8)	n=50 6 (12.0)	n=12 1 (8.3)	n=47 10 (21.3)	9.5 (−5.2 to 24.2)
Initial CPR					
Bystander	n=162 8 (4.9)	n=117 13 (11.1)	n=63 6 (9.5)	n=142 21 (14.8)	9.9 (3.2 to 16.6)
First responder (firefighter)	n=143 2 (1.4)	n=165 6 (3.6)	n=77 5 (6.5)	n=192 14 (7.3)	5.9 (1.7 to 10.1)
EMS response intervals					
Defib to scene in >4 min	n=356 16 (4.5)	n=287 16 (5.6)	n=121 9 (7.4)	n=330 35 (10.6)	6.1 (2.1 to 10.1)
Defib to scene in ≤4 min	n=42 1 (2.4)	n=70 9 (12.9)	n=39 4 (10.3)	n=73 12 (16.4)	11.6 (0.9 to 22.3)
Initial cardiac rhythm					
Asystole	n=200 3 (1.5)	n=178 2 (1.1)	n=81 1 (1.2)	n=199 4 (2.0)	0.5 (−2.1 to 3.1)
PEA	n=100 1 (1.0)	n=89 3 (3.4)	n=38 0 (0)	n=107 8 (7.5)	5.5 (−0.2 to 11.2)
VF or VT	n=124 14 (11.3)	n=101 22 (21.8)	n=42 12 (28.6)	n=97 35 (36.1)	24.8 (13.7 to 35.9)
Witnessed VF					
All-witnessed VF	n=80 11 (13.8)	n=71 17 (23.9)	n=26 9 (34.6)	n=76 31 (40.8)	27.0 (13.6 to 40.4)
Bystander-witnessed VF	n=61 5 (8.2)	n=56 12 (21.4)	n=24 8 (33.3)	n=66 23 (34.8)	26.6 (13.2 to 40.0)
EMS-witnessed VF	n=19 6 (31.6)	n=15 5 (33.3)	n=2 1 (50.0)	n=10 8 (80.0)	48.4 (16.0 to 80.8)

Wake County Experience



WAKE COUNTY NORTH CAROLINA

Wake County Experience



Wake County Experience

The combination of compressions, controlled ventilations, working arrests in the field, and hypothermia increased survival by 7% actually and 200% relatively

This is an increase of 3 lives saved per 100,000 population per year, or 30 additional lives saved annually in Wake County

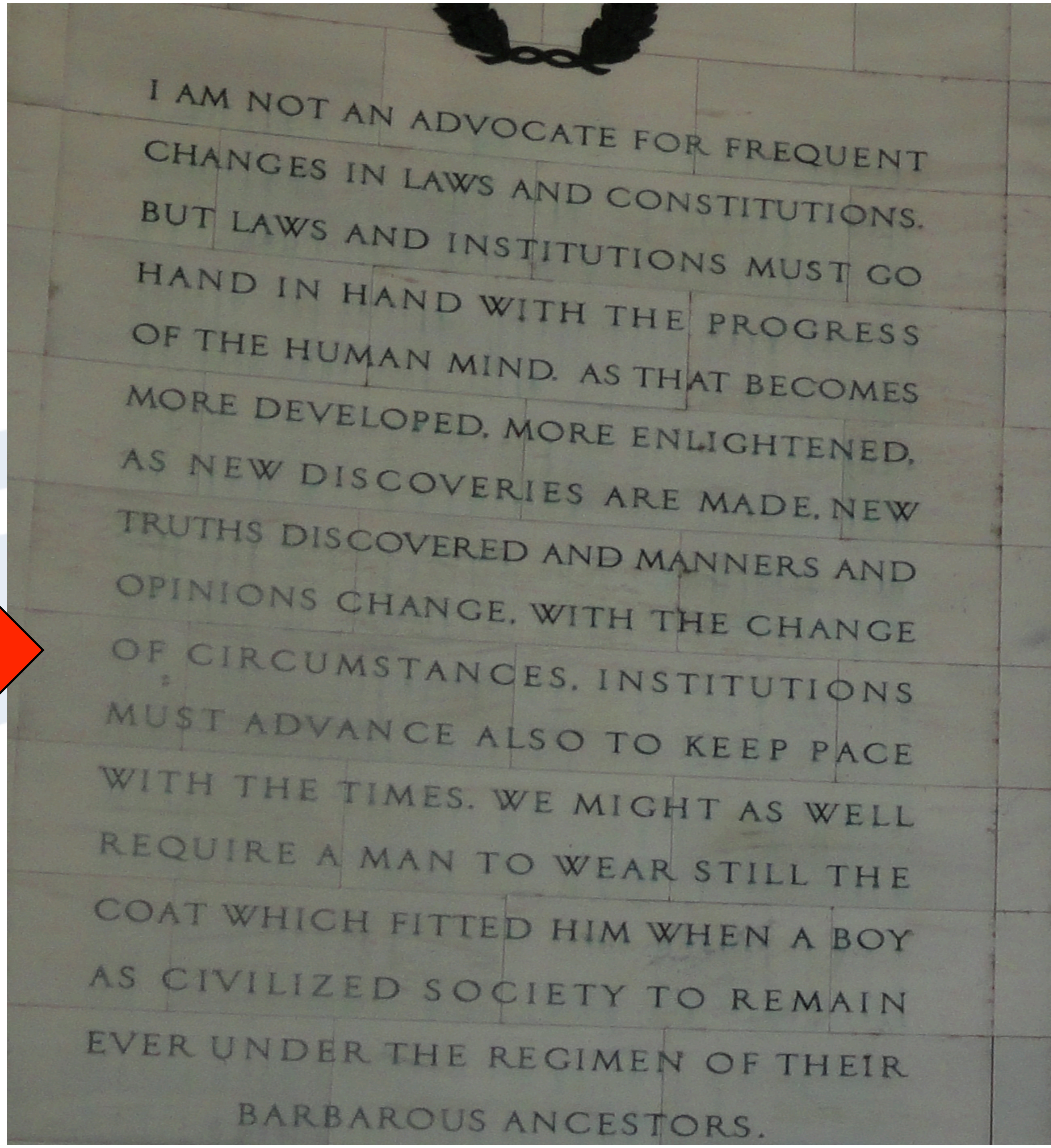
Wake EMS CARES: Jan 1 – Dec 31, 2013

Data Element	Wake County	NC	Nation
Total Number	463	4222	31127
Pronounced In Field	239 (52%, 47-56%)	1558 (37%, 35-38%)	8567 (28%, 27-28%)
Pronounced in ED	50 (11%, 8-14%)	711 (17%, 16-18%)	5215 (17%, 16-17%)
Ongoing Resus in ED	174 (38%, 33-42%)	1953 (46%, 45-48%)	17345 (56%, 55-56%)
Overall Survival to Admit	**144 (31%, 27-35%)**	**1138 (27%, 26-28%)**	**8558 (28%, 27-28%)**
Overall Survival to DC	**69 (15%, 12-18%)**	**452 (11%, 10-12%)**	**3315 (11%, 10-11%)**
Neuro Intact Survival	**63 (14%, 11-17%)**	**398 (9%, 9-10%)**	**2588 (8%, 8-9%)**
Utstein	**57 (46%, 40-66%)**	**617 (32%, 28-36%)**	**4281 (33%, 32-34%)**
Utstein with Bystander	**32 (53%, 36-70%)**	**356 (35%, 30-40%)**	**2442 (38%, 36-40%)**

WAKE COUNTY
NORTH CAROLINA

WAKE COUNTY
NORTH CAROLINA

Now What? When Should We Stop?


I AM NOT AN ADVOCATE FOR FREQUENT
CHANGES IN LAWS AND CONSTITUTIONS.
BUT LAWS AND INSTITUTIONS MUST GO
HAND IN HAND WITH THE PROGRESS
OF THE HUMAN MIND. AS THAT BECOMES
MORE DEVELOPED, MORE ENLIGHTENED,
AS NEW DISCOVERIES ARE MADE, NEW
TRUTHS DISCOVERED AND MANNERS AND
OPINIONS CHANGE, WITH THE CHANGE
OF CIRCUMSTANCES, INSTITUTIONS
MUST ADVANCE ALSO TO KEEP PACE
WITH THE TIMES. WE MIGHT AS WELL
REQUIRE A MAN TO WEAR STILL THE
COAT WHICH FITTED HIM WHEN A BOY
AS CIVILIZED SOCIETY TO REMAIN
EVER UNDER THE REGIMEN OF THEIR
BARBAROUS ANCESTORS.

Concepts in Emergency and Critical Care

Roger C. Bone, MD, *Section Editor*

Distinct Criteria for Termination of Resuscitation in the Out-of-Hospital Setting

Marni J. Bonnin, MD; Paul E. Pepe, MD; Kay T. Kimball, PhD; Peter S. Clark, Jr, EMT

JAMA 1993;270:1457-62

Table 3.—Criteria for Termination of Resuscitation Efforts at the Scene Following Unmonitored, Out-of-Hospital, Adult, Primary Cardiac Arrest

1. Adult cardiopulmonary arrest (not associated with trauma, body temperature aberration, respiratory etiology, or drug overdose)
2. Standard advanced cardiac life support[5] for 25 min
3. No restoration of spontaneous circulation (spontaneous pulse rate of >60 beats per min for at least one 5-min period)
4. Absence of persistently recurring or refractory ventricular fibrillation/tachycardia or any continued neurological activity (eg, spontaneous respiration, eye opening, or motor response)

guideline.[11] However, while this study helps to validate the practice (of terminating resuscitations at the scene) as a reasonable and medically acceptable option for EMS systems today, it must also be recognized that these conclusions remain valid only as long as new or unusual treatment advances have not become available. There is no more worrisome a place for self-fulfilling prophecies than in resuscitation practices.

Resuscitation in the Out-of-hospital Setting:

Medical Futility Criteria for On-scene Pronouncement of Death

Paul E. Pepe, MD, MPH, Robert A. Swor, DO, Joseph P. Ornato, MD, Edward M. Racht, MD, Donald M. Blanton, MD, John K. Griswell, MD, Thomas Blackwell, MD, James Dunford, MD

Abstract

The complete and irreversible cessation of life is often difficult to determine with complete confidence in the dynamic environment of out-of-hospital emergency care. As a result, resusci-

mended procedures for on-scene or prehospital pronouncement of death (termination of resuscitation). In cases of *nontraumatic* cardiac arrest, few unassailable criteria, other than certain physical signs of irreversible tissue

death; field pronouncement; pronouncement of death; futility; resuscitation; cardiac arrest; trauma.

PREHOSPITAL EMERGENCY CARE 2001;5:79–87

TABLE 3. Cardiac Resuscitation for Adults and Pediatric Patients: Nontraumatic Arrest

Start?	Attempt to resuscitate all patients *Exceptions:* cases of rigor mortis, dependent lividity, or "do-not-attempt-resuscitation" orders
Duration?	Terminate 25 minutes after starting advanced cardiac life support if return of pulses is not achieved (30 minutes in monitored cases) *Exceptions:* Hypothermia, persistent ventricular fibrillation
Where?	On scene (directly at the scene of the resuscitation effort) *Exceptions:* 1. refractory or persistently-recurring ventricular fibrillation, especially with spontaneous eye opening and other neurological signs 2. child involved* 3. family non-amenable (or other environmental concerns)*

*Social/public service reason (not medical futility).

Prehospital Resuscitation

The Good, the Bad, and the Futile

Termination Rules

Many different studies have looked at this question

NAEMSP official position paper revision is in press

Brief review follows

Take home: we have sufficient data to adopt termination of resuscitation rules

CARES Registry Study

BLS Rule

Not witnessed by EMS

Non-shockable rhythm

No ROSC

ALS Rule

Not witnessed by EMS

Non-shockable rhythm

No ROSC

Not by-stander witnessed

No bystander CPR

CARES Registry Study

BLS Rule
PPV 99.8%
(99.6-99.9)

NPV 13.3%
(12.1-14.6)

ALS Rule
PPV 100%
(99.7-100)

NPV 9.1%
(8.3-10.0)

History of the Project

Direct Clinical Question:

- "How Long Should We Do CPR On-Scene and Still Have Reasonable Expectation of Neurologically Intact Survival?"
- Historical literature implies no more than 20 to 25 minutes
- We were seeing clinical indicators of viability well beyond 25 minutes
- We had data – SAS had analysts

History of the Project

How did SAS help?

- Multiple factors are known to impact survival
  - Age
  - Initial Cardiac Rhythm
  - Witnessed status
- Other factors seem to impact survival
  - Presence of continuous compressions
  - Controlled ventilations
  - Presence of induced hypothermia
- SAS has the ability to control for these variables

MODELING DATASET

Modeling Dataset - 2906 Observations

- Observations excluded from the Model Dataset
  - Trauma
  - Age < 16
  - Resuscitation not Attempted
  - EMS Witnessed
  - Code Not in our Control
- Variables created to provide ability to subset model
  - Treatment Phases
  - Utstein survival
  - Accuracy of time data for Length of Resuscitation

WAKE COUNTY EMS | MODELING DATASET

Treatment Phases

- Phase 1: Continuous CPR — April 15, 2005 - April 17, 2006
- Phase 2: ITD — April 18, 2006 - Oct 4, 2006
- Phase 3: Hypothermia Post-ROSC — Oct 5, 2006 - April 14, 2011
- Phase 4: Hypothermia Pre-ROSC — April 15, 2011 - Dec 31, 2012

Phase	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	323	11.11	323	11.11
2	146	5.02	469	16.14
3	1686	58.02	2155	74.16
4	751	25.84	2906	100.00

WAKE COUNTY EMS DATA TREND BY PHASE (MODEL DATASET)

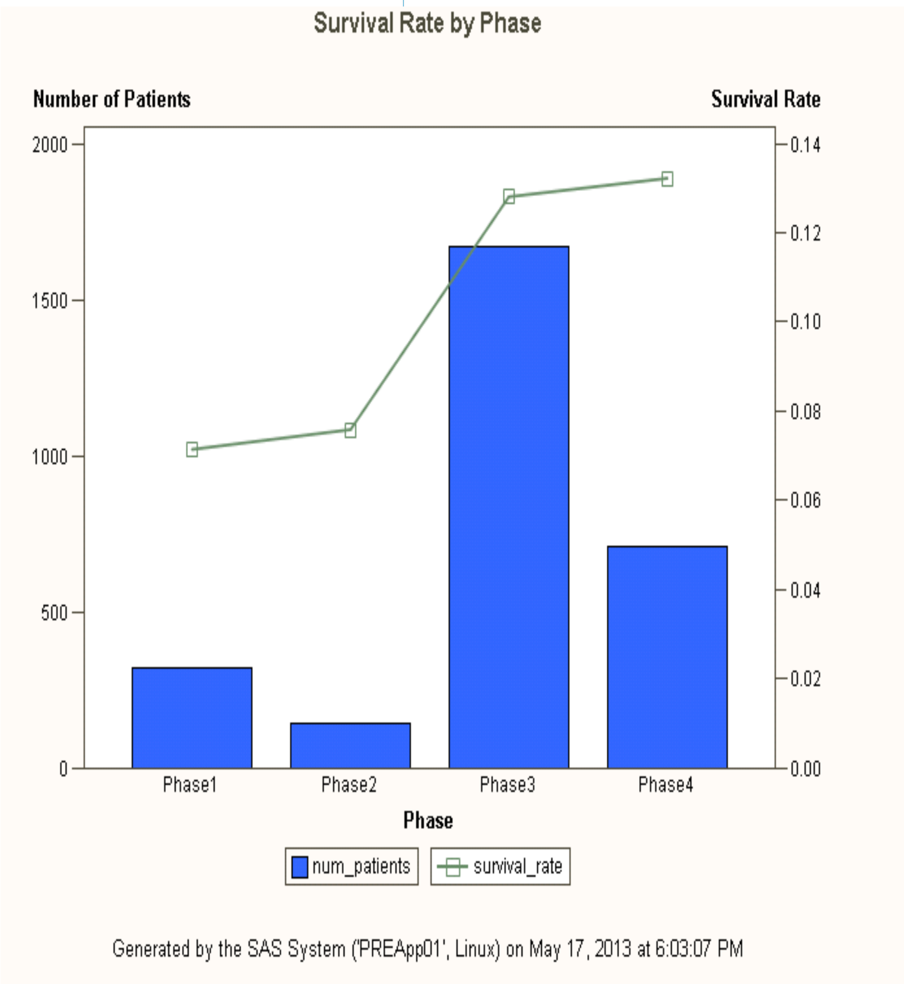


Table of target_survived by Phase

target_survived		Phase 1	2	3	4	Total
0	Frequency	300	135	1471	637	2543
	Col Pct	92.88	92.47	87.25	84.82	
1	Frequency	23	11	215	114	363
	Col Pct	7.12	7.53	12.75	15.18	
Total	Frequency	323	146	1686	751	2906

Statistic	DF	Value	Prob
Chi-Square	3	16.8754	0.0007
Likelihood Ratio Chi-Square	3	18.4333	0.0004
Mantel-Haenszel Chi-Square	1	16.1265	<.0001
Phi Coefficient		0.0762	
Contingency Coefficient		0.0760	
Cramer's V		0.0762	

WAKE COUNTY EMS DATA TREND BY PHASE (MODEL DATASET)

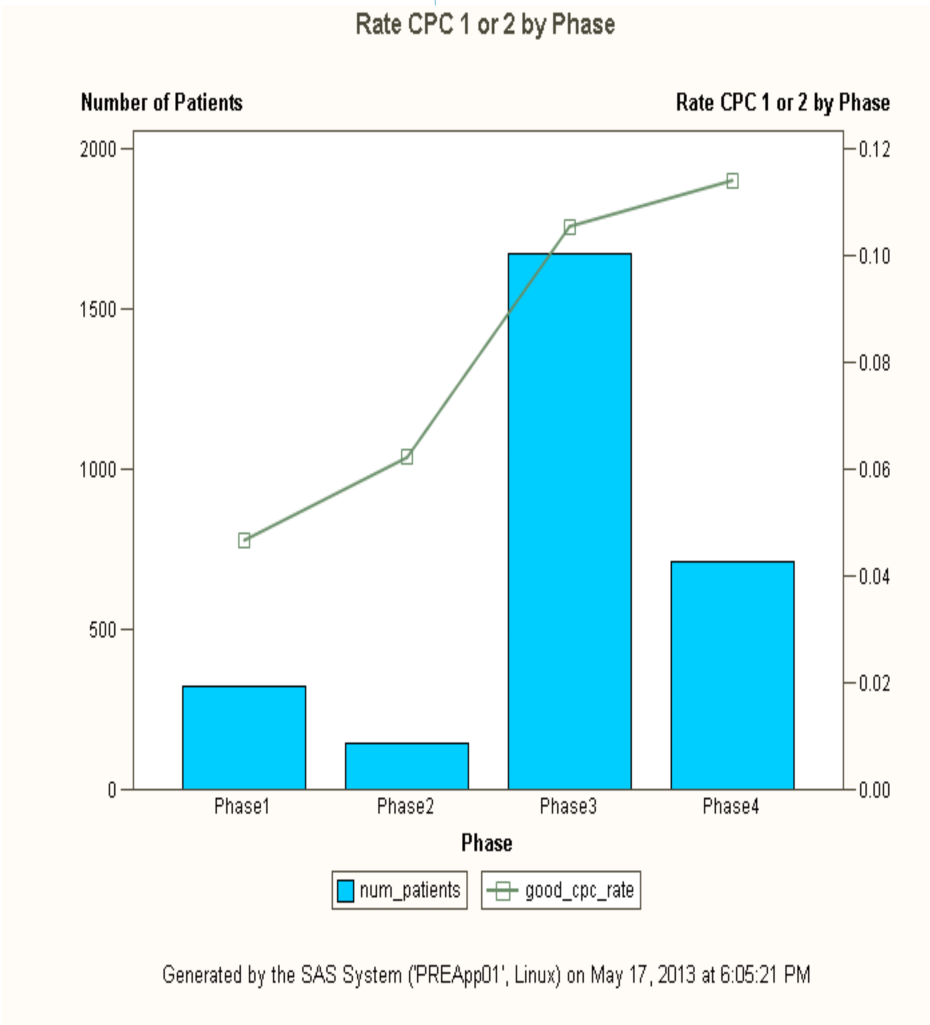
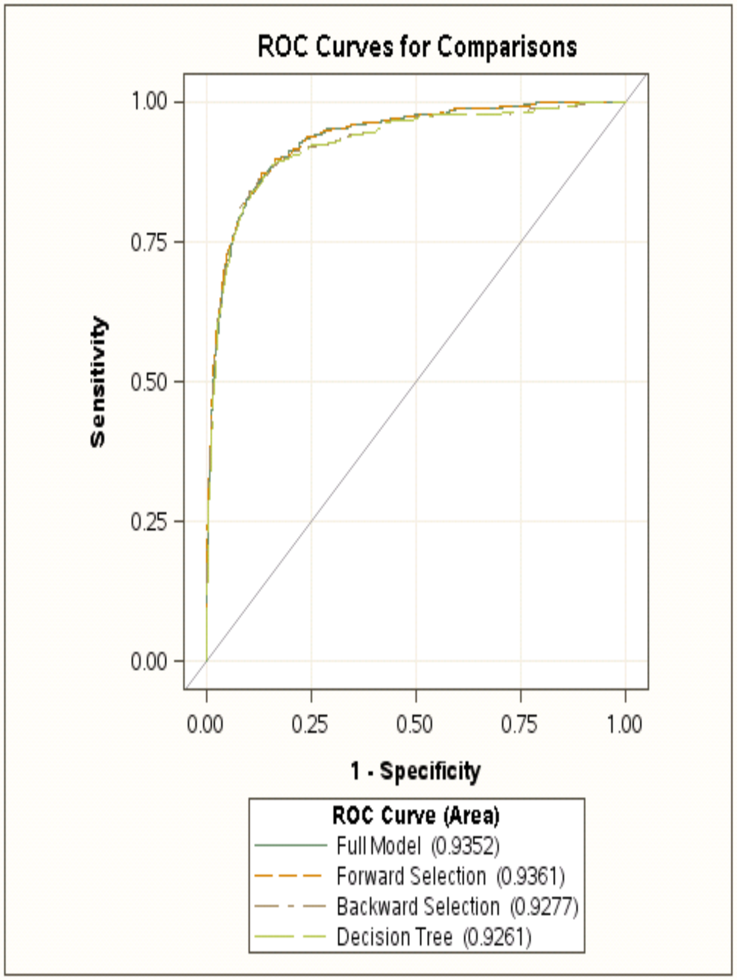


Table of target_cpc by Phase						
		Phase				
		1	2	3	4	Total
target_cpc						
0	Frequency	308	137	1509	652	2606
	Col Pct	95.36	93.84	89.50	86.82	
1	Frequency	15	9	177	99	300
	Col Pct	4.64	6.16	10.50	13.18	
Total	Frequency	323	146	1686	751	2906

Statistic	DF	Value	Prob
Chi-Square	3	20.6685	0.0001
Likelihood Ratio Chi-Square	3	23.2124	<.0001
Mantel-Haenszel Chi-Square	1	20.3576	<.0001
Phi Coefficient		0.0843	
Contingency Coefficient		0.0840	
Cramer's V		0.0843	

WAKE COUNTY EMS LOGISTIC REGRESSION RESULTS



ROC Association Statistics

ROC Model	Mann-Whitney Area	Standard Error	95% Wald Confidence Limits		Somers' D (Gini)	Gamma	Tau-a
Full Model	0.9352	0.00712	0.9213	0.9492	0.8704	0.8704	0.1868
Forward Selection	0.9361	0.00713	0.9221	0.9501	0.8722	0.8722	0.1872
Backward Selection	0.9277	0.00831	0.9114	0.9439	0.8553	0.8553	0.1835
Decision Tree	0.9261	0.00835	0.9097	0.9424	0.8521	0.8521	0.1829

ROC Contrast Test Results

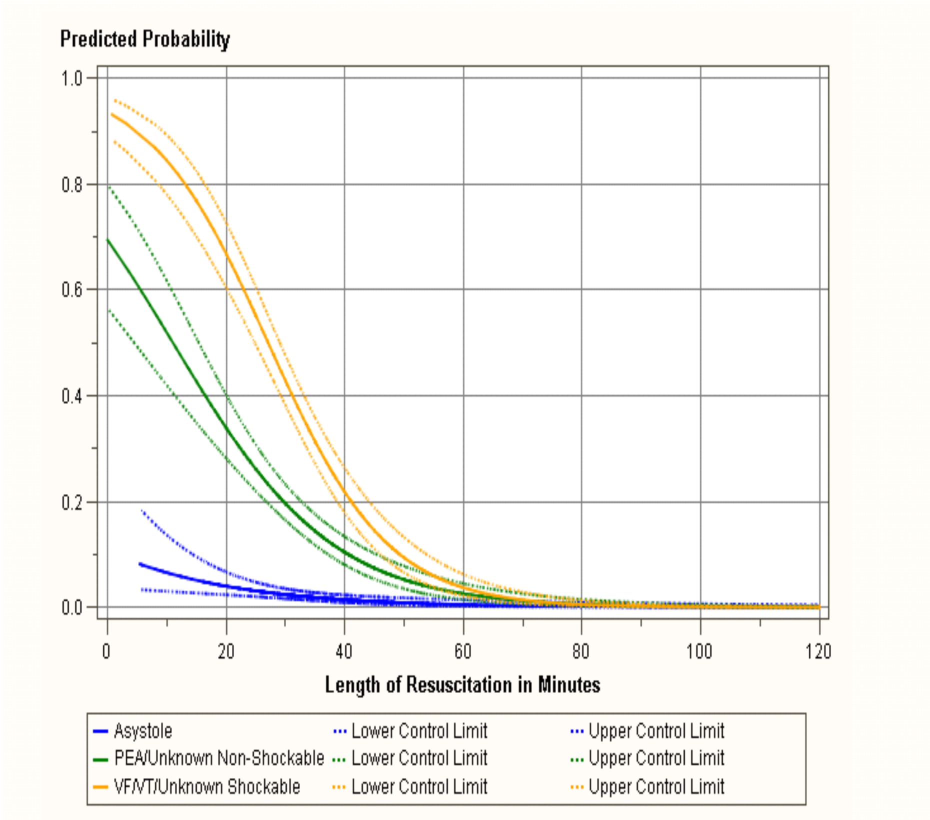
Contrast	DF	Chi-Square	Pr > ChiSq
Overlay of ROC Curves	3	17.5447	0.0005

ROC Contrast Estimation and Testing Results by Row

Contrast	Estimate	Standard Error	95% Wald Confidence Limits		Chi-Square	Pr > ChiSq
Full Model - Forward Selection	-0.00089	0.000602	-0.00207	0.000293	2.1685	0.1409
Full Model - Backward Selection	0.00757	0.00260	0.00246	0.0127	8.4511	0.0036
Full Model - Decision Tree	0.00917	0.00258	0.00412	0.0142	12.6516	0.0004
Forward Selection - Backward Selection	0.00845	0.00241	0.00373	0.0132	12.3250	0.0004
Forward Selection - Decision Tree	0.0101	0.00255	0.00505	0.0151	15.5228	<.0001
Backward Selection - Decision Tree	0.00160	0.000797	0.000039	0.00316	4.0346	0.0446

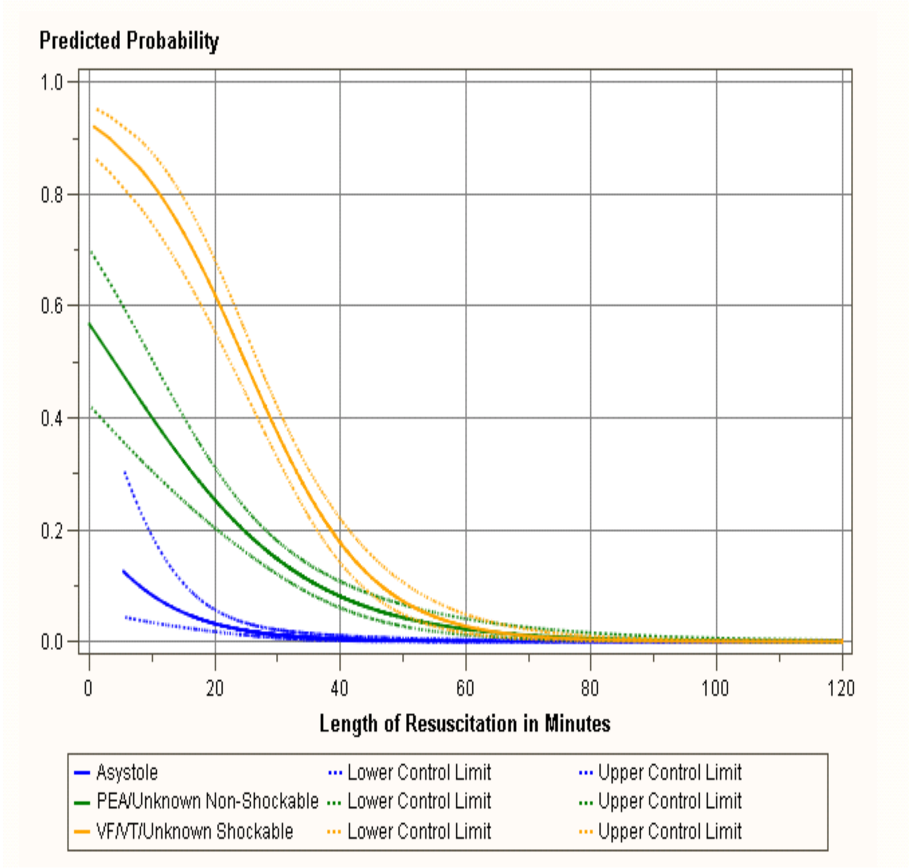
WAKE COUNTY EMS PREDICTED SURVIVAL PROBABILITY BY INITIAL RHYTHM

LOR minutes	Asystole	VF/VT/ Shockable	PEA/ Non Shockable
10	0.0653	0.8445	0.5192
15	0.0502	0.7679	0.4267
20	0.0397	0.6685	0.3391
25	0.0308	0.5513	0.2613
30	0.0239	0.4281	0.1960
35	0.0185	0.3132	0.1439
40	0.0143	0.2175	0.1038
45	0.0110	0.1448	0.0740
50	0.0085	0.0935	0.0522
55	0.0066	0.0592	0.0366
60	0.0050	0.0369	0.0255



WAKE COUNTY EMS | PREDICTED PROBABILITY CPC=1,2 BY INITIAL RHYTHM

LOR minutes	Asystole	VF/VT/ Shockable	PEA/ Non Shockable
10	0.0830	0.8188	0.4003
15	0.0503	0.7312	0.3225
20	0.0320	0.6207	0.2535
25	0.0196	0.4962	0.1950
30	0.0119	0.3722	0.1473
35	0.0072	0.2629	0.1097
40	0.0044	0.1767	0.0808
45	0.0027	0.1144	0.0590
50	0.0016	0.0721	0.0428
55	0.0010	0.0447	0.0309
60	0.0006	0.0274	0.0222



Wake County EMS
331 South McDowell St.
Raleigh, NC 27601

WakeMed Health & Hospitals
3000 New Bern Ave.
Raleigh, NC 27610

MW Bachman, MHS, EMT-P[1]; JG Williams, MD, MPH[1,2]; JB Myers, MD, MPH[1]; K Hart, MA, MSA[3]; J Zalkin BS, EMT-P[1]; VJ De Maio, MD, MSc[2]
[1]Wake County, NC Emergency Medical Services; [2] Clinical Research Unit, Emergency Services Institute, WakeMed Health and Hospitals; [3] SAS Institute, Cary, NC

Duration of Prehospital Resuscitation For Adult Out-of-Hospital Cardiac Arrest: Neurologically Intact Survival Approaches Overall Survival Despite Extended Efforts

OBJECTIVE

- Out-of-hospital cardiac arrest (OHCA) guidelines suggest resuscitation beyond 30 minutes may be futile.
- Few studies address neurologic outcome for survivors of extended duration OHCA.
- The duration of prehospital resuscitation (DOR) that yields a reasonable probability of neurologically intact survival (NIS) is unknown.
- We assess whether DOR affects NIS from OHCA.

METHODS

- We conducted a retrospective cohort study of all OHCA patients in our urban/suburban advanced life support EMS system (pop 950,000) from 2005–2012.
- Excluded were resuscitations not attempted, age < 16, trauma patients, and EMS-witnessed arrests.
- DOR was measured from time of dispatch to end of prehospital resuscitation, defined by first return of spontaneous circulation, en-route hospital, or death.
- Primary outcome was NIS, defined as cerebral performance category (CPC) 1 or 2 at hospital discharge.
- Multivariate logistic regression determined the odds ratios with 95% confidence intervals (CI) for both survival and NIS adjusted for DOR and factors determined to have a significant relationship with NIS at the univariate level.

Fig 1. All Survivors and Neurologically Intact Survivors by DOR, with 90th Percentile DOR (40 minutes) Highlighted

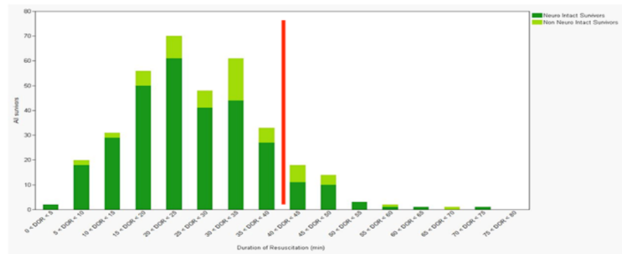


Fig 2. Predicted Probability of Survival with CPC 1 or 2 across Duration of Resuscitation, by Initial Rhythm (unadjusted)

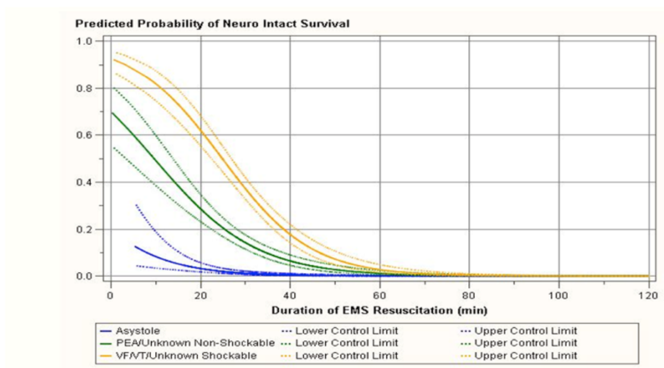
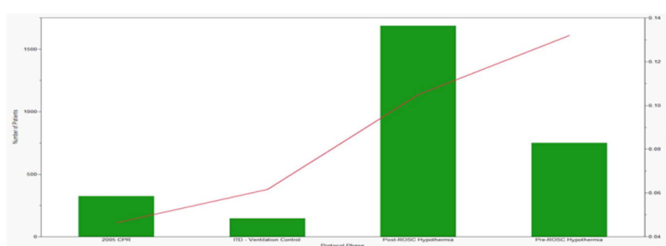


Fig 3. Wake County EMS OHCA cases by protocol phase, with rate of Neurologically Intact Survival



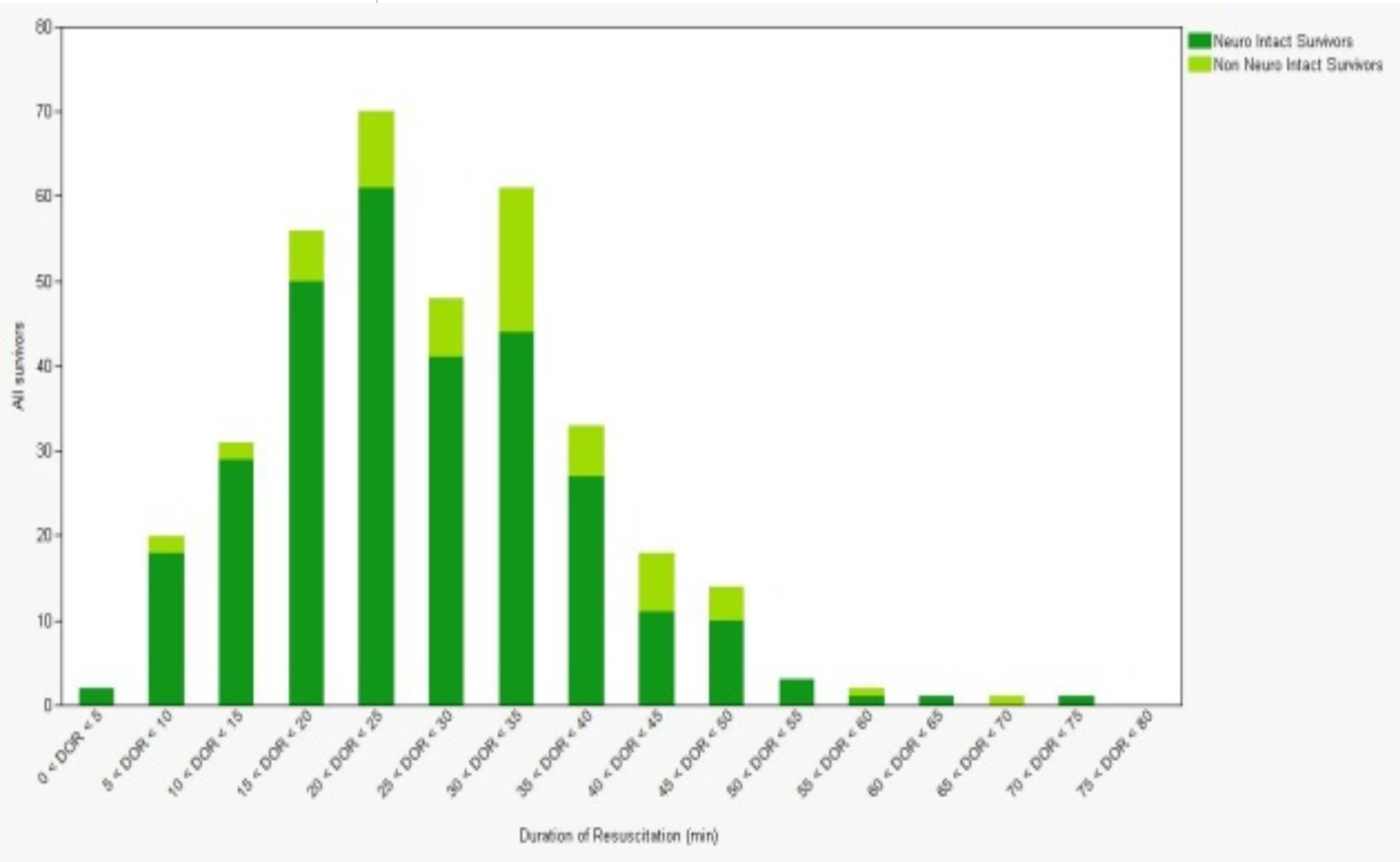
RESULTS

- Of 2905 eligible OHCA, patients were: mean age 64.6 years (sd=17.0) male 60.1%, bystander witnessed 38.9% and had bystander CPR 37.2%. Overall, 362 survived (12.5%) and 300 had NIS (82.9% of survivors). Median defibrillator to scene was 7 minutes (IQR 5-9).
- Overall median DOR was 38 min (IQR 29-48), with median DOR for NIS of 24 min (IQR 18-32). **The 90th percentile for NIS was 40 min.** Beyond 40 min, 29/42 survivors (69%, 95% CI 54-81%) were neurologically intact. The longest resuscitation that achieved NIS was 73 min.
- Controlling for OHCA protocol changes over time ("protocol phase"), adjusted OR (95% CI) was 0.91 (0.90-0.92) for both survival and NIS. Other predictors of NIS across models were initial rhythm, age, bystander witness, therapeutic hypothermia, and absence of advanced airway.

CONCLUSIONS

- In a retrospective analysis of OHCA, DOR is associated with declining survival and NIS, with NIS approximating the overall survival curve. DOR was within 40 minutes from time of dispatch for 90% of NIS. A large number of patients survived neurologically intact with DORs greater than previous guidelines would suggest. Further study should examine factors predictive of NIS in longer resuscitations.

DURATION OF RESUSCITATION AND NIT VS NNIT SURVIVAL



Conclusions

- 90 percent of neurologically intact survivors had ROSC at 40 minutes of resuscitation
- 29 of 42 survivors with resuscitation beyond 40 minutes had NIS (69%, (CI 54-81%)).
  - Presence of continuous compressions
  - Controlled ventilations/no hyperventilation
  - Presence of therapeutic temp management

Implications

What Does This Mean?

- If we had followed the 25 minute rule, ~ 100 neurologically-intact survivors would have had their resuscitative efforts abandoned prematurely
- Prolonged resuscitative efforts with continuous compressions, controlled ventilations, and hypothermia can reliably produce neurologically intact survivors
- The next steps are:
  - National scientific presentation in January, 2014
  - Manuscript preparation for peer review publication
  - Analysis of physiologic parameters to assist with prediction

HeartRescue PROJECT

Not Certain of This Yet

How does $EtCO_2$ predict outcomes?

Very preliminary data analysis with SAS

We are hoping there will be a number

End Tidal CO_2

The information provided is currently in DRAFT format and is NOT a FINAL version

Treatment Recommendation:

We suggest that $ETCO_2 \geq 10$ mmHg, measured after the intubation or at 20 min of resuscitation, may be a predictor of ROSC (weak recommendation, low quality of evidence).

We suggest that $ETCO_2 \geq 10$ mmHg, measured after the intubation, or $ETCO_2 \geq 20$ mmHg, measured at 20 min of resuscitation, may be a predictor of survival at discharge (weak recommendation, low quality of evidence).

Although certain $ETCO_2$ cutoff values appear to be a strong predictor of ROSC and mortality, their utility in accurately predict outcome during CPR is not established. Thus, we recommend against using $ETCO_2$ cutoff values alone as a mortality predictor or on the decision to stop the resuscitation attempt (weak recommendation, low quality of evidence).

How Do We Know When to Stop?

Today:

- Experienced provider assists, with first decision point at 25 minutes after first unit arrives
- EMS Physician is available to assist but phone call is not required
- We think it is a combination of rhythm and $EtCO_2$

When The Patient is In *&*^ing Asystole

Specifically, SAS is analyzing:

- ~ 3400 attempted resuscitations
- For many (but not all) of these, we have:
- Standard Utstein Information, including CPC score for survivors
- Initial, highest, lowest, and recording nearest 30 minutes of $EtCO_2$
- Currently, we are uploading continuous $EtCO_2$ waveforms

What Do We Hope to Learn?

Does some combination of EtCO2 values provide actionable information regarding the decision to continue vs. terminate resuscitative efforts?

HINT: We think it is does

Discussion

ILCOR Timeline

Timeline

Nov 2011	Ilcor meeting Orlando
Oct 2012	Ilcor meeting Vienna
18-20 Apr 2013	Spark Of Life Conference Melbourne
21-22 Apr 2013	Ilcor meeting Melbourne
23 Apr 2013	Utstein meeting Melbourne
29-30 Apr 2014	ILCOR meeting Canada
2-5 Feb 2015	International Consensus Conference
15 Oct 2015	ILCOR CoSTR and Guidelines published

Temperature Management

The information provided is currently in DRAFT format and is NOT a FINAL version

Treatment Recommendation:

We recommend targeted temperature management as opposed to no targeted temperature management for adults with OHCA with an initial shockable rhythm who remain unresponsive after ROSC (strong recommendation, low-quality evidence).

We suggest targeted temperature management as opposed to no targeted temperature management for adults with OHCA with an initial nonshockable rhythm (weak recommendation, very low-quality evidence) who remain unresponsive after ROSC.

We suggest targeted temperature management as opposed to no targeted temperature management for adults with IHCA (weak recommendation, very low-quality evidence) with any initial rhythm who remain unresponsive after ROSC.

We recommend selecting and maintaining a constant, target temperature between 32°C and 36°C for those patients in whom temperature control is used (strong recommendation, moderate-quality evidence). Whether certain subpopulations of cardiac arrest patients may benefit from lower (32-34oC) or higher (36oC) temperatures remains unknown, and further research may help elucidate this.

Mechanical Compressions

The information provided is currently in DRAFT format and is NOT a FINAL version

Treatment Recommendation:

We suggest mechanical chest compression devices should not be considered the standard of care for cardiac arrest patients, but can be considered a reasonable alternative to high quality manual chest compressions in some settings (weak recommendation, moderate quality of evidence).

Values and Preferences Statement:

In making this recommendation we place value on data from a large, high-quality RCT demonstrating equivalence between high quality manual chest compressions and mechanical chest compressions. Local considerations such as relative costs and resource availability for maintenance of high quality manual chest compressions and mechanical chest compression device implementation should guide decisions around which mode of chest compression delivery is most appropriate. Also, there may be scenarios not directly addressed in the literature reviewed to support this treatment recommendation such as CPR in a moving ambulance, in the angiography suite or during preparation for ECLS, where mechanical chest compressions are more practical.

Prehospital Temperature Management

The information provided is currently in DRAFT format and is NOT a FINAL version

Treatment Recommendation:

We recommend against routine use of prehospital cooling with rapid infusion of large volumes of cold intravenous fluid immediately after ROSC (strong recommendation, moderate-quality evidence).

ILCOR ITD

The information provided is currently in DRAFT format and is NOT a FINAL version

Treatment Recommendation:

Impedance Threshold Device + Standard CPR (I) vs Standard CPR (C):
We recommned against routine use of ITD in addition to standard CPR (strong recommendation, high quality of evidence). Values and preferences statement: In making this recommendation we place a higher value on not allocating resources to an ineffective intervention over any yet to be proven benefit for critical or important outcomes.

Impedance Threshold Device + Active Compression Decompression CPR (I) vs Active Compression Decompression CPR (C):
We suggest against the routine use of ITD in addition to Active Compression-Decompression CPR (weak recommendation, very low quality of evidence). Values and preferences statement: In making this recommendation we place a higher value on not allocating resources to an ineffective intervention over any yet to be proven benefit for critical or important outcomes.

Impedance Threshold Device + Active Compression Decompression CPR (I) vs Standard CPR (C):
We suggest against the routine use of ITD with Active Compression-Decompression CPR as an alternative to standard CPR (weak recommendation, very low quality of evidence). Values and preferences statement: In making this recommendation we place a higher value on not allocating resources to an intervention with equivocal benefit for critical or important outcomes.