Update in Cardiac Arrest and STEMI Care

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Disclosures

- Consultant
  - Astra Zenica

The 2015 AHA Guidelines Update for CPR and ECC

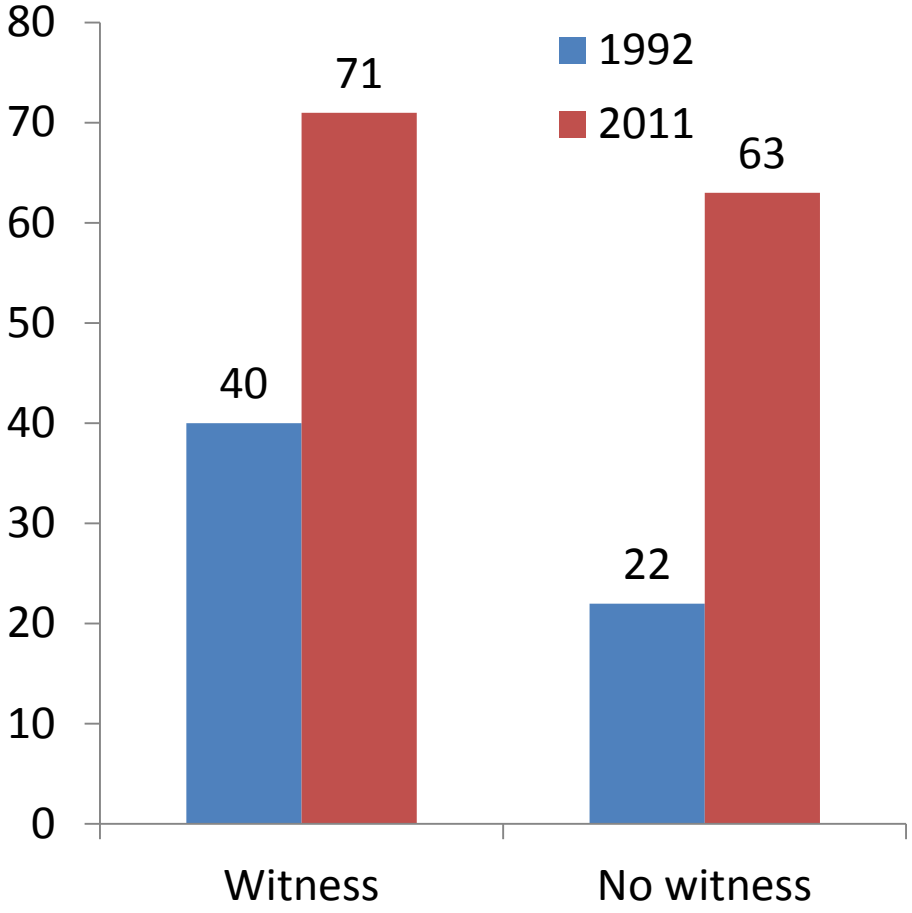
- Contains 315 classified recommendations
- Class:
  - Class I 78 (25 %)
  - Class II a and b 217 (68 %)
  - Class III 20 (7 %)
- Level of Evidence:
  - A (multiple randomized trials) 3 (1 %)
  - LOE B-R (randomized studies) 50 (15 %)
  - LOE B-NR (nonrandomized studies) 46 (15 %)
  - LOE C-LD (limited data) 145 (46 %)
  - LOE C-EO (consensus of expert opinion) 73 (23 %)
- Highlight the persistent knowledge gap in resuscitation science
- Will be updated as new data available, rather than q 5 years

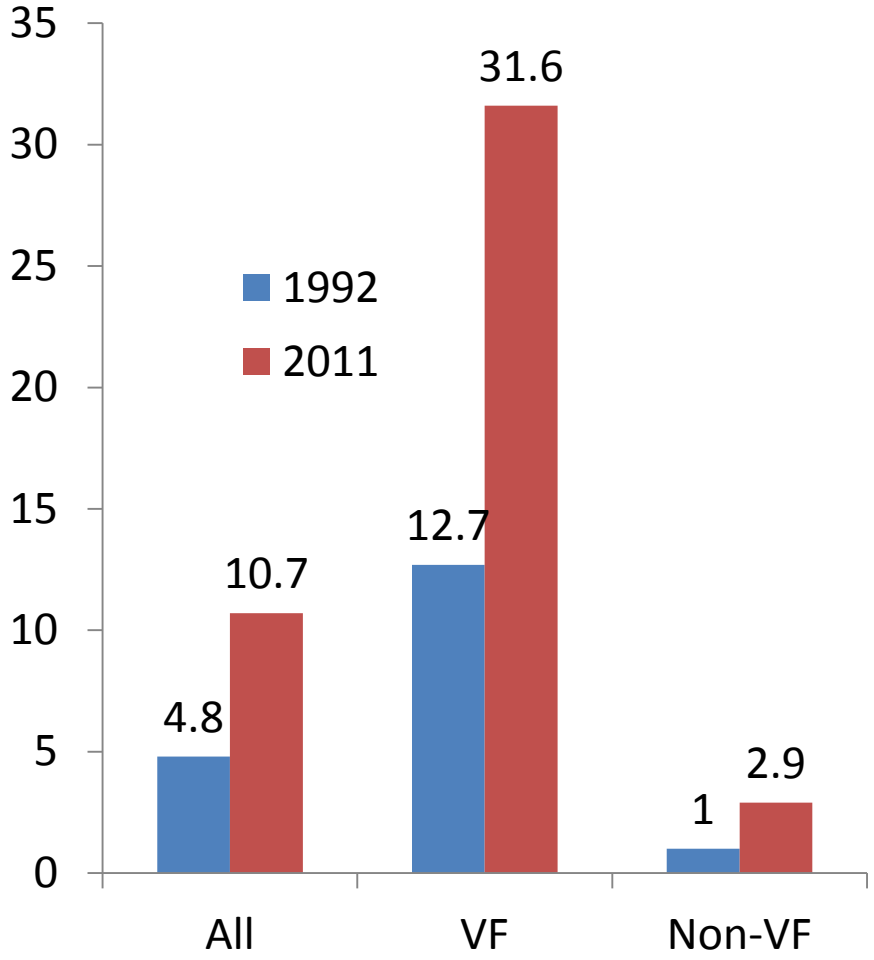
Updated Guidelines

Dispatcher

- Emergency dispatchers should determine if a patient is unconscious with abnormal breathing after acquiring the information to determine the location
- If the patient is unconscious with abnormal/absent breathing, is reasonable to assume the patient is in cardiac arrest
- Dispatchers should provide chest compression–only CPR instructions to callers for adults with suspected OOHCA

Improvement in Bystander CPR and 30 Day Mortality, Sweden, 1992-2011

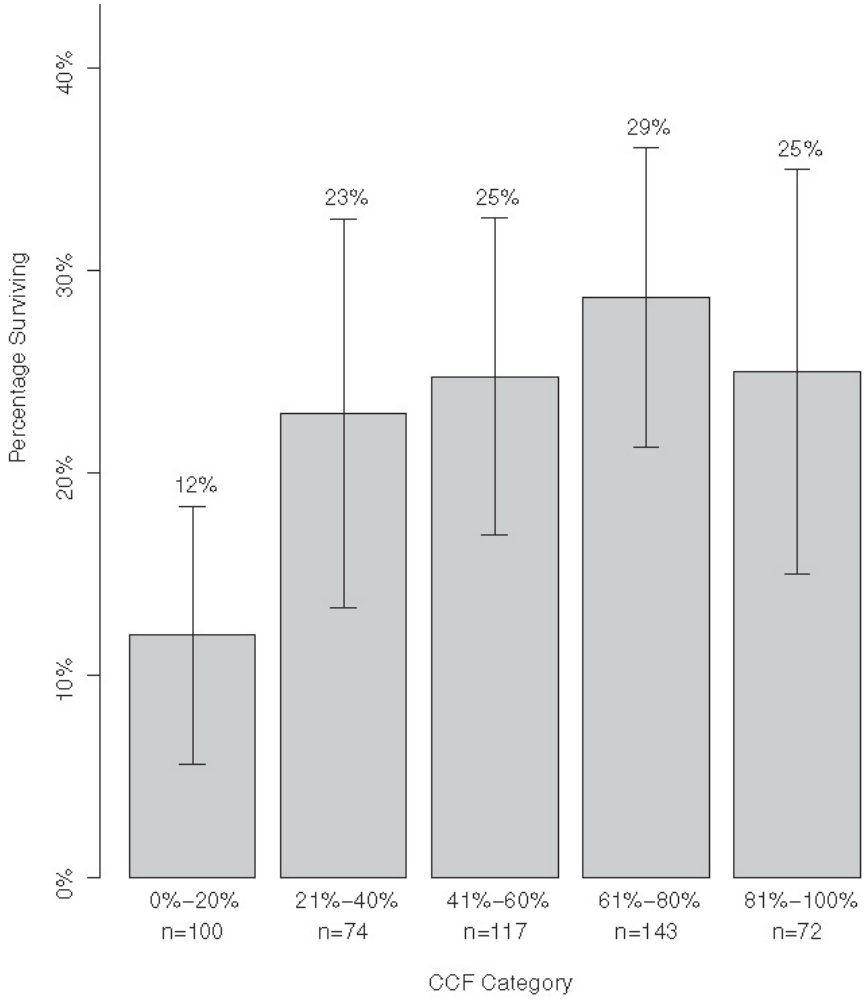




Anneli Strömsöe et al. Eur Heart J 2015;36:863-871

Greater Survival Associated with Greater Chest Compression Fraction

Christenson Circulation 2009

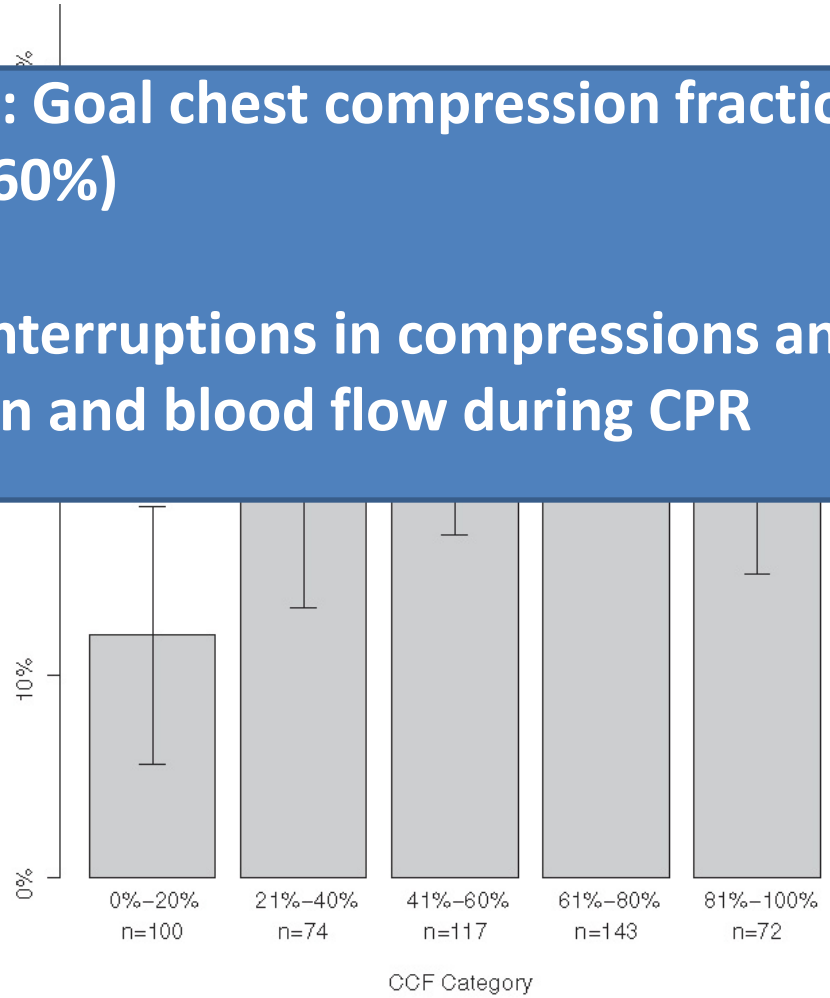


Greater Survival Associated with Greater Chest Compression Fraction

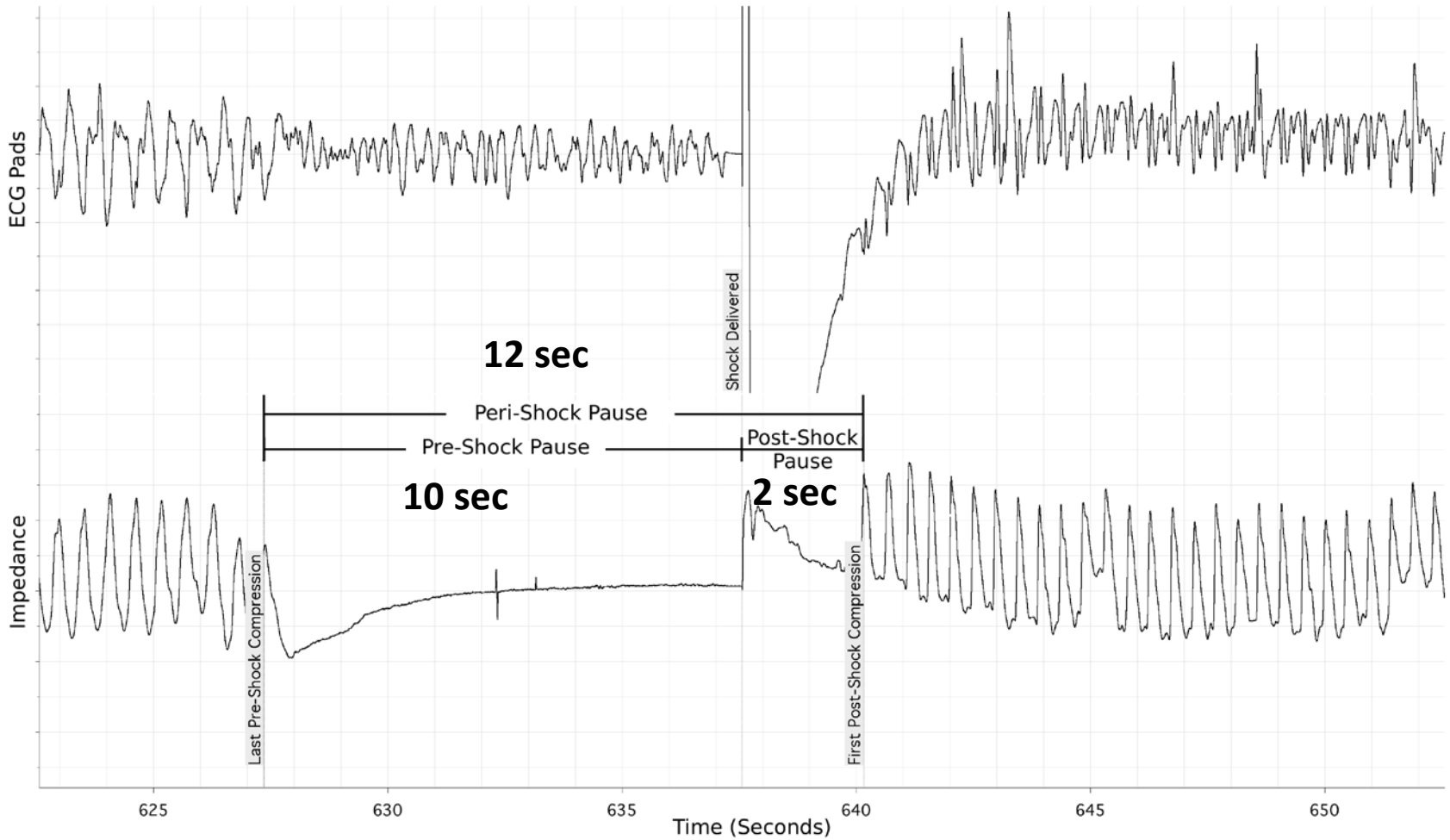
Christenson Circulation 2009

Recommendation: Goal chest compression fraction is as high as possible (target ≥60%)

Rationale--Limit interruptions in compressions and to maximize coronary perfusion and blood flow during CPR



Pre-, Post- and Peri-shock Pause



Survival by Shock Pause Length

Cheskes Circulation, 2011

Pre-Shock Pause	<10 sec	10-20sec	>20 sec
% Survival	35.2%	33.7%	24.0%

Post-Shock Pause	<10 sec	10-20 sec	>20 sec
% Survival	31.1%	30.9%	19.1%

Peri-Shock Pause	<20 sec	20-40 sec	>40 sec
% Survival	33.0%	29.9%	19.0%

Survival by Shock Pause Length

Cheskes Circulation, 2011

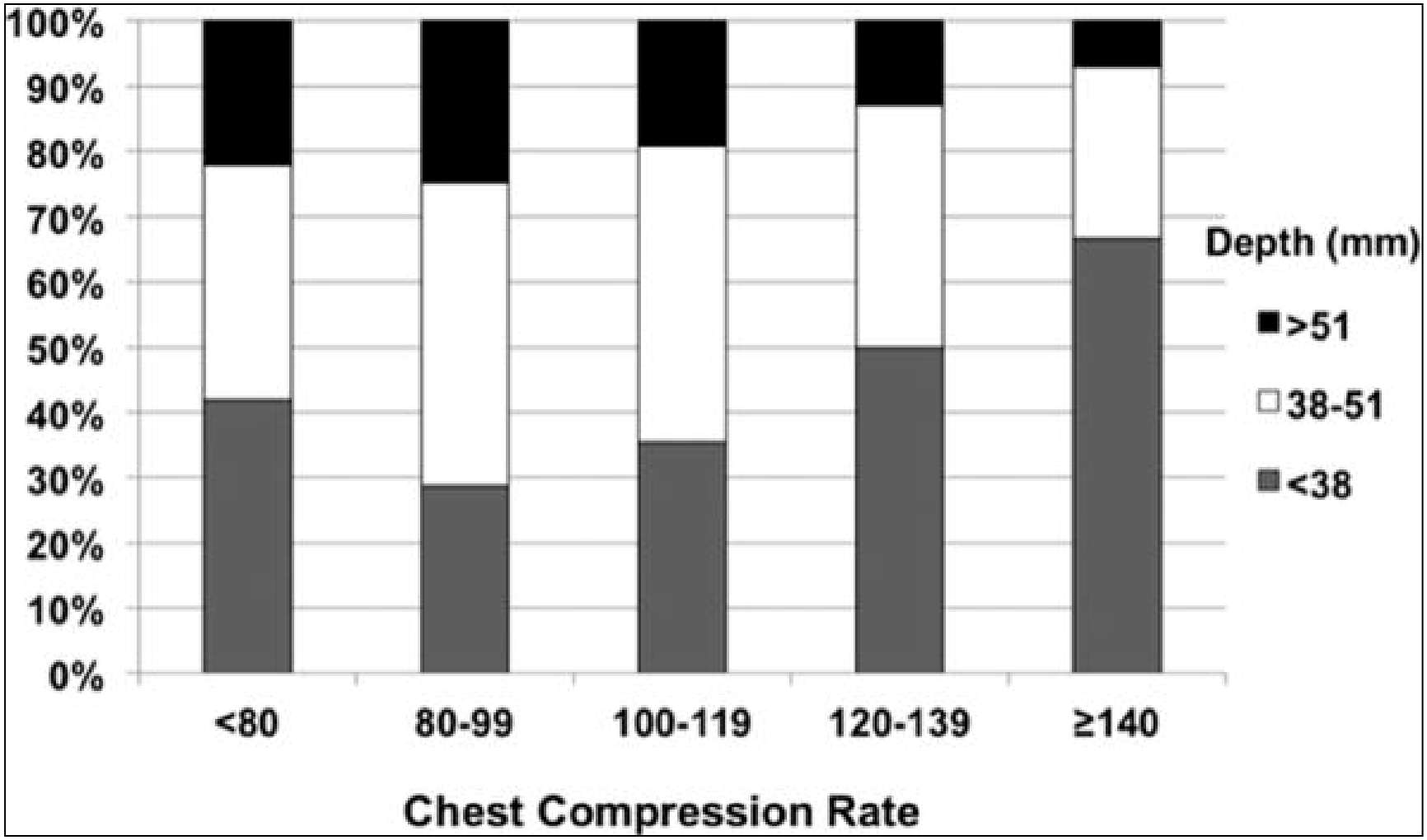
Pre-Shock Pause	<10 sec	10-20sec	>20 sec

Recommendation: Make pre-shock and post-shock pauses in chest compressions as short as possible

Rationale: Shorter pauses associated with greater shock success, ROSC and (in some studies), higher survival to hospital discharge

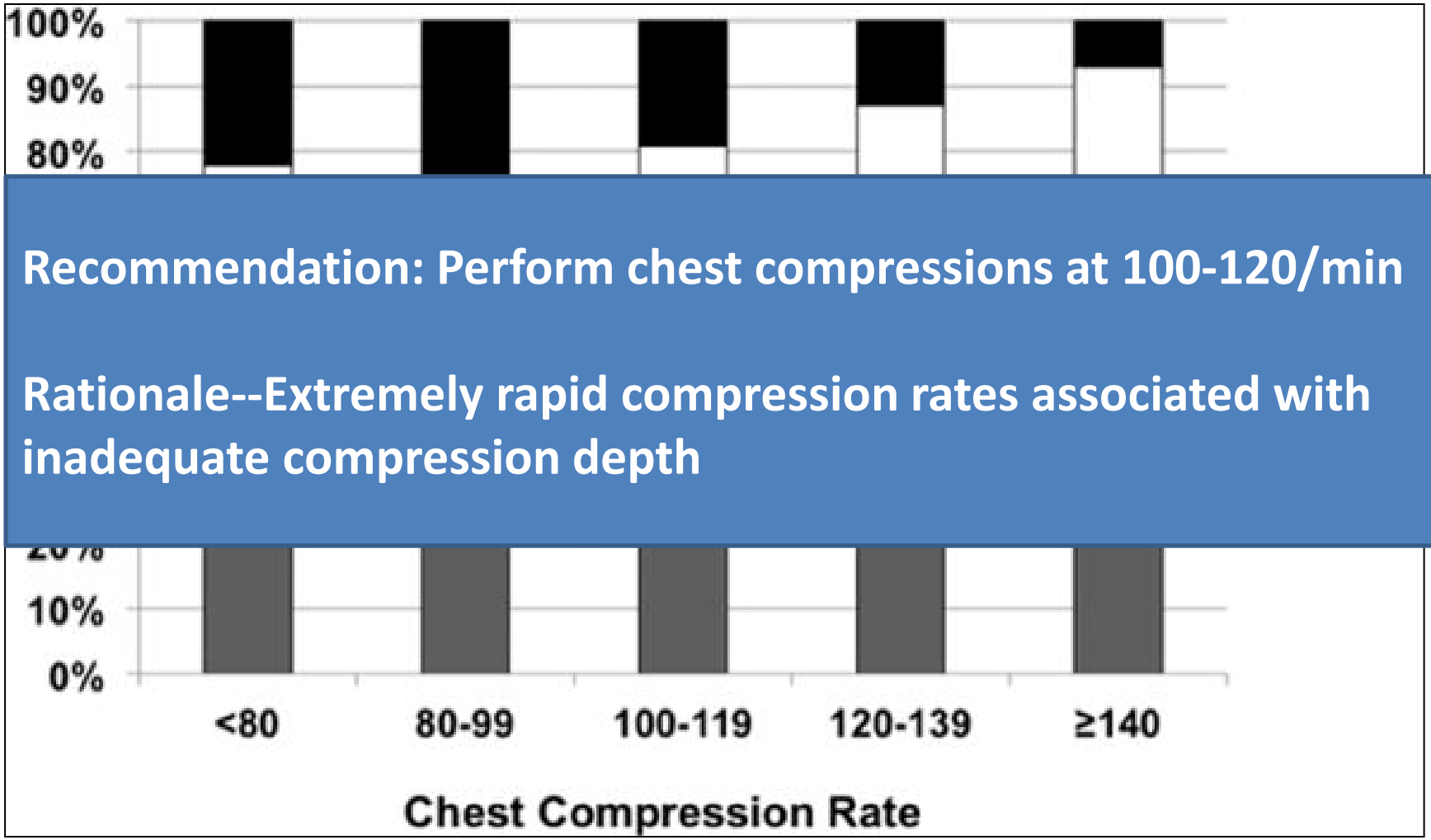
Peri-Shock Pause	<20 sec	20-40 sec	>40 sec
% Survival	33.0%	29.9%	19.0%

Increasing Chest Compression Rate vs Chest Compression Depth



Idris A, et al Critical Care Medicine. 2015; 43:840-848

Increasing Chest Compression Rate vs Chest Compression Depth



Recommendation: Perform chest compressions at 100-120/min

Rationale--Extremely rapid compression rates associated with inadequate compression depth

Idris A, et al Critical Care Medicine. 2015; 43:840-848

New Recommendations for BLS—CPR

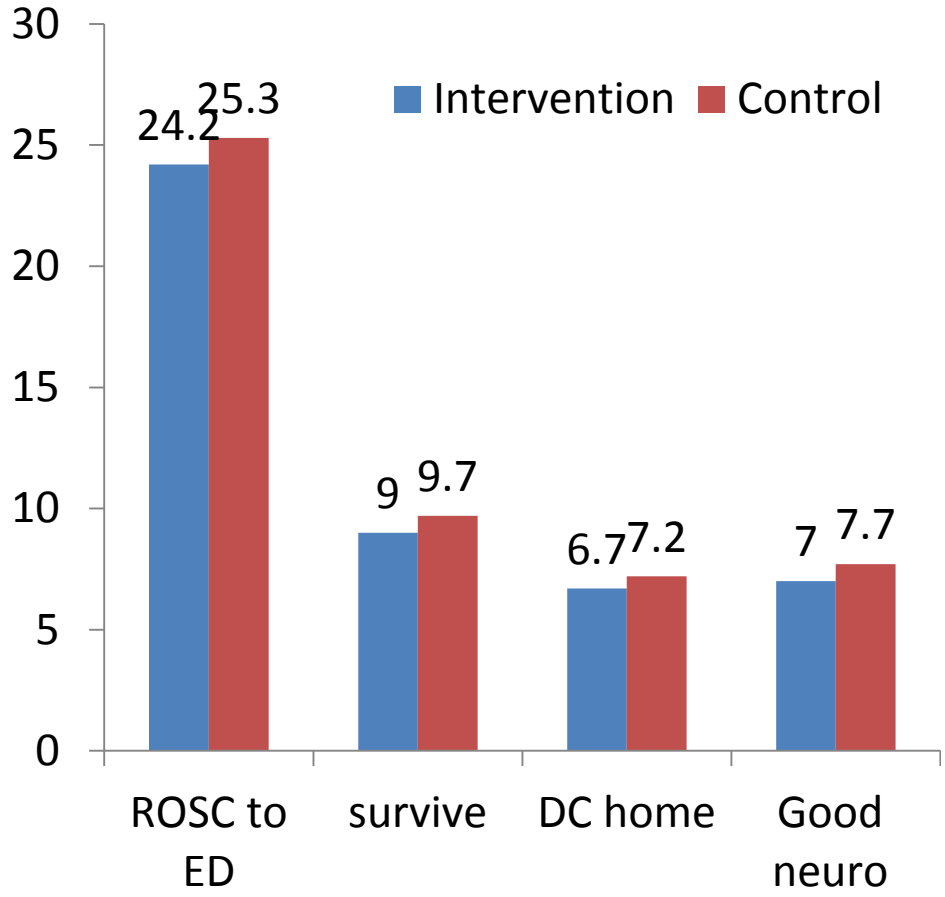
- Perform chest compressions at 100-120/min
  - Rationale--One large registry study found extremely rapid compression rates associated with inadequate compression depth
- Make pre-shock and post-shock pauses in chest compressions as short as possible
  - Rationale: Shorter pauses associated with greater shock success, ROSC and (in some studies), higher survival to hospital discharge
- Goal chest compression fraction is as high as possible (target ≥60%)
  - Rationale--Limit interruptions in compressions and to maximize coronary perfusion and blood flow during CPR
- Perform chest compressions to >2 inches but avoiding excessive chest compression depths >2.4 inches
  - Rationale: potential harm from excessive chest compression depth
  - Caveat--Compression depth may be difficult to judge without use of feedback devices, and identification of upper limits of compression depth may be challenging

Ventilation Recommendations

- For witnessed OHCA with a shockable rhythm, it may be reasonable to delay positive-pressure ventilation for giving up to 3 cycles of 200 continuous compressions with passive oxygen insufflation
- Do not recommend the routine use of passive ventilation techniques during conventional CPR
- In EMS systems that use bundles of care involving continuous chest compressions, the use of passive ventilation techniques may be considered as part of that bundle

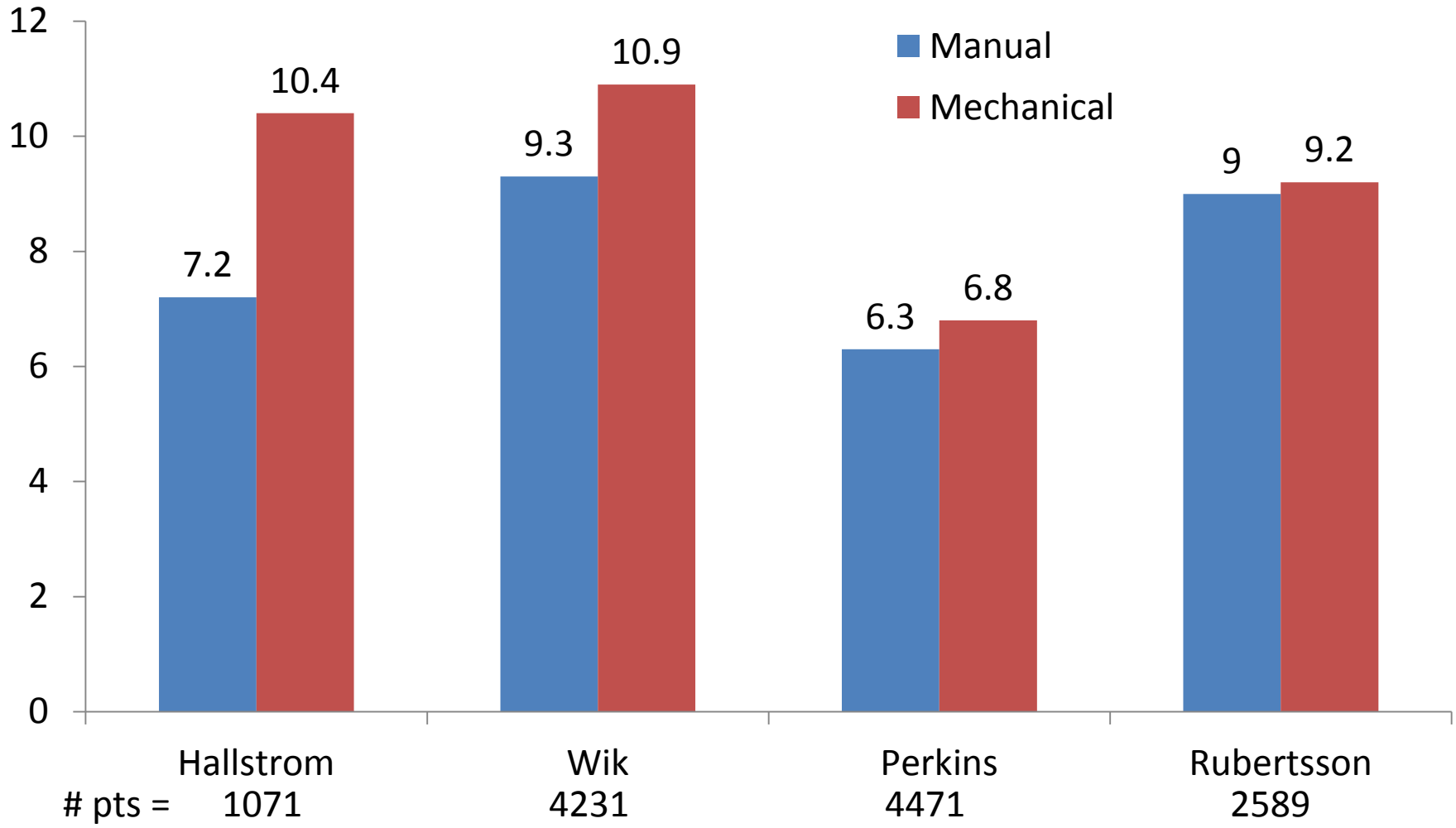
Should CPR be Interrupted for Ventilation?

- Goal: to assess outcomes after continuous compressions with PPV differed vs compressions that were interrupted for ventilation (30:2)
- Total of 23,711 patients included from 114 EMS agencies
- Compression Fraction: 0.83 vs 0.77
- No significant difference in outcomes
- Concluded that in pts with OOHCA, continuous vs interrupted chest compressions during CPR did not result in significantly higher rates of survival or favorable neurologic function



Nichol G et al NEJM 2015;online

No Benefit of Mechanical vs Manual CPR on Hospital Survival: Randomized trials



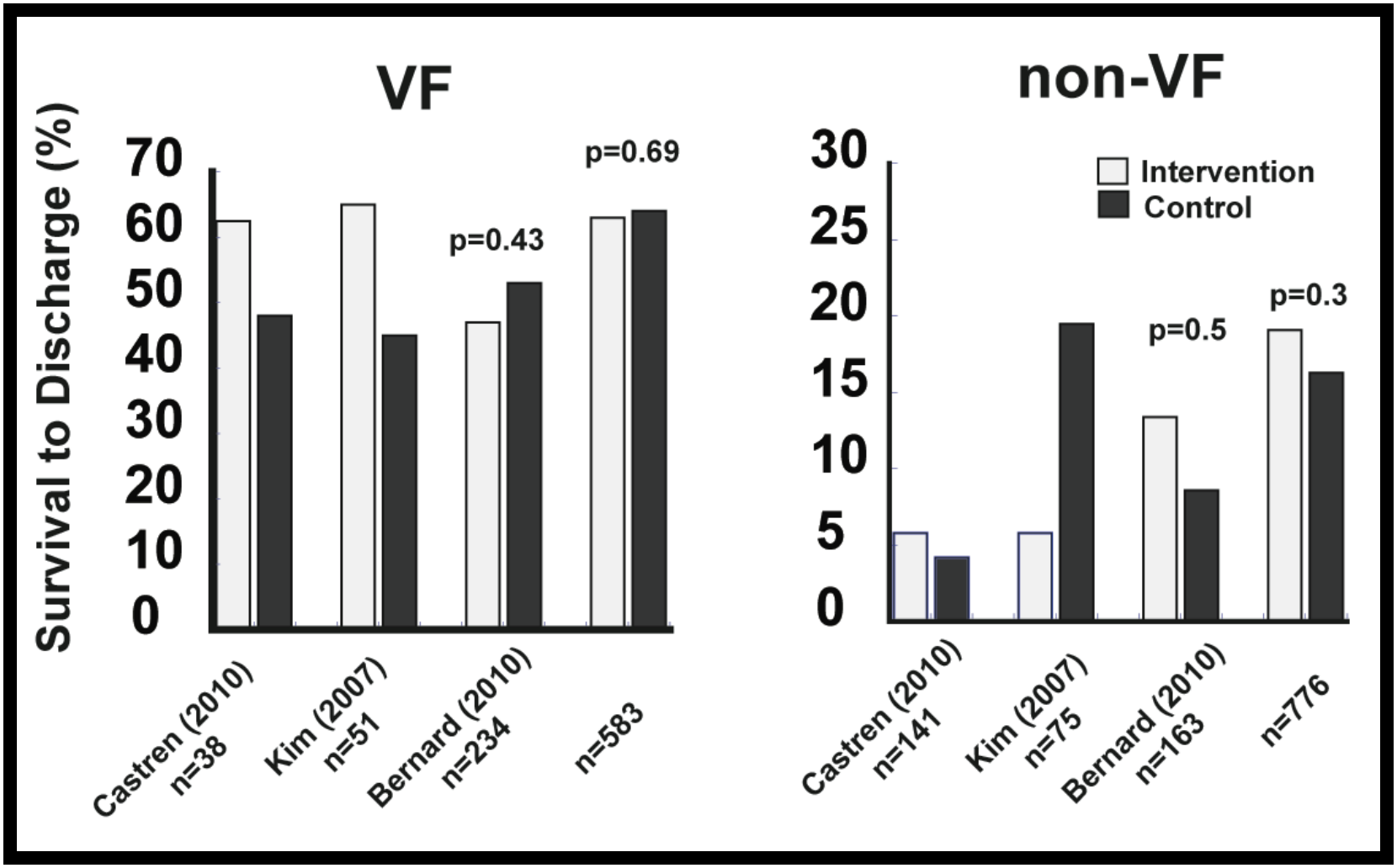
Tang L et al 2015

Manual vs Mechanical Compression Recommendations

- Manual chest compressions remain the standard of care for the treatment of cardiac arrest
- The use of the mechanical chest compression devices may be considered in specific settings where high-quality manual CPR may be challenging or dangerous
  - prolonged CPR during hypothermic cardiac arrest
  - in a moving ambulance
  - in the cath lab
  - during preparation for ECPR
- provided that rescuers strictly limit interruptions in CPR during deployment and removal of the device

Pre- and In-Hospital Hypothermia

Summary of Pre-hospital Cooling Trials



Pre-Hospital Hypothermia Recommendations

- Recommend against the routine prehospital cooling of patients after ROSC by using rapid infusion of cold saline
  - Absence of any benefit
  - Presence of some complications
- Does not preclude the use of cold intravenous fluids in more controlled or more selected settings
- Did not address other methods of inducing hypothermia (e.g., intra cardiac arrest)

Why Does Pre-hospital Cooling Not Work?

- Cooling not early enough-potential greater benefit of cooling during arrest
- Other methods of cooling may be better than saline
- Time savings in reaching hypothermia not sufficient to improve outcomes
- Potential for rewarming while waiting for definitive care
- Harm balanced the benefit of the faster hypothermia (pulmonary edema, re-arrest)

Ongoing Pre-Hospital Hypothermia Trials

STUDY PROTOCOL Open Access

Design of the RINSE Trial: The Rapid Infusion of cold Normal Saline by paramedics during CPR

Conor Deasy[1,2,3*], Stephen Bernard[1,2,3], Peter Cameron[2,3], Ian Jacobs[4,5], Karen Smith[1,2], Cindy Hein[6], Hugh Grantham[6] and Judith Finn[4,5], for the RINSE investigators

STUDY PROTOCOL Open Access

Design of the PRINCESS trial: pre-hospital resuscitation intra-nasal cooling effectiveness survival study (PRINCESS)

Per Nordberg[1,2], Fabio Silvio Taccone[3*], Maaret Castren[1,4], Anatolij Truhlár[5,6,8], Didier Desruelles[7], Sune Forsberg[1,2], Jacob Hollenberg[1,2], Jean-Louis Vincent[3] and Leif Svensoon[1,2]

AHA 2005 Guidelines

- Two trials (N=469 pts) found significant improvement in outcomes
- Treatment Recommendation:

"**Unconscious adult** patients with **spontaneous circulation** after **out-of-hospital cardiac arrest should be cooled** to 32°C to 34°C for 12 to 24 hours when the initial rhythm was **VF**.

Cooling to 32°C to 34°C for 12 to 24 hours **may be considered** for unconscious adult patients with spontaneous circulation after out-of-hospital cardiac arrest from **any other rhythm or cardiac arrest in hospital**."

American Heart Association. Circulation. 2005;112(suppl): Part 4: III-25-III-54

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

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ABSTRACT

BACKGROUND

Unconscious survivors of out-of-hospital cardiac arrest have a high risk of death or poor neurologic function. Therapeutic hypothermia is recommended by international guidelines, but the supporting evidence is limited, and the target temperature associated with the best outcome is unknown. Our objective was to compare two target temperatures, both intended to prevent fever.

METHODS

In an international trial, we randomly assigned 950 unconscious adults after out-of-hospital cardiac arrest of presumed cardiac cause to targeted temperature management at either 33°C or 36°C. The primary outcome was all-cause mortality through the end of the trial. Secondary outcomes included a composite of poor neurologic function or death at 180 days, as evaluated with the Cerebral Performance Category (CPC) scale and the modified Rankin scale.

RESULTS

In total, 939 patients were included in the primary analysis. At the end of the trial, 50% of the patients in the 33°C group (235 of 473 patients) had died, as compared with 48% of the patients in the 36°C group (225 of 466 patients) (hazard ratio with a temperature of 33°C, 1.06; 95% confidence interval [CI], 0.89 to 1.28; P=0.51). At the 180-day follow-up, 54% of the patients in the 33°C group had died or had poor neurologic function according to the CPC, as compared with 52% of patients in the 36°C group (risk ratio, 1.02; 95% CI, 0.88 to 1.16; P=0.78). In the analysis using the modified Rankin scale, the comparable rate was 52% in both groups (risk ratio, 1.01; 95% CI, 0.89 to 1.14; P=0.87). The results of analyses adjusted for known prognostic factors were similar.

The authors' affiliations are listed in the Appendix. Address reprint requests to Dr. Nielsen at the Department of Anesthesia and Intensive Care, Intensive Care Unit, Helsingborg Hospital, S Vallgatan 5, 251 87, Helsingborg, Sweden, or at niklas.nielsen@med.lu.se.

*A complete list of investigators participating in the Target Temperature Management 33°C versus 36°C after Out-of-Hospital Cardiac Arrest (TTM) trial is provided listed in the Supplementary Appendix, available at NEJM.org.

This article was published on November 17, 2013, at NEJM.org.

N Engl J Med 2013.
DOI: 10.1056/NEJMoa1310519
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Targeted Temperature Management Trial Objectives and Inclusion criteria

•Objectives

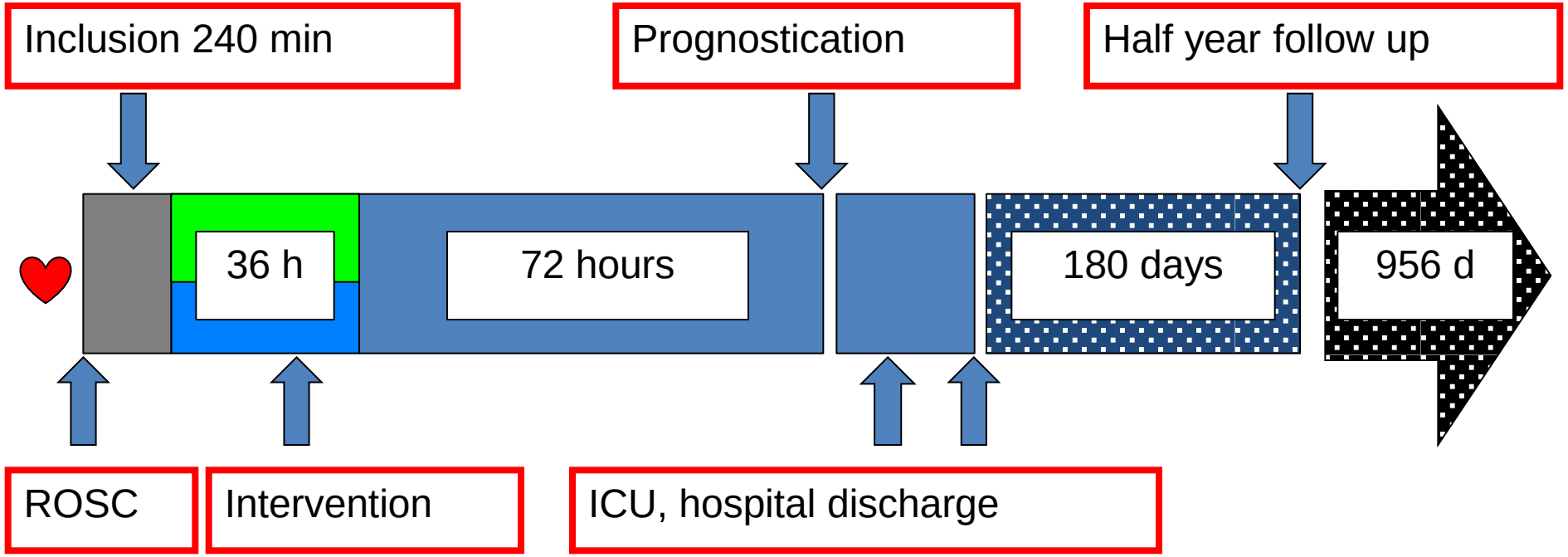
- To assess the benefits and harms of a targeted temperature management at 33°C versus 36°C
- Avoiding fever in post-cardiac arrest patients in both groups

•Inclusion criteria

- Adults with out-of-hospital cardiac arrest
- Presumed cardiac cause
- All initial rhythms
- Unconscious (Glasgow Coma Scale < 8)
- Stable Return of Spontaneous Circulation

Targeted Temperature Management Trial
Design and timeline

- Temperature intervention 36 hours
- All patients sedated and ventilated minimum 36 hours
- Feed-back controlled cooling devices in all patients
- Intravascular or surface devices

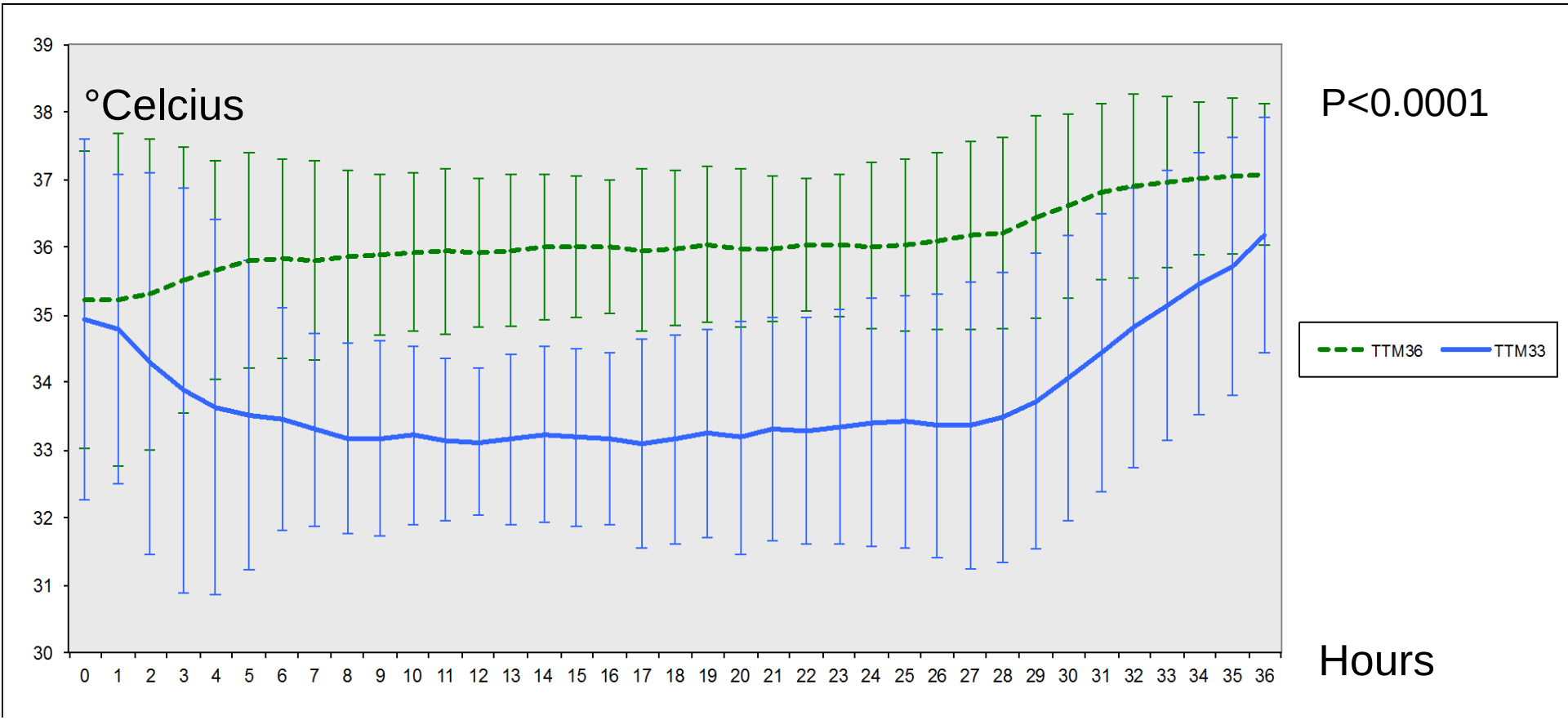


Baseline Characteristics

	33° C	36° C
No.	473	466
Age Male sex	64+/-12 83 %	64+/-13 79 %
Arrest in place of residence Arrest in public place Bystander witnessed Bystander CPR Ventricular Fibrillation **Shockable Rhythm**	 52 % 42 % 89 % 73 % **79 %**	 55 % 40 % 90 % 73 % **81 %**
Arrest to ROSC (min)	**25 [18-40]**	**25 [16-40]**
Circulatory shock on adm. Lactate mmol/L	15 % 6.7±4.5	14 % 6.7±4.5
ST-elevation infarction	40 %	42 %
GCS	3 [3-4]	3 [3-4]

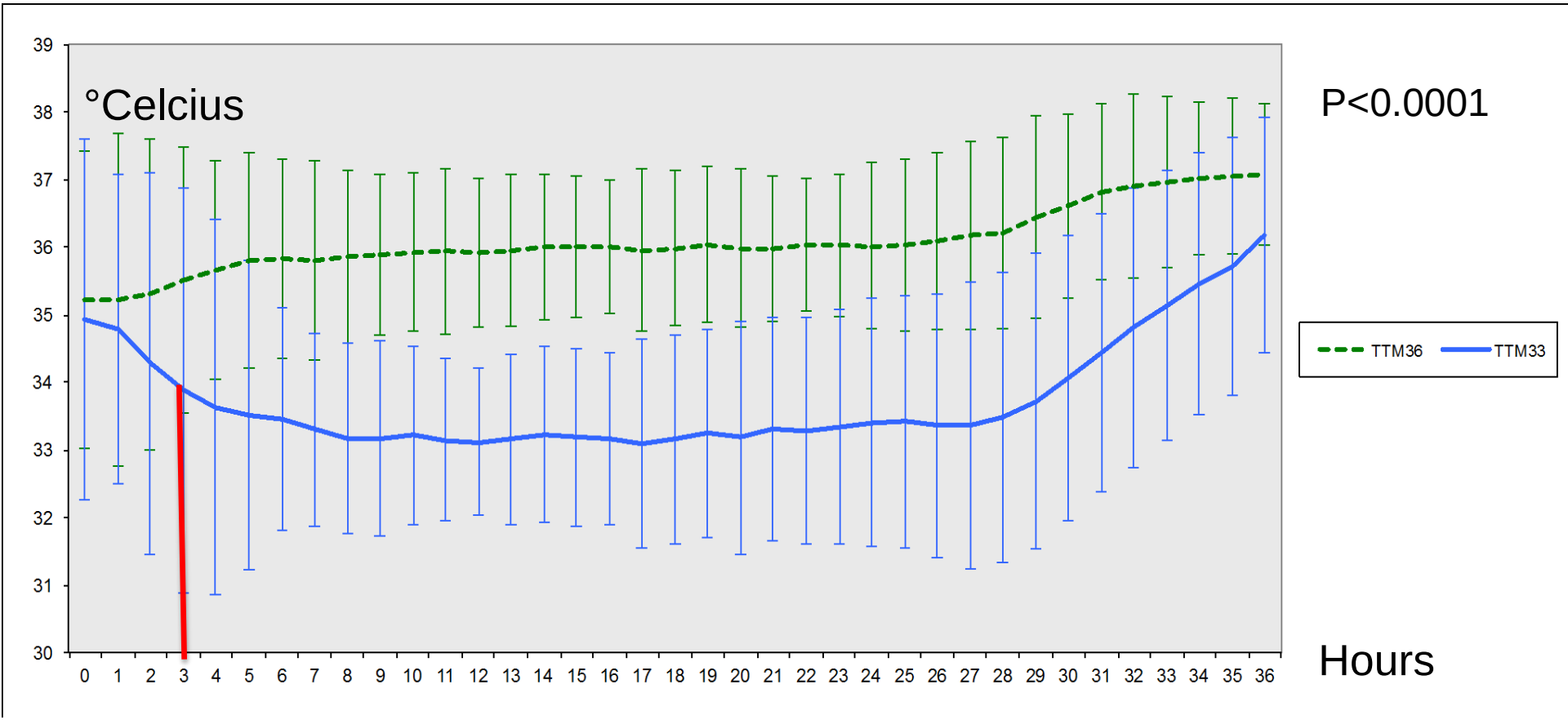
Temperature profile

Mean ± 2SD



Temperature profile

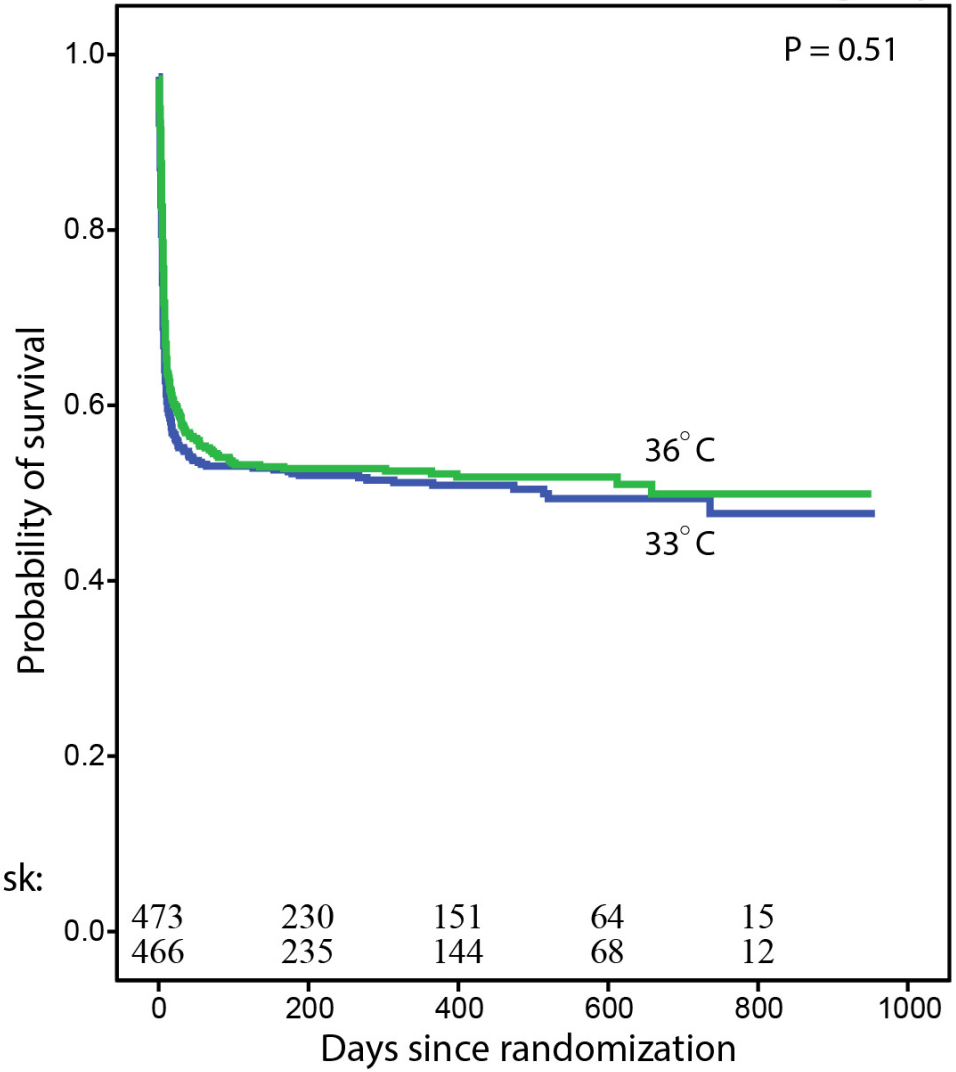
Mean ± 2SD



Survival
No Benefit

Kaplan-Meier estimates for time to death in TTM-trial intervention groups

P=0.51



No. of patients at risk:

Target 33° C	473	230	151	64	15
Target 36° C	466	235	144	68	12

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

Conclusion

In unconscious survivors of out-of-hospital cardiac arrest of a presumed cardiac cause targeting a temperature of 33°C did not confer any benefit compared to targeting a temperature of 36°C

Why Were The Results Different in This Trial?

- Preventing hypothermia may be the most important benefit of targeted temperature management
- Patients not as sick as in other trials (high rates of witnessed arrest, VF, and bystander CPR)
- Colder may be better
- Time to target temperature too long
- Colder may prevent more subtle neurologic damage
- Overall care has gotten better, making it difficult to show differences

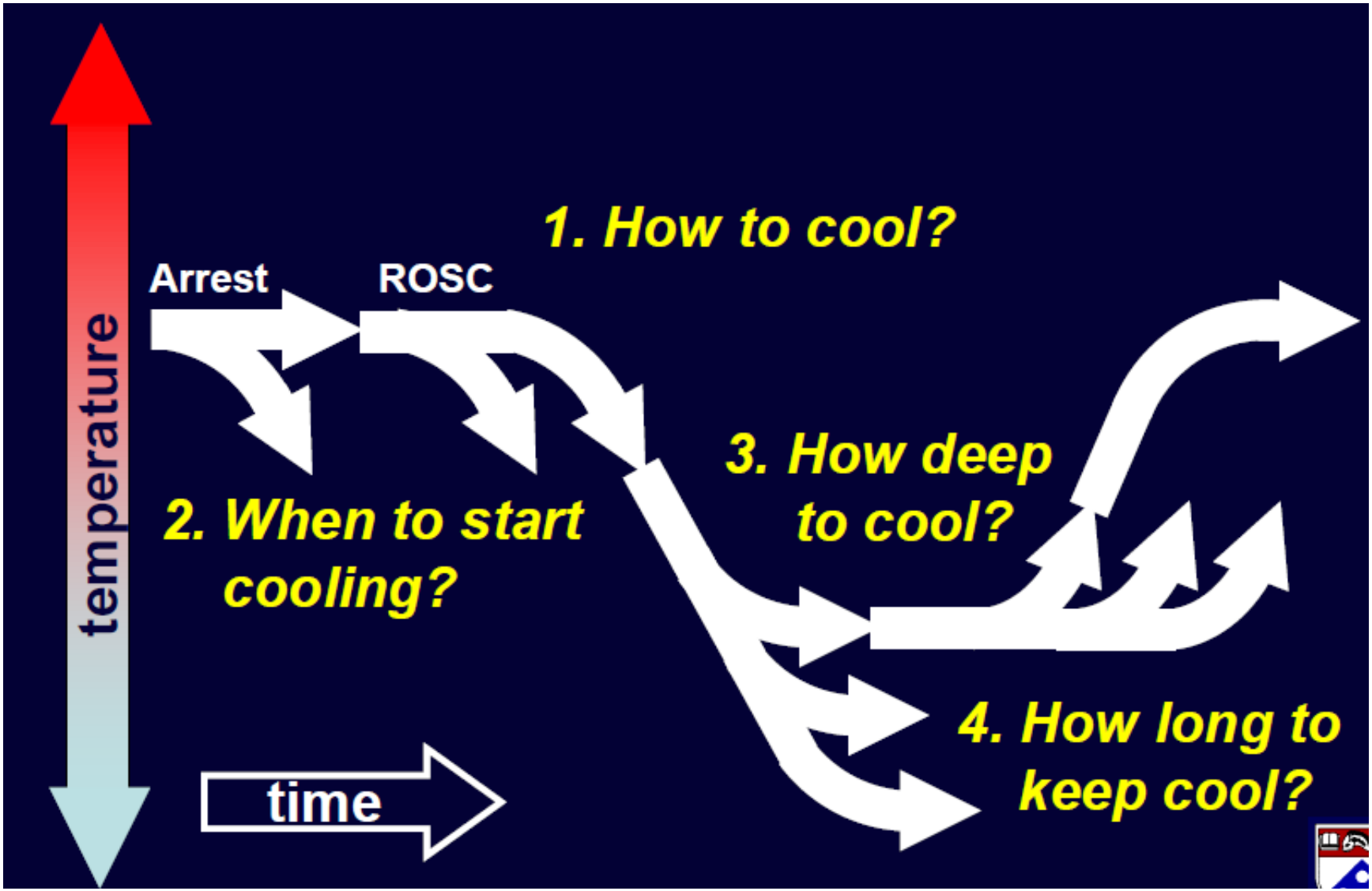
Implications

- Was a trial of targeted temperature management, NOT hypothermia vs no hypothermia
- Hypothermia only one part of bundled care for the post arrest patient (oxygen, ventilation, glucose management)
- Preventing fever post arrest may be critical to improving outcomes
- Decreased threshold to increase temperature for patients who have hypothermic induced complications (bleeding, bradycardia)

In-Hospital Hypothermia Recommendations

- All comatose patients with ROSC after OOCHA should have
  - targeted temperature management
  - selecting and maintaining a constant temperature between 32°C and 36°C
  - Continue for at least 24 hours after achieving target temperature.
- Reasonable to actively prevent fever in comatose patients after targeted temperature management

Hypothermia—Unresolved Questions



Ongoing Trials

- **Mild Versus Moderate Therapeutic Hypothermia in Out-of-hospital Cardiac Arrest Patients (CAPITAL CHILL)**
  - (Canada) to determine whether neurologic outcomes are improved with moderate (31 C) versus mild (34 Ce) therapeutic hypothermia
- **The TTH48 trial**
  - (Denmark) compare prolonged mild therapeutic hypothermia ("MTH") at 32-34°C for 24 versus 48 hours
- **Therapeutic Hypothermia After Cardiac Arrest in Non Shockable Rhythm (HYPERION)**
  - (France) randomized multicenter study examining the utility of targeted temperature control between 32.5 and 33.5 ° C in pts with non-shockable rhythms
- **Refractory Out-Of-Hospital Cardiac Arrest Treated With Mechanical CPR, Hypothermia, ECMO and Early Reperfusion (CHEER)**
  - (Australia) Use of a mechanical chest compression device, cooled to 33°C, placed on ECMO, and then primary PCI with subsequent therapeutic hypothermia
- **Finding the Optimal Cooling tempeRature After Out-of-HoSpiTal Cardiac Arrest (FROSTI)**
  - (US) Randomized to 24 hr at 32, 33 or 34 ° C

Pre-Hospital ECG Recommendations

- A prehospital 12-lead ECG should be acquired early for patients with possible ACS
- Explicitly permit trained non-MDs to interpret ECGs for the presence of STEMI
- Computer-assisted ECG interpretation may be used in conjunction with MD or trained provider interpretation to recognize STEMI
- Trained non-MD ECG interpretation can be used as the basis for decision making, including activation of the catheterization laboratory, administration of fibrinolysis, and selection of destination hospital
- Prehospital notification of the hospital and/or prehospital activation of the cath lab should occur for all patients with a recognized STEMI on prehospital ECG

Acute Coronary Angiography

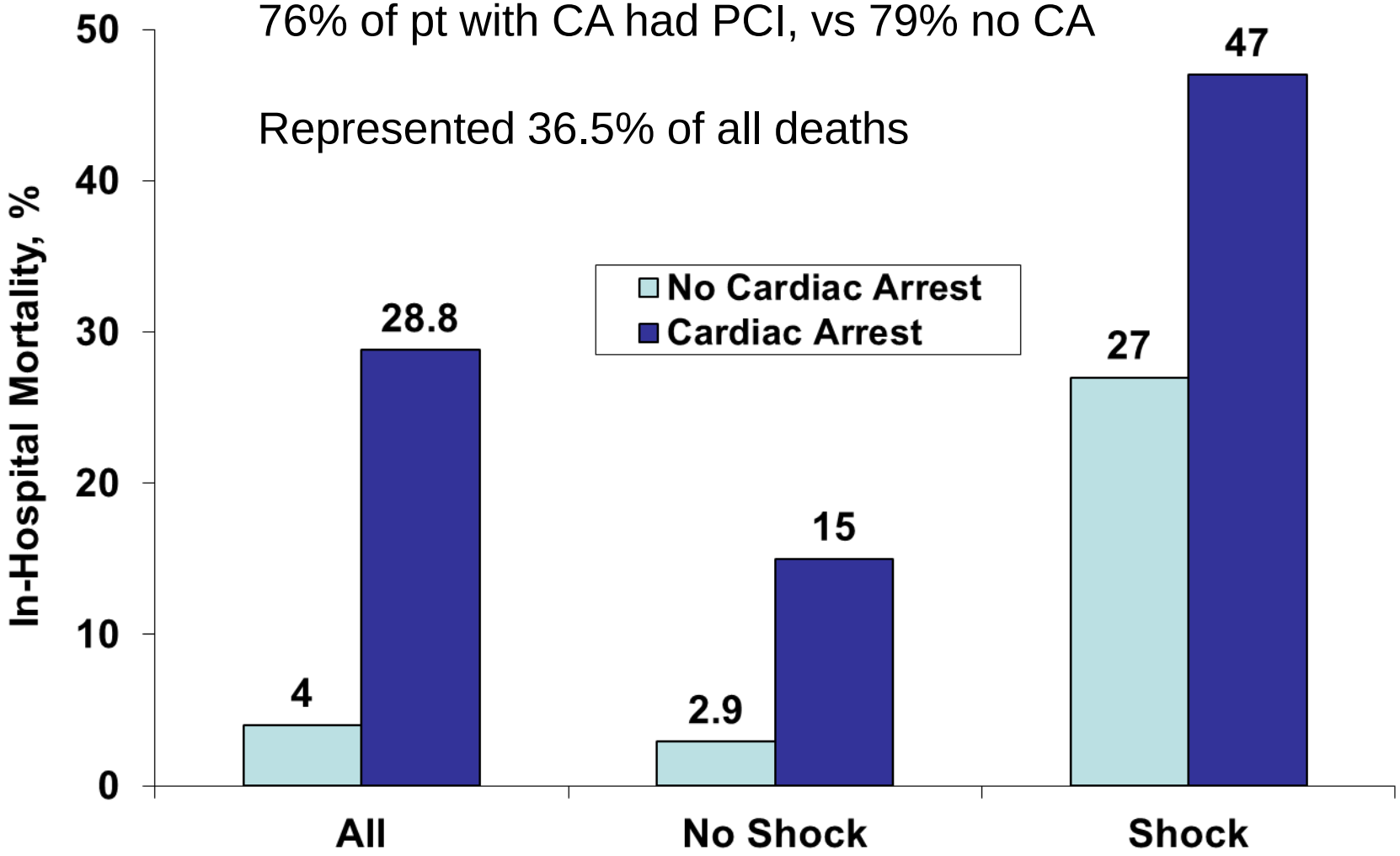
- Coronary angiography should be performed emergently for OHCA patients with STEMI
- The decision to perform should not include consideration of neurologic status, because of the unreliability of early prognostic signs.
- Emergency coronary angiography is reasonable for select (e.g., electrically or hemodynamically unstable) pts without ST elevation on ECG with OHCA of suspected cardiac origin

Cardiac Arrest Mortality and Impact of Shock

CA pts were 7.5% of the total cohort

76% of pt with CA had PCI, vs 79% no CA

Represented 36.5% of all deaths

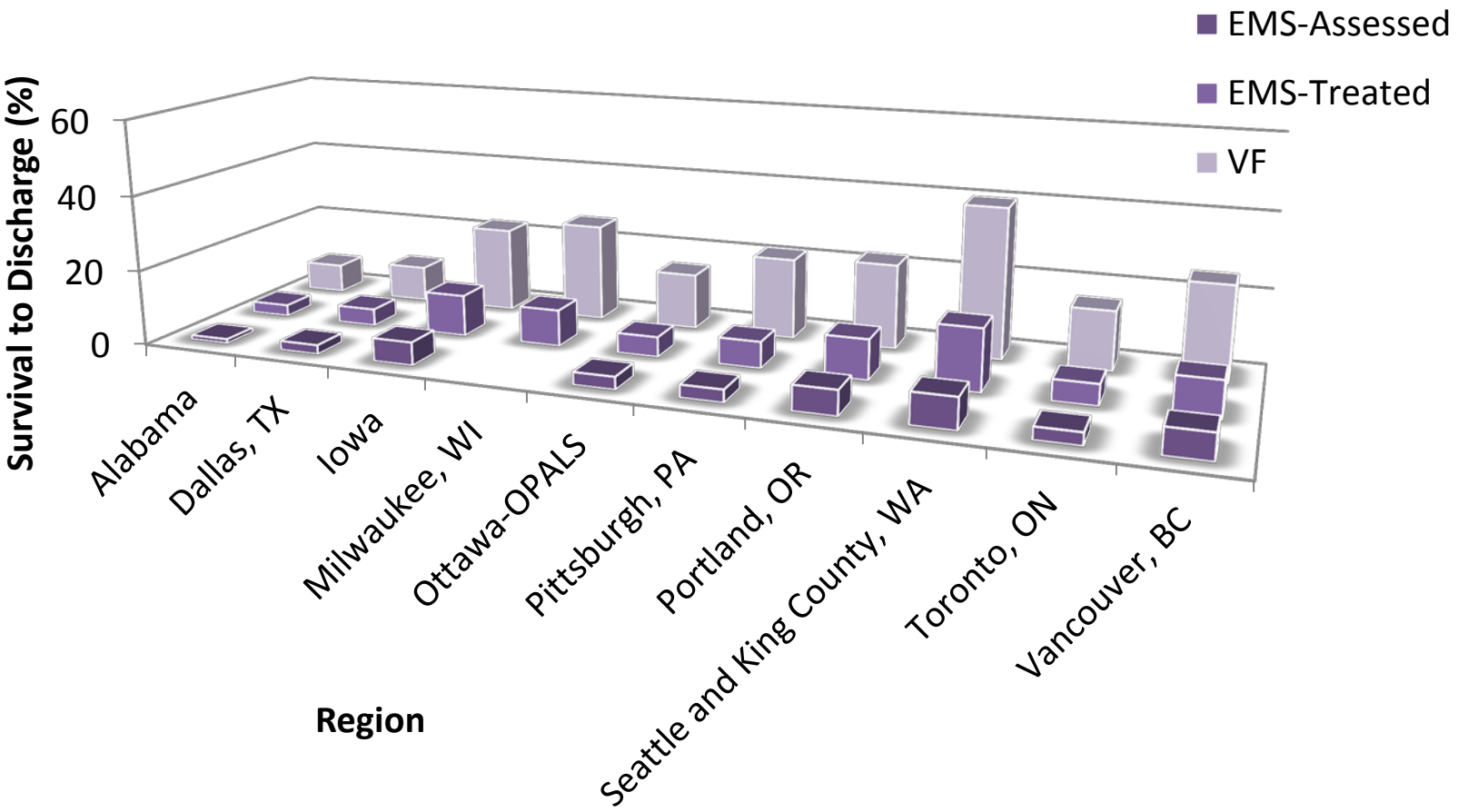


Kontos MC et al Am Heart J 2014

Systems of care

Large Regional Variation in Survival After Out-of-Hospital Cardiac Arrest

Nichol JAMA 2008



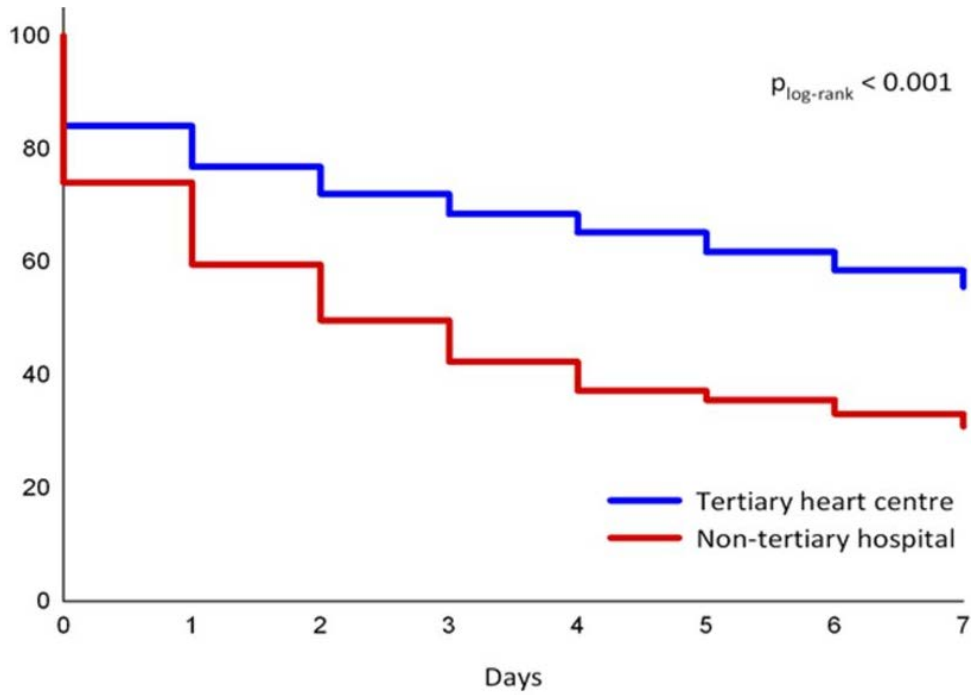
Differences Survival b/w Centers

- Variation may be attributable to differences in:

1. Type of EMS system
2. Proportion of victims receiving bystander CPR
3. Response time intervals of providers
4. Whether EMS was contacted
5. Characteristics of the population served
6. Other Factors

Outcomes in Tertiary vs Non-Tertiary Centers

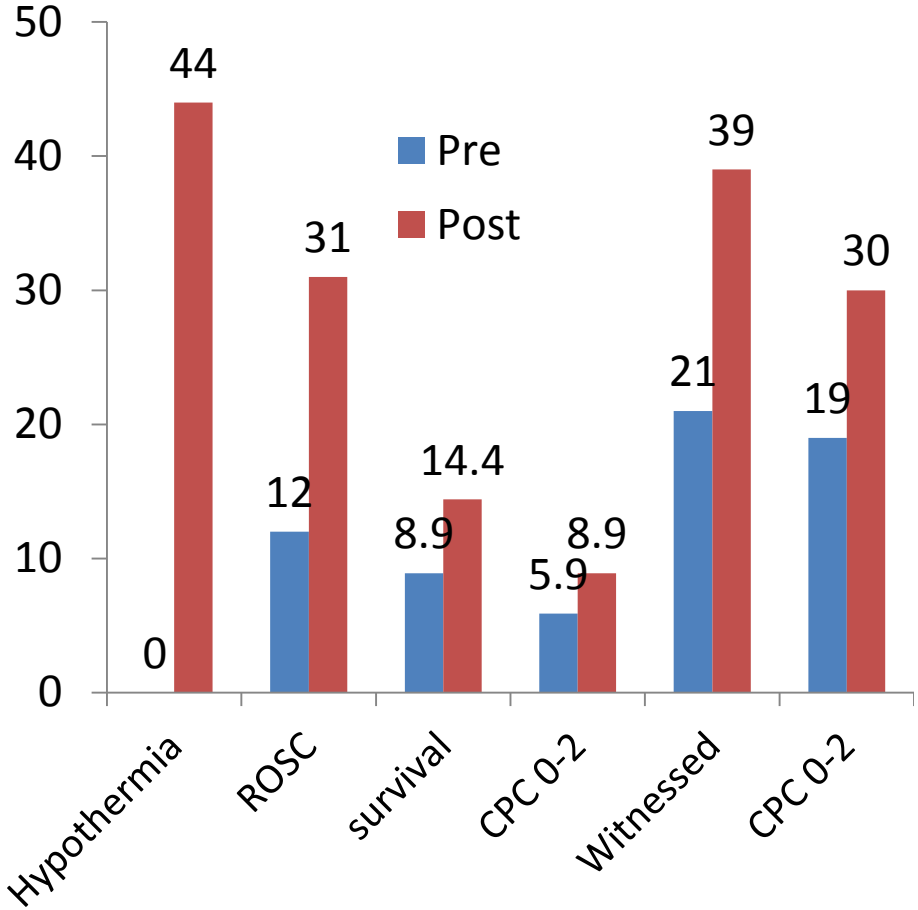
- Consecutive out-of-hospital cardiac arrest patients (n=1078) without STEMI were included
  - tertiary centers (54%)
  - Non-tertiary hospitals (46%)
- Associated with more intensive care (tests, procedures, consultants)
- Survival to discharge significantly higher 45% versus 24% (*P*<0.001)
- After adjustment, admission to tertiary centers was associated with lower 30-day mortality (OR, 0.78 [0.64–0.96; *P*=0.02])
- Concluded that Admission to tertiary centers was associated with significantly higher survival



Soholm H, et al Circ CV Qual outcomes 2015;8;268

Improved Outcomes with Cardiac Arrest Systems of Care

- In Dec 2007 the Arizona Department of HS began recognizing cardiac receiving centers who committed to provide specified post-arrest care
- Interventions included:
  - therapeutic hypothermia
  - coronary angiography or PCI in appropriate patients
  - implementation of EMS bypass triage protocols (if <15 min)
  - AHA guideline based care
- During the study (12/07-12/10) 31 hospitals classified as cardiac receiving centers
  - Before 440 OOHCA pts
  - After 1,737 OOHCA pts



AHA Policy Statement

Regional Systems of Care for Out-of-Hospital Cardiac Arrest

A Policy Statement From the American Heart Association

Graham Nichol, MD, MPH, FAHA, Chair; Tom P. Aufderheide, MD, FAHA; Brian Eigel, PhD; Robert W. Neumar, MD, PhD; Keith G. Lurie, MD; Vincent J. Bufalino, MD, FAHA; Clifton W. Callaway, MD, PhD; Venugopal Menon, MD, FAHA; Robert R. Bass, MD; Benjamin S. Abella, MD, MPhil; Michael Sayre, MD; Cynthia M. Dougherty, PhD, FAHA; Edward M. Racht, MD; Monica E. Kleinman, MD; Robert E. O'Connor, MD; John P. Reilly, MD; Eric W. Ossmann, MD; Eric Peterson, MD, MPH, FAHA; on behalf of the American Heart Association Emergency Cardiovascular Care Committee; Council on Arteriosclerosis, Thrombosis, and Vascular Biology; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation; Council on Cardiovascular Nursing; Council on Clinical Cardiology; Advocacy Committee; and Council on Quality of Care and Outcomes Research

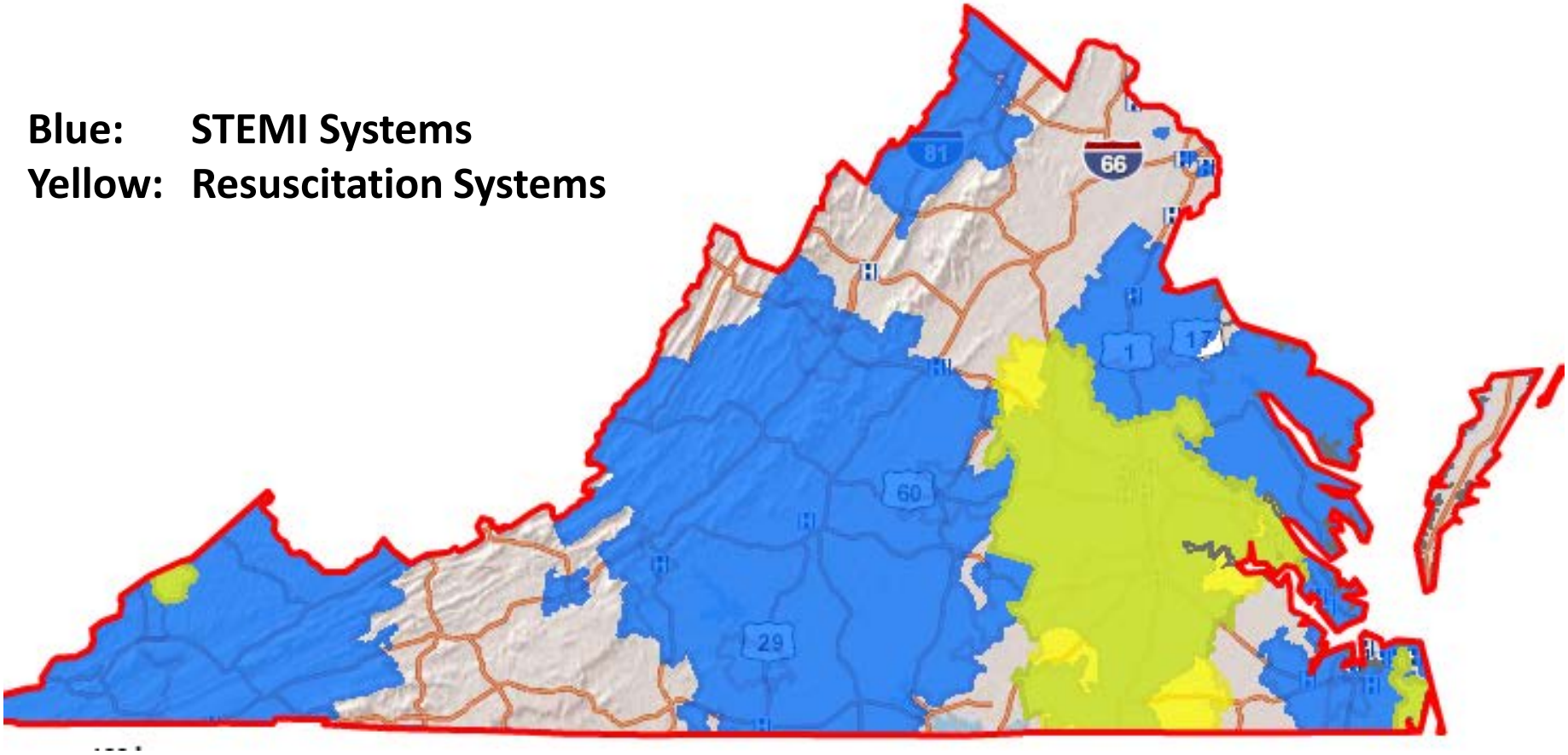
Endorsed by the National Association of State EMS Officials

Have a Interconnected community, EMS and hospital response to out-of-hospital cardiac arrest that is coherently organized to **measure and improve care processes and outcomes** in a **region**.

Circulation 2010

Mission:Lifeline and Virginia

Blue: **STEMI Systems**
Yellow: **Resuscitation Systems**



Strategies to Improve Cardiac Arrest Survival Institute of Medicine Report (1)

- **Robust cardiac arrest data collection and dissemination.**
  - The CDC should establish a cardiac arrest surveillance system for the nation, including data on in-hospital and out-of-hospital cardiac arrest
  - States and municipal organizations need to mandate reporting of cardiac arrest and ensure that data are available to the public
- **Improvement of public response.**
  - State and local departments of health and education and leading organizations in community health response should partner with professional organizations, public advocacy groups, community and neighborhood organizations, school systems, and local employers to promote public awareness of the signs, symptoms, and treatment of cardiac arrest
- **Enhancement of the capabilities of EMS nationwide**
  - The National Highway Traffic Safety Administration should become the primary organization to coordinate with other federal agencies and representatives from private industry, states, first responders, EMS systems, and nonprofit organizations to promote uniformly high-quality EMS cardiac arrest care across the nation

Strategies to Improve Cardiac Arrest Survival Institute of Medicine Report (2)

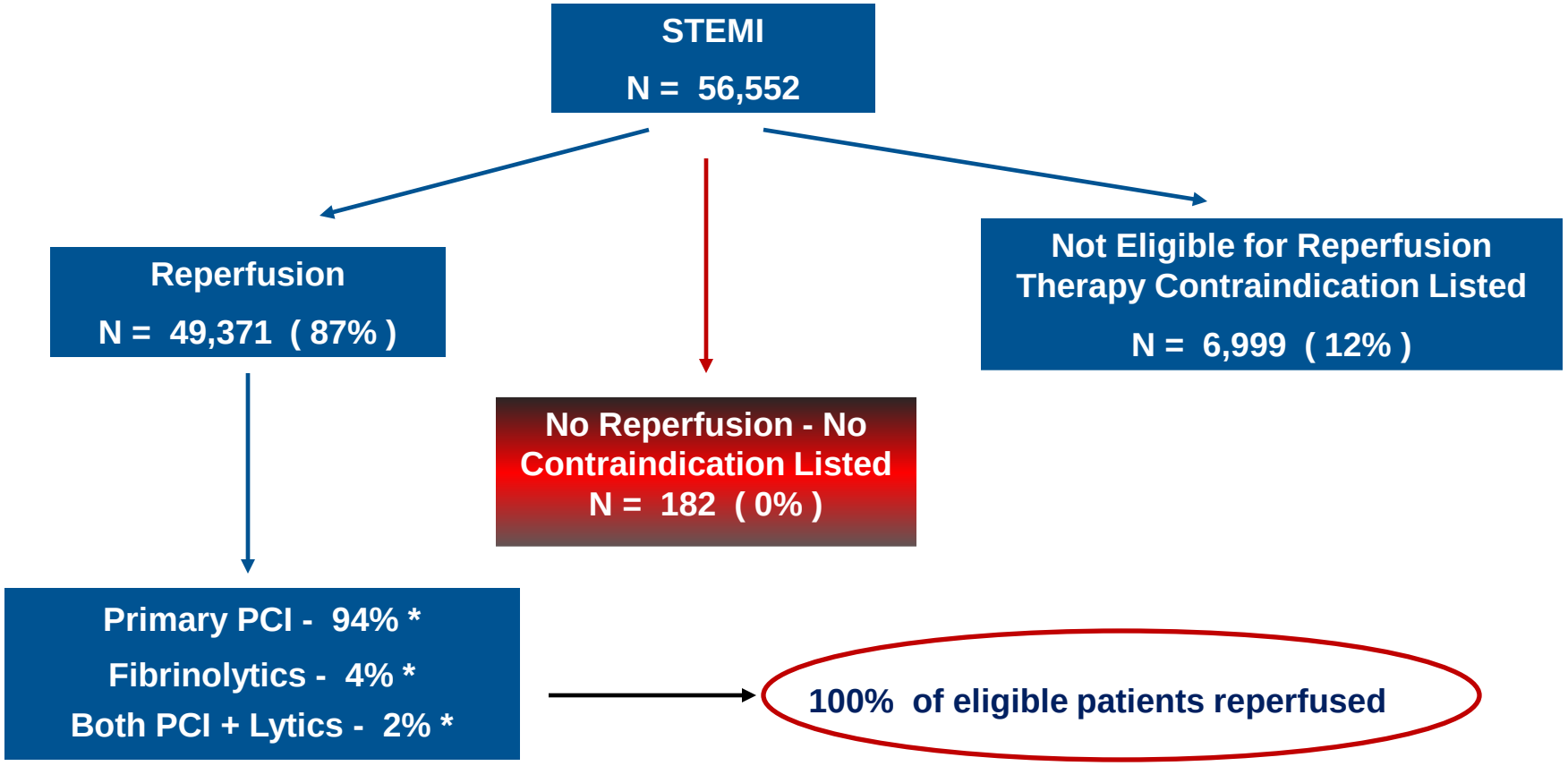
- **Updated national accreditation standards**
- **Continuous quality improvement**
- **Increase research funding for work in resuscitation science**
- **Speed the adoption of existing effective cardiac arrest therapies**
- **Establish a new National Cardiac Arrest Collaborative**
- The IOM report emphasizes that, "A national responsibility exists to significantly improve the likelihood of survival and favorable neurologic outcomes following a cardiac arrest."

Update in STEMI Care

ACTION Registry-GWTG Results

January 01, 2014 - December 31, 2014

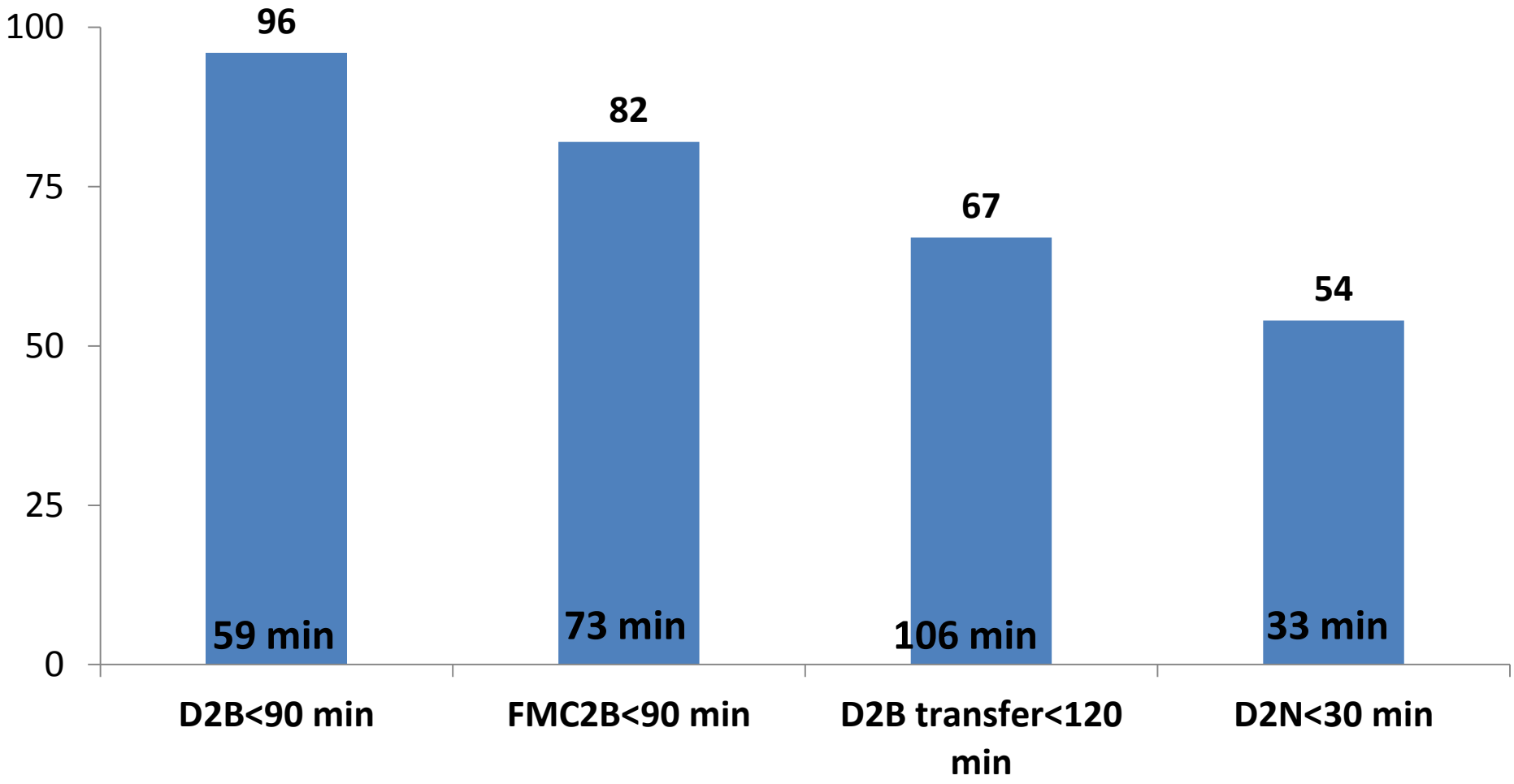
Increased Use of Reperfusion Therapy for STEMI



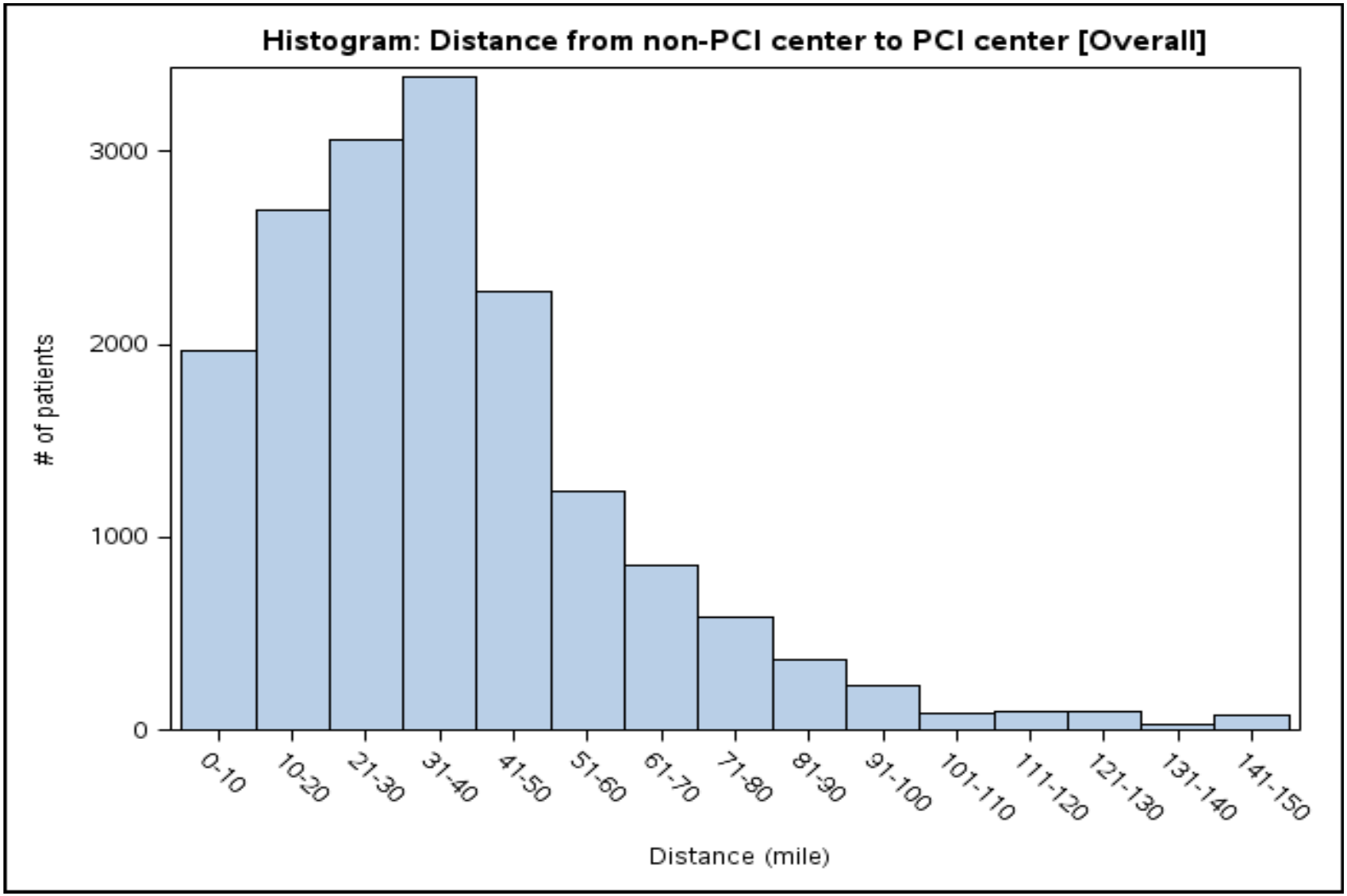
**** Among patients receiving reperfusion***

ACTION Registry-GWTG DATA: January 01, 2014 - December 31, 2014

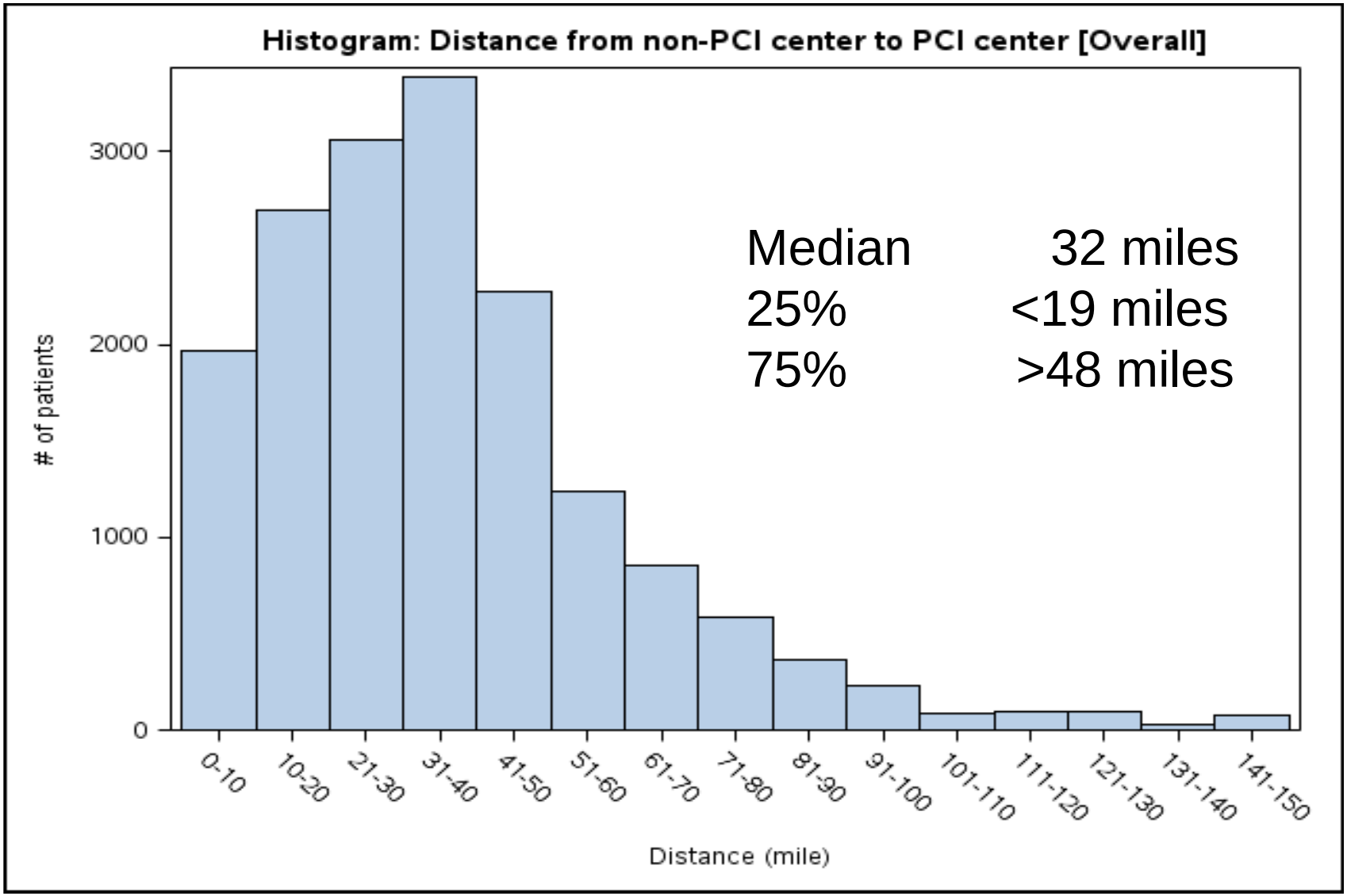
STEMI–Door to Balloon and Door to Needle Times 2014 Data
Percent Patients Meeting Goal Times



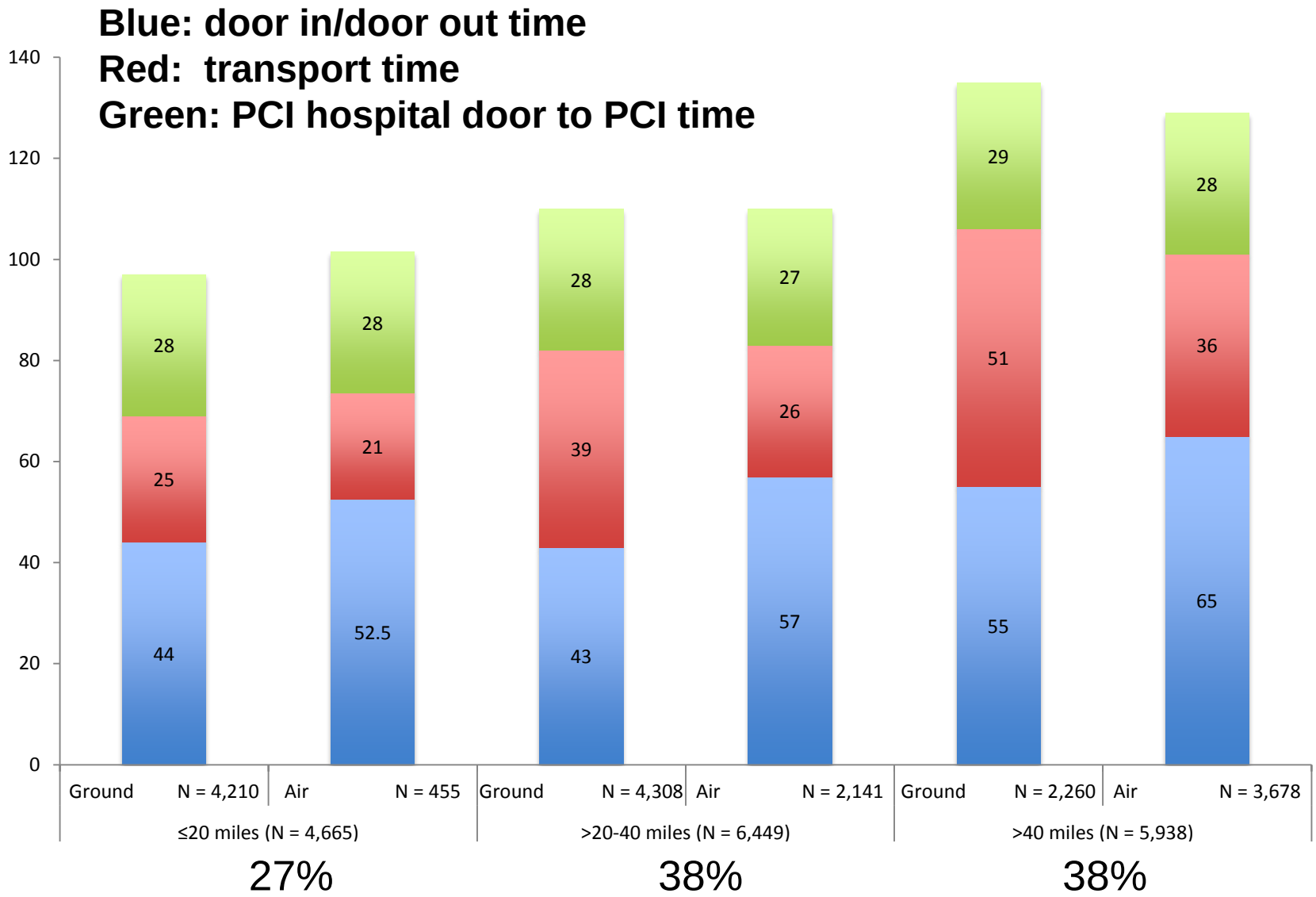
Distance from the Non-PCI to the PCI Center



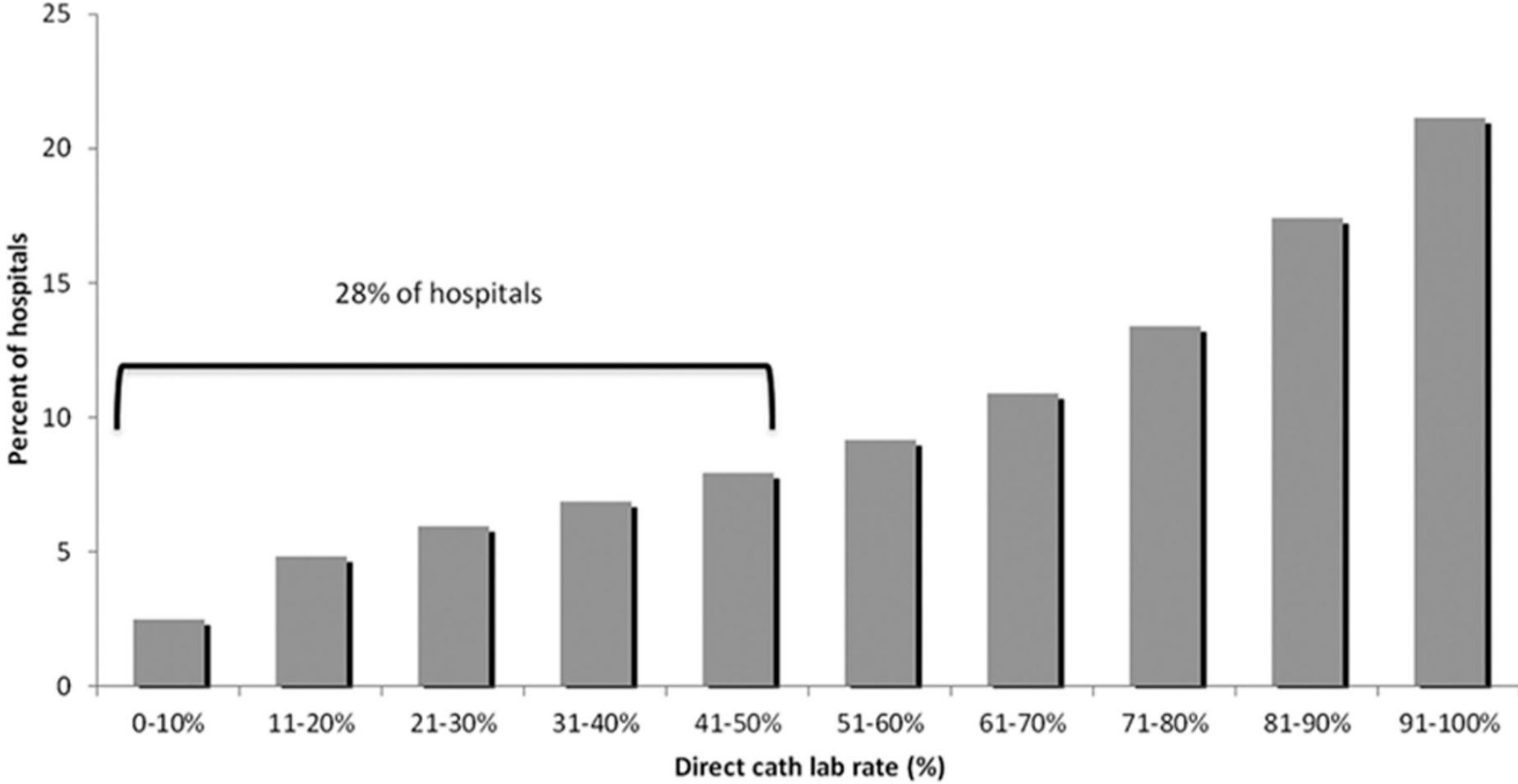
Distance from the Non-PCI to the PCI Center



Transfer Patients, Mode of Transport and Time to Reperfusion



Frequency of Direct Patient Transfer to the Cath Lab



Lindsay L Anderson et al. Circ Cardiovasc Interv. 2015;8:e002477

Virginia Data

2015 VHAC/M:L State Meeting

heart.org/missionlifeline

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Data Collection – as of today

- 39 pPCI Hospitals (as of May 2015) in VA – does not count any hospitals doing pPCI during the day nor federal hospitals
    - Portsmouth Navel (24/7)
    - VA Richmond (24/7)
    - Fort Belvoir – Daytime
- 35 Hospitals have partnered with ML

Data Collection – as of today

- 34 Hospitals have signed the Data release for to allow them to receive the ML reports AND are included on the state report
  - New state report coming in 2015

Definitions

- **EMS:** Emergency Medical Service. Refers only to patients transported to the hospital via ambulance. Other 3rd-party modes of transport (Mobile ICU, Air) are included in specific report line items only where noted.
- **POV:** Personally Operated Vehicle. Refers to patients who transport themselves to the hospital, or who are transported to the hospital by a family member or friend.
- **FMC:** First Medical Contact. In the context of the report, this term is applicable ONLY when a patient is seen by medical personnel prior to hospital arrival and arrives via ambulance (EMS).
- **System:** All Mission: Lifeline hospitals participating in the specified regional hospital group. System data are an aggregate of data from all hospitals within the group.

Mission: Lifeline

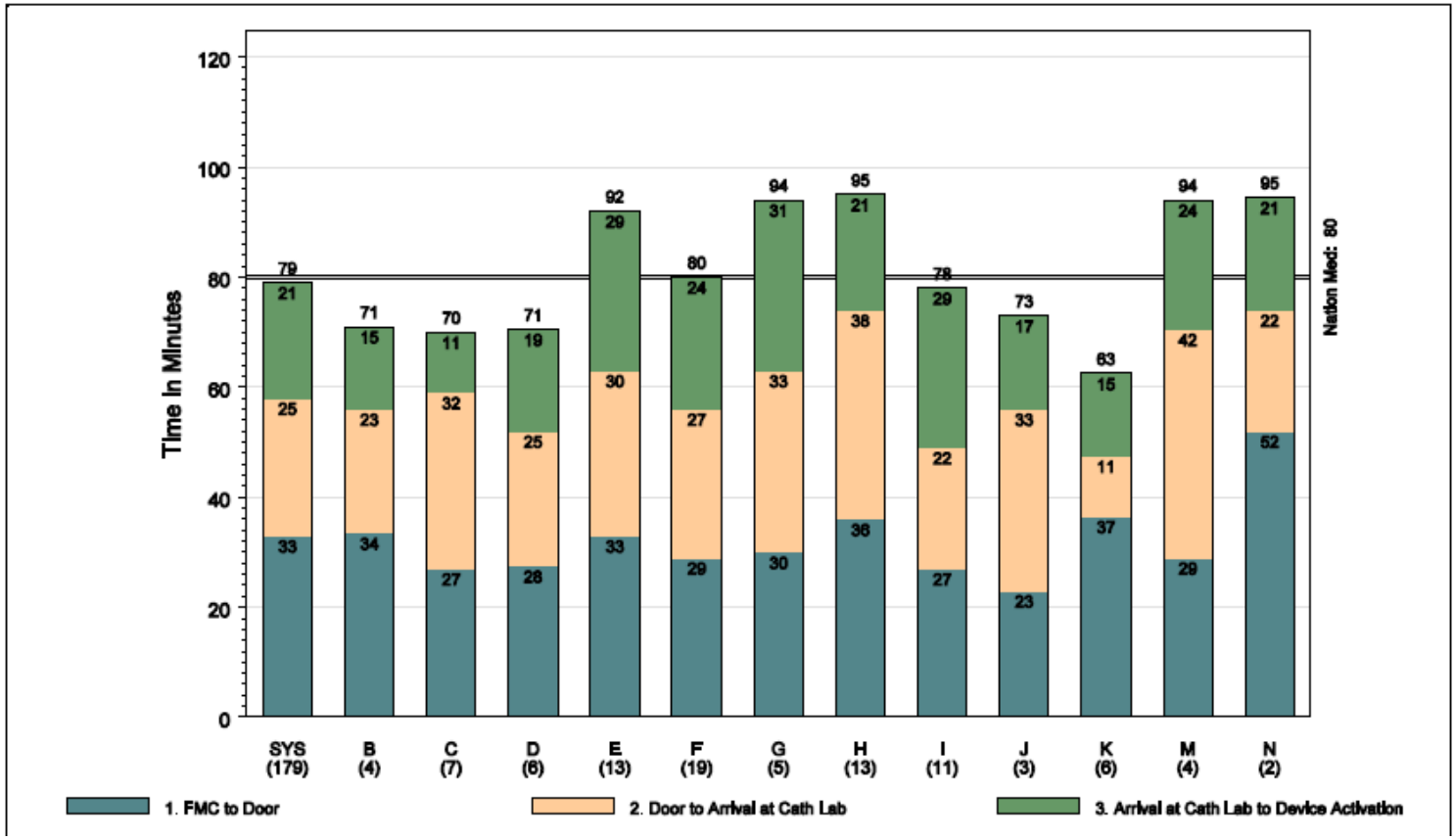
- We recommend that Every pPCI center have meetings with EMS to review cases
- We recommend EMS feedback on every case

	Hospital		State	Nation
	Last Qtr	Last 12 mo		
Median Time from Cath Lab Arrival to First Device Activation (mins)	[illegible]	[illegible]	21.5	23.0
Median Time from First Medical Contact to Primary PCI[1] (mins)				
Overall	96.0	97.0	95.0	91.0
% within 90 minutes	33%	38%	43%	49%
Non-Transfer-In	96.0	97.0	[illegible]	87.0
% within 90 minutes	33%	38%	50%	55%
Transfer-In	-	-	143.0	144.0
% within 90 minutes	-	-	0%	6%
% within 120 minutes	-	-	29%	26%
Median Time from Arrival to Primary PCI (mins)				
Non-Transfer-In	76.0	64.0	61.0	61.0
% within 90 minutes	85%	94%	94%	91%
Arrived by EMS	76.0	62.0	57.0	55.0
Arrived by POV	83.0	68.0	69.0	70.0
Transfer-In[2]	211.0	211.0	108.0	114.0
% within 90 minutes	0%	0%	27%	24%
Arrived at referral facility by EMS	-	-	114.0	116.0
% within 90 minutes	-	-	22%	22%
% within 60 minutes	-	-	2%	3%
Arrived at referral facility by POV	211.0	211.0	105.0	113.0

	System		State	Nation
	Last Qtr	Last 12 mo	Last 12 mo	Last 12 mo
Median Time from Arrival to Cath Lab Arrival (mins)				
Direct Presentation	36.0	37.0	36.0	37.0
Arrived by EMS	32.0	31.0	31.0	30.0
Arrived by POV	48.0	49.0	49.0	48.0
Transfers In				
From Arrival at First Facility	105.0	98.5	100.0	95.0
From Arrival at Receiving Facility	9.0	8.0	9.0	9.0
Median Time from Arrival to Primary PCI (mins)				
Direct Presentation	56.0	56.0	55.0	55.0
Arrived by EMS	49.0	50.0	50.0	49.0
Arrived by POV	64.0	66.0	66.0	66.0
Transfers In				
From Arrival at First Facility	109.5	105.0	107.5	105.0
From Arrival at Receiving Facility	[illegible]	[illegible]	30.0	27.0
Median Time from First Medical Contact to Primary PCI (mins)[1]	83.0	83.0	84.0	80.0

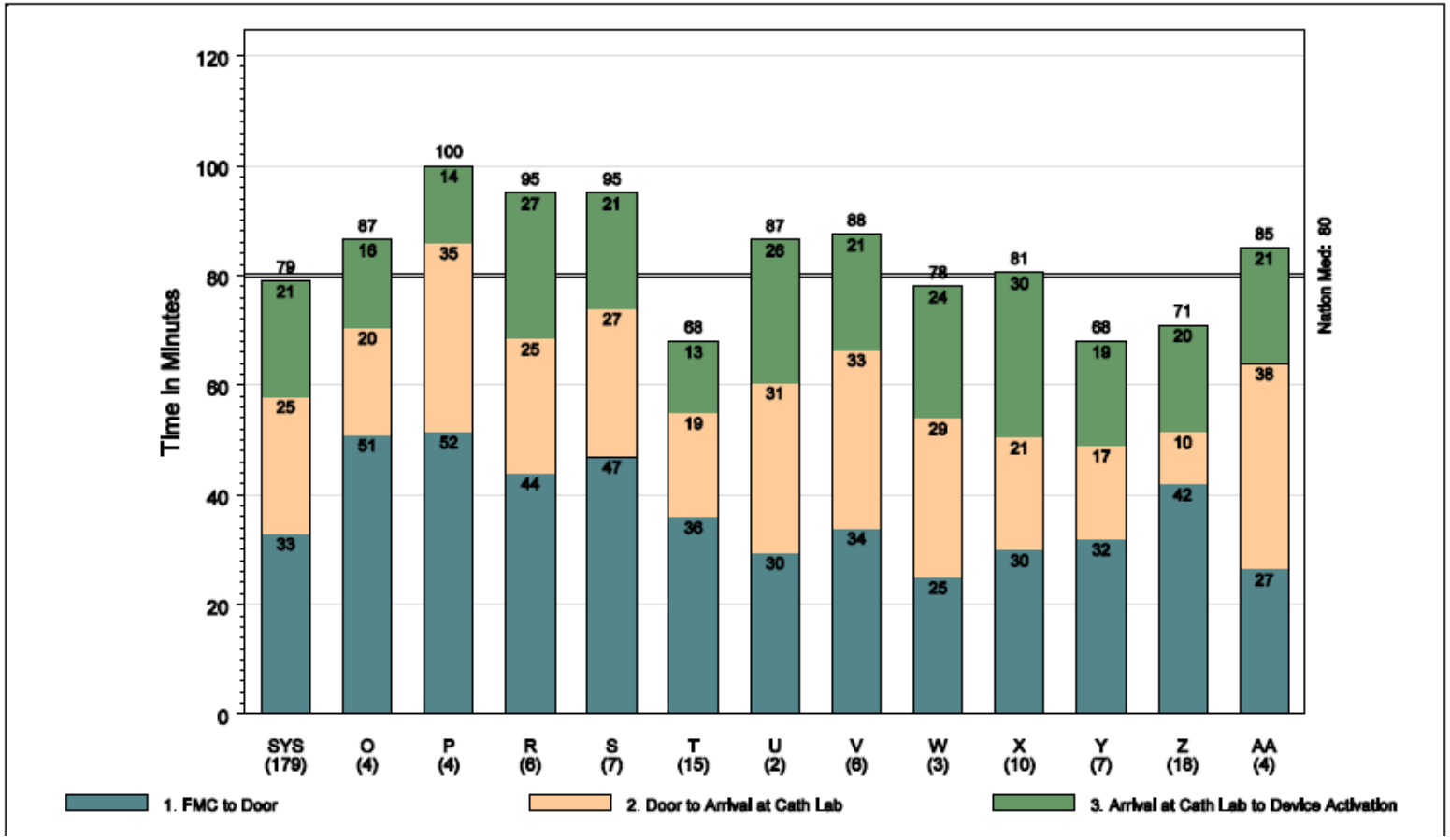
0002: 2015 Q1

First Medical Contact to Device
Median Time (minutes)
Direct Presentation, Arriving via EMS



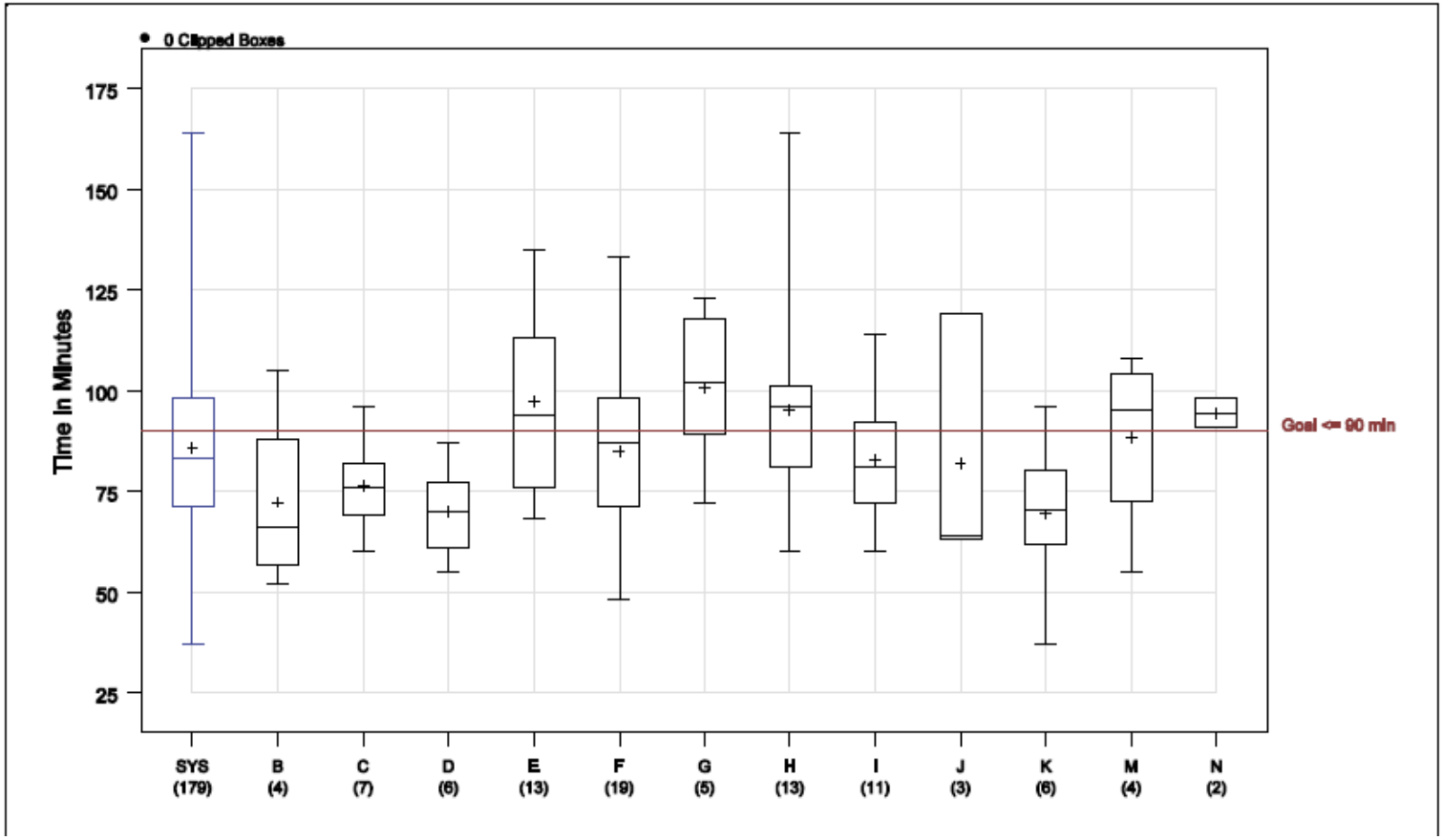
0002: 2015 Q1

First Medical Contact to Device
Median Time (minutes)
Direct Presentation, Arriving via EMS



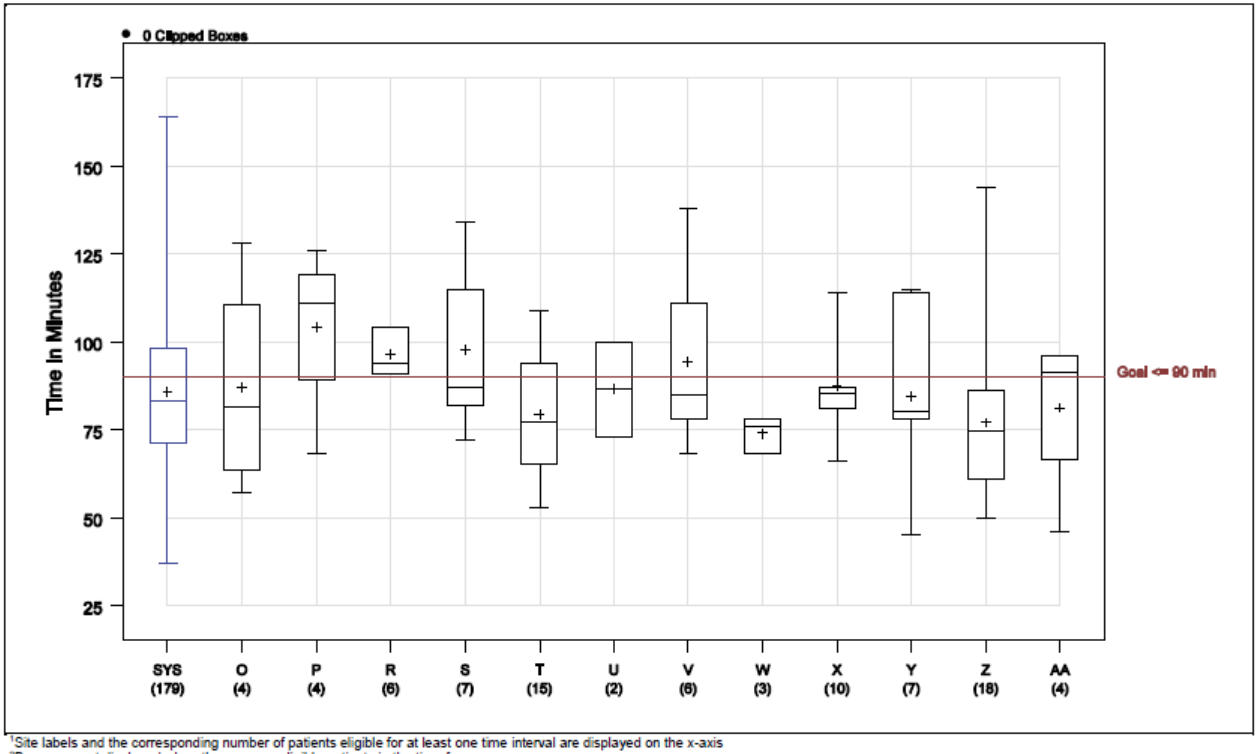
0002: 2015 Q1

First Medical Contact to Device Activation
Distribution of Times (minutes)
Direct Presentaion, Arriving via EMS



0002: 2015 Q1

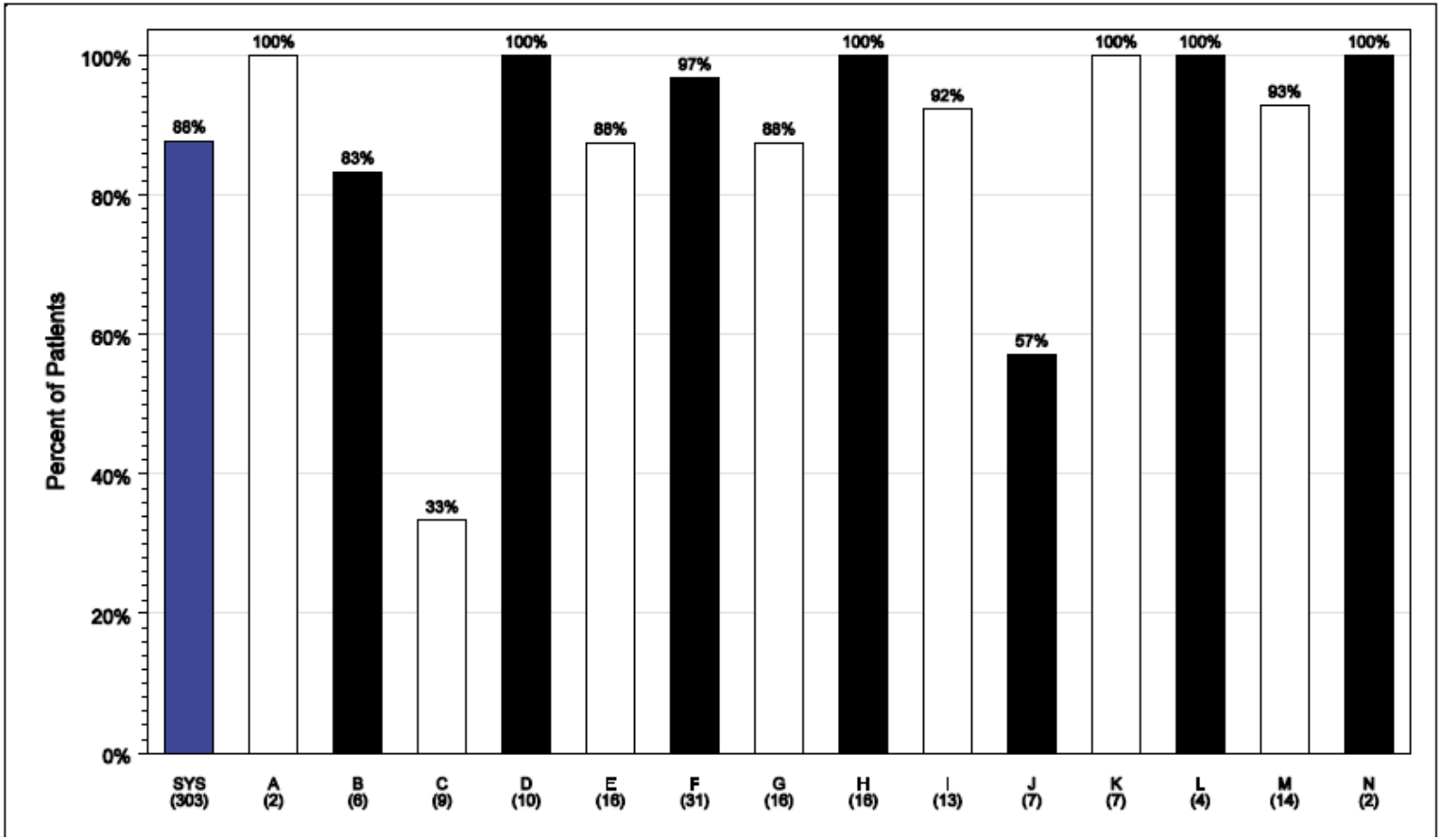
First Medical Contact to Device Activation
Distribution of Times (minutes)
Direct Presentaion, Arriving via EMS



[1]Site labels and the corresponding number of patients eligible for at least one time interval are displayed on the x-axis
[2]Boxes are not displayed when there are no eligible patients in the time frame

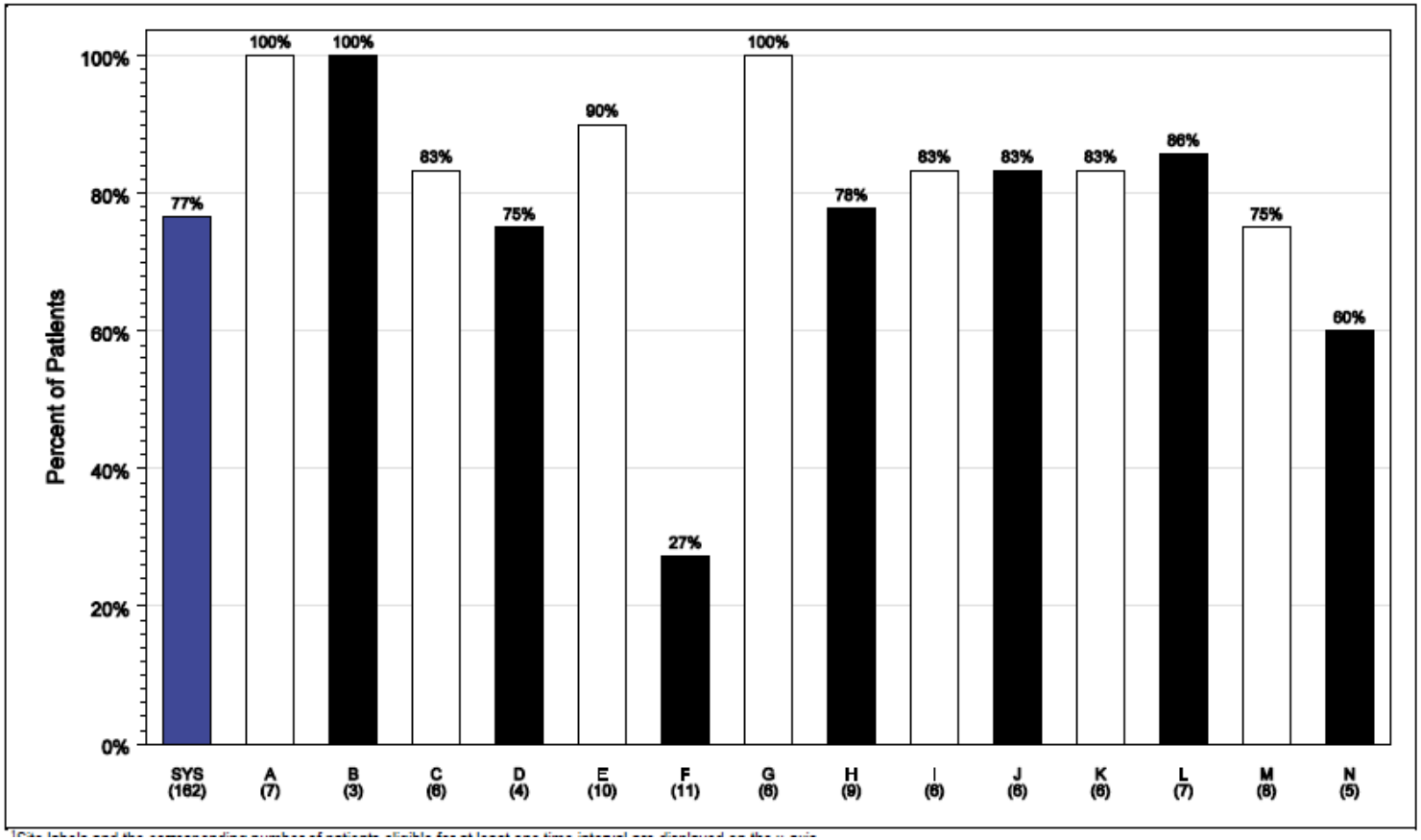
0002: 2015 Q1

Pre-Hospital ECG
Direct Presentation, Arriving via EMS



0002: 2015 Q1

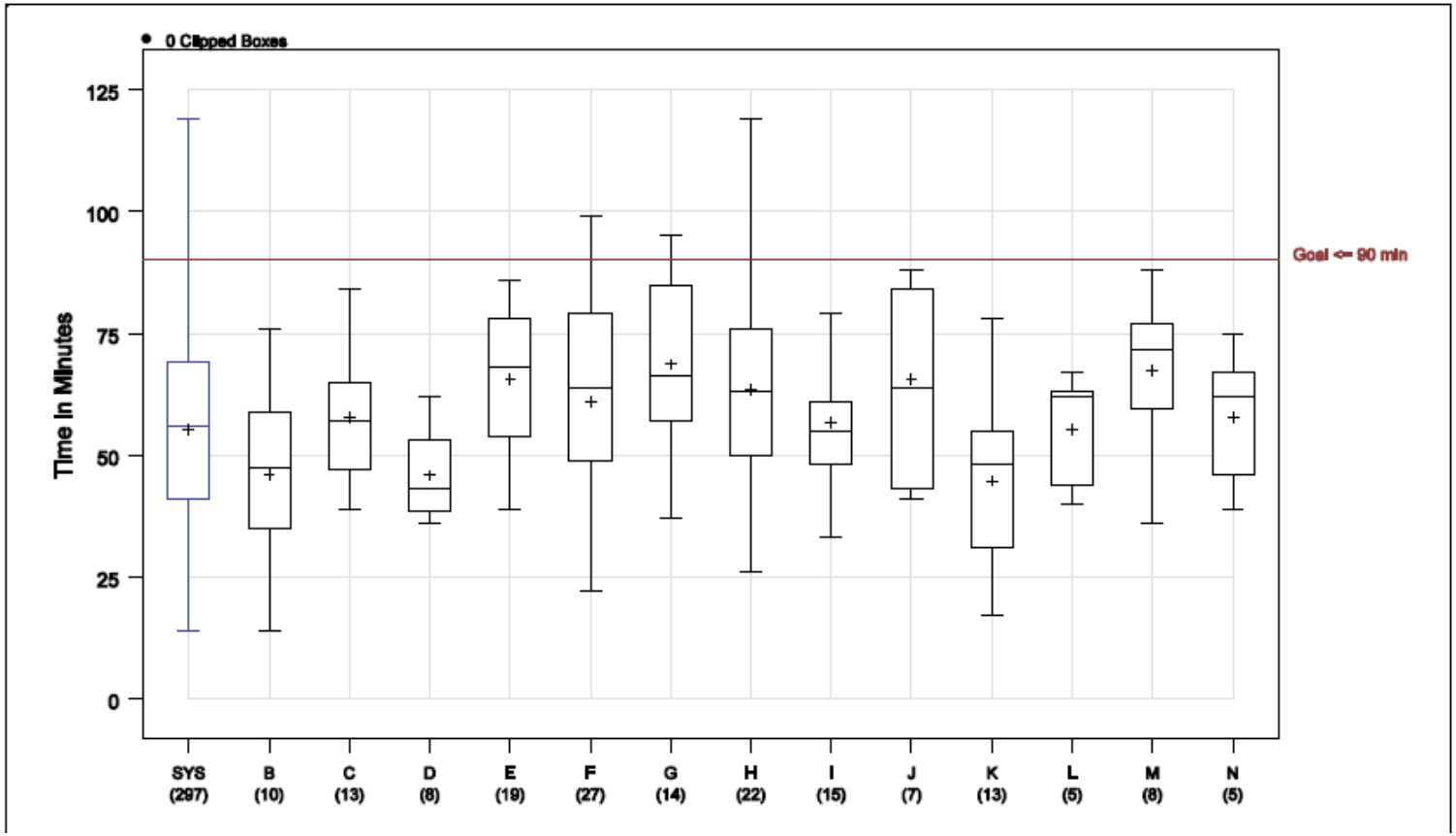
ECG Within 10 Minutes of Arrival
Direct Presentation, Arriving via POV



[1]Site labels and the corresponding number of patients eligible for at least one time interval are displayed on the x-axis.

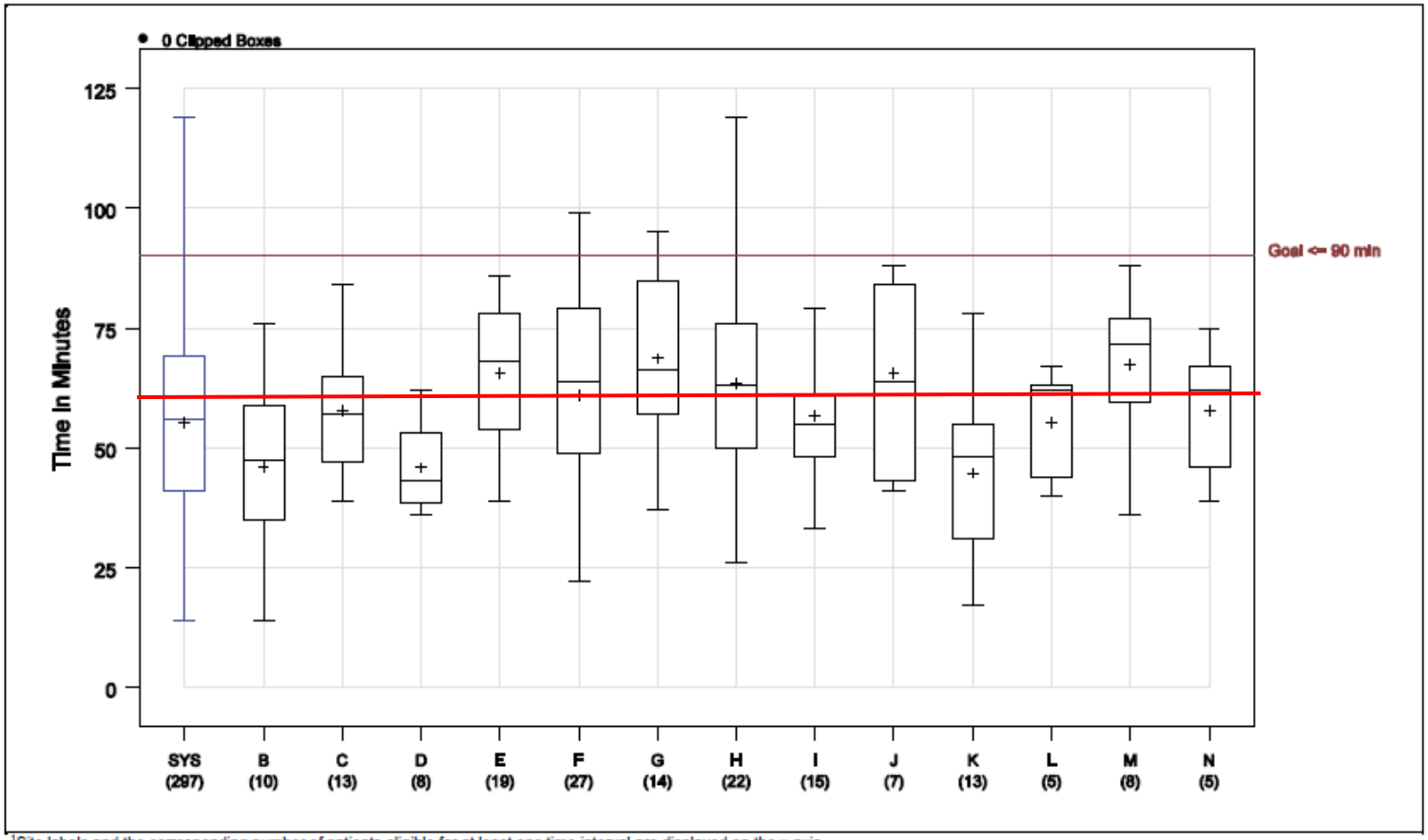
0002: 2015 Q1

Arrival to Device Activation
Distribution of Times (minutes)
Direct Presentation, All Arrival Modes



0002: 2015 Q1

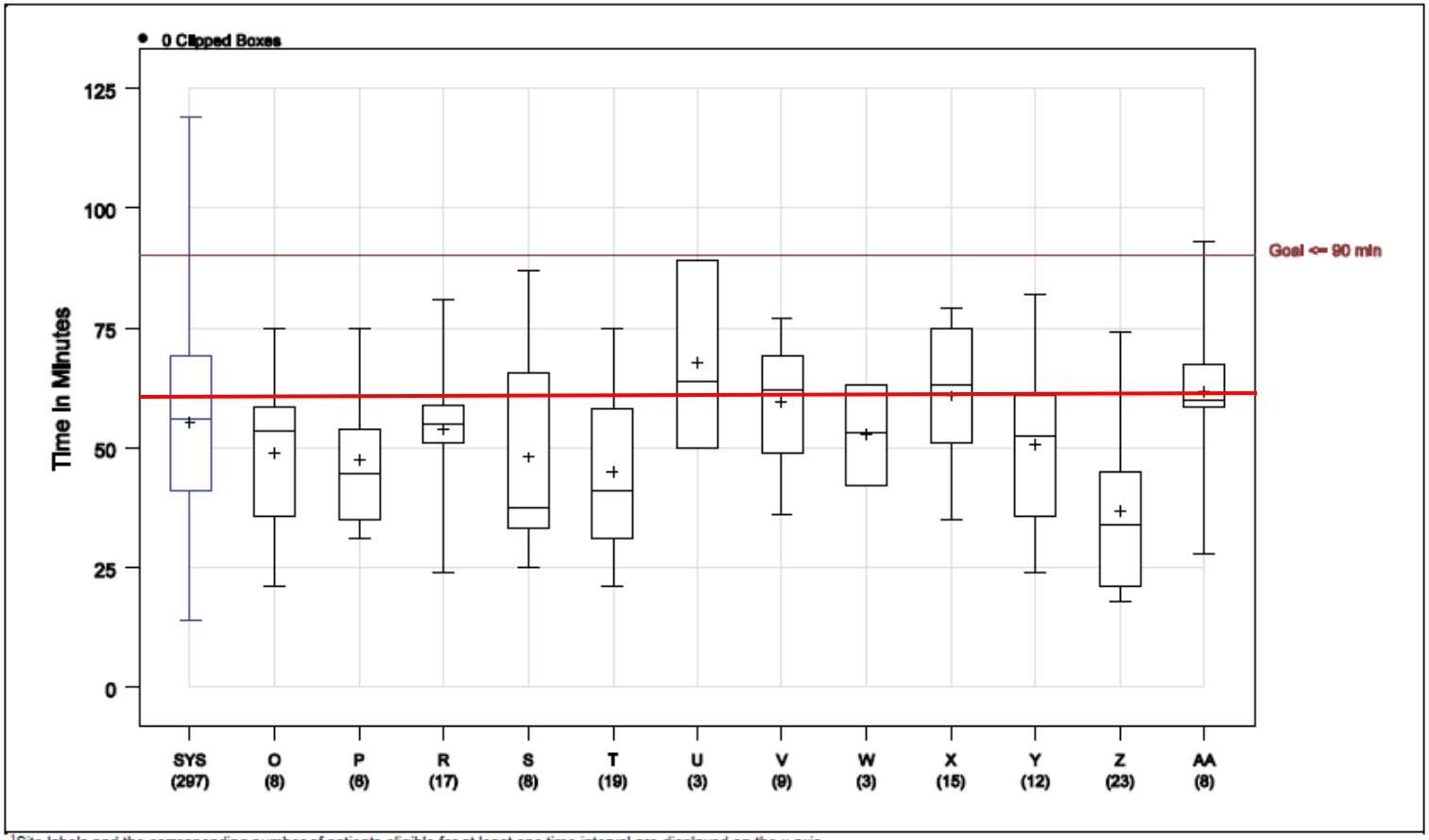
Arrival to Device Activation
Distribution of Times (minutes)
Direct Presentation, All Arrival Modes



[1]Site labels and the corresponding number of patients eligible for at least one time interval are displayed on the x-axis

0002: 2015 Q1

Arrival to Device Activation
Distribution of Times (minutes)
Direct Presentation, All Arrival Modes



[1]Site labels and the corresponding number of patients eligible for at least one time interval are displayed on the x-axis

Conclusions

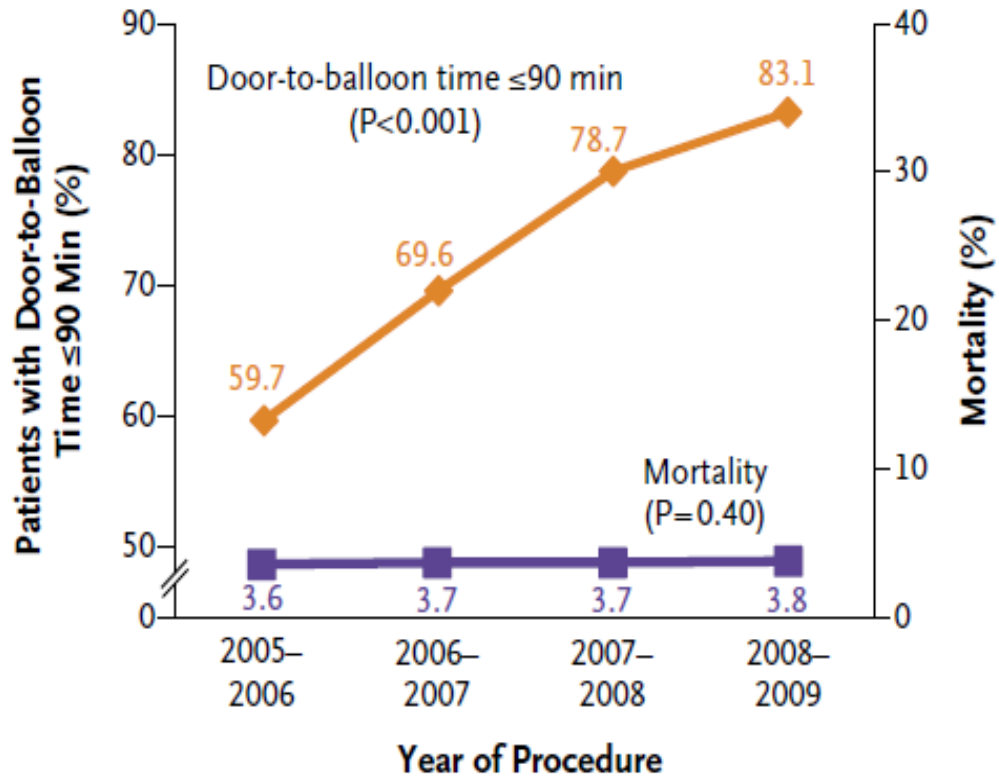
- New AHA CPR and Emergency Cardiac Care guidelines provide updated treatment recommendations
- Improvement in care will require improvements at multiple levels through the care continuum
- STEMI care continues to improve, but treatment gaps remain

MI Mortality:Does D2B Matter? NEJM 2013

- Unknown whether D2B improvements are associated with reduced mortality
- Some studies found that mortality did not decrease among patients undergoing primary PCI, despite large reductions in D2B times
  - Study limited to regional results
  - may have lacked sufficient power to detect a survival benefit related to the improved treatment times
- Purpose of the study: to determine if shorter D2B times are associated with a decrease in in-hospital mortality among patients undergoing primary PCI for STEMI

Results

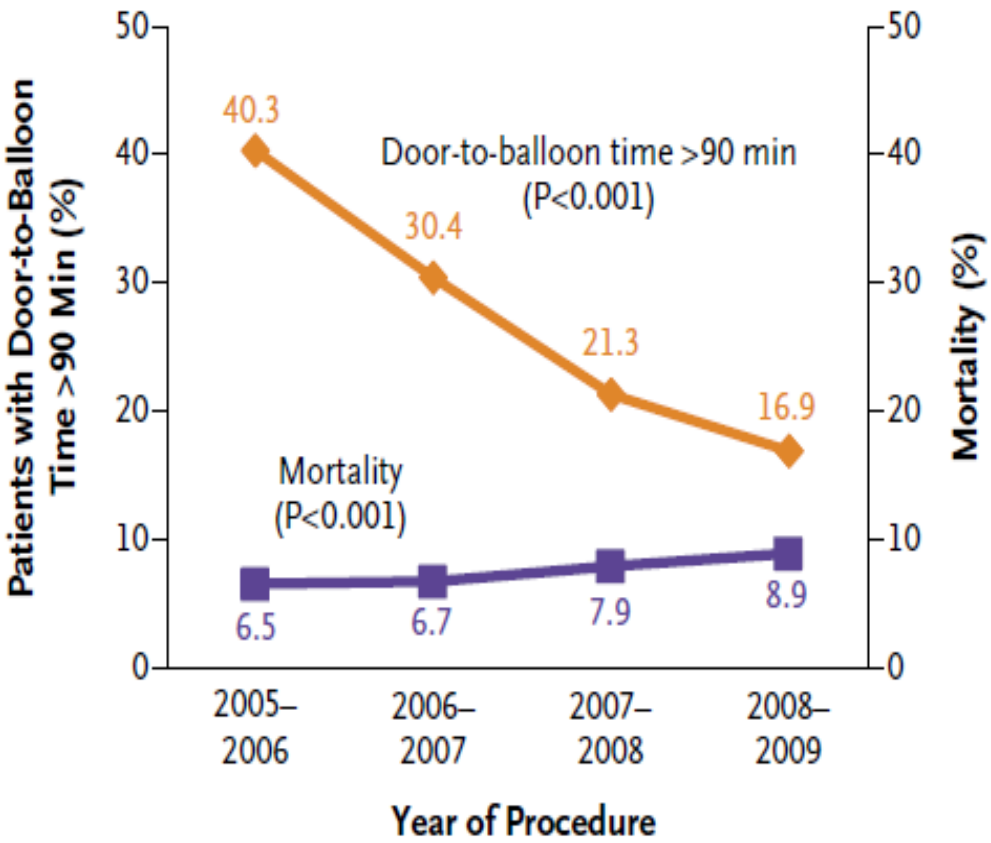
- The percent of pts with a D2B time ≤90 minutes increased from 60% to 83% over the course of the study (P<0.001)
- Unadjusted mortality for pts with D2B ≤90 minutes remained constant at 3.7% (P=0.40 for trend)



No. of Patients				
Door-to-balloon time ≤90 min	11,737	16,764	20,243	22,647
Deaths	425	616	755	858

Results (4)

- The percent of pts with a D2B time of >90 minutes decreased from 40% to 17%
- Unadjusted mortality increased for pts with D2B time >90 minutes from 6.5% in the first year to 8.9% in the last (P<0.001)
- Unadjusted mortality was lower among ptswith a D2B time <90 minutes than > 90 minutes (3.7%

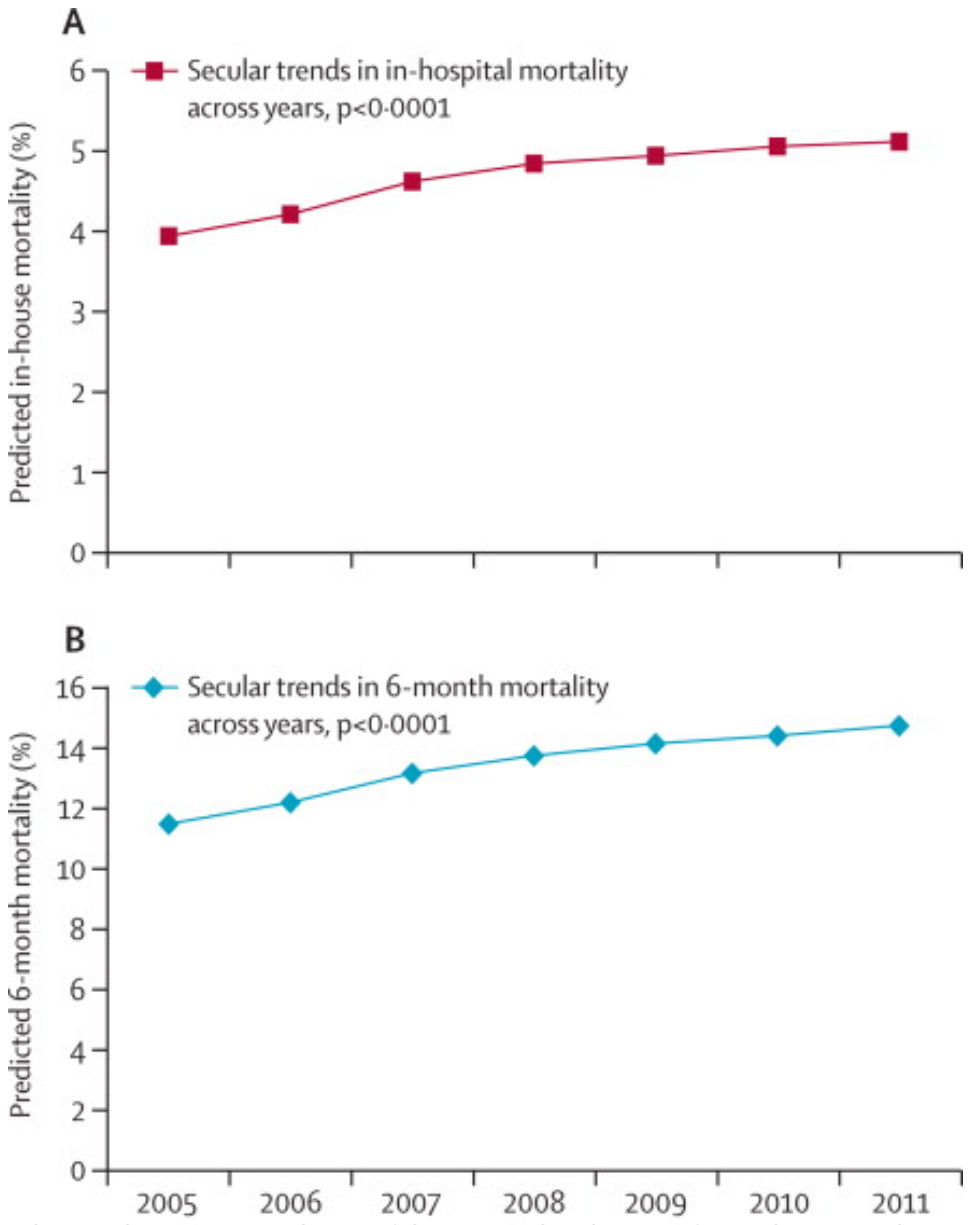


No. of Patients				
Door-to-balloon time >90 min	7927	7337	5485	4598
Deaths	513	492	435	410

Results

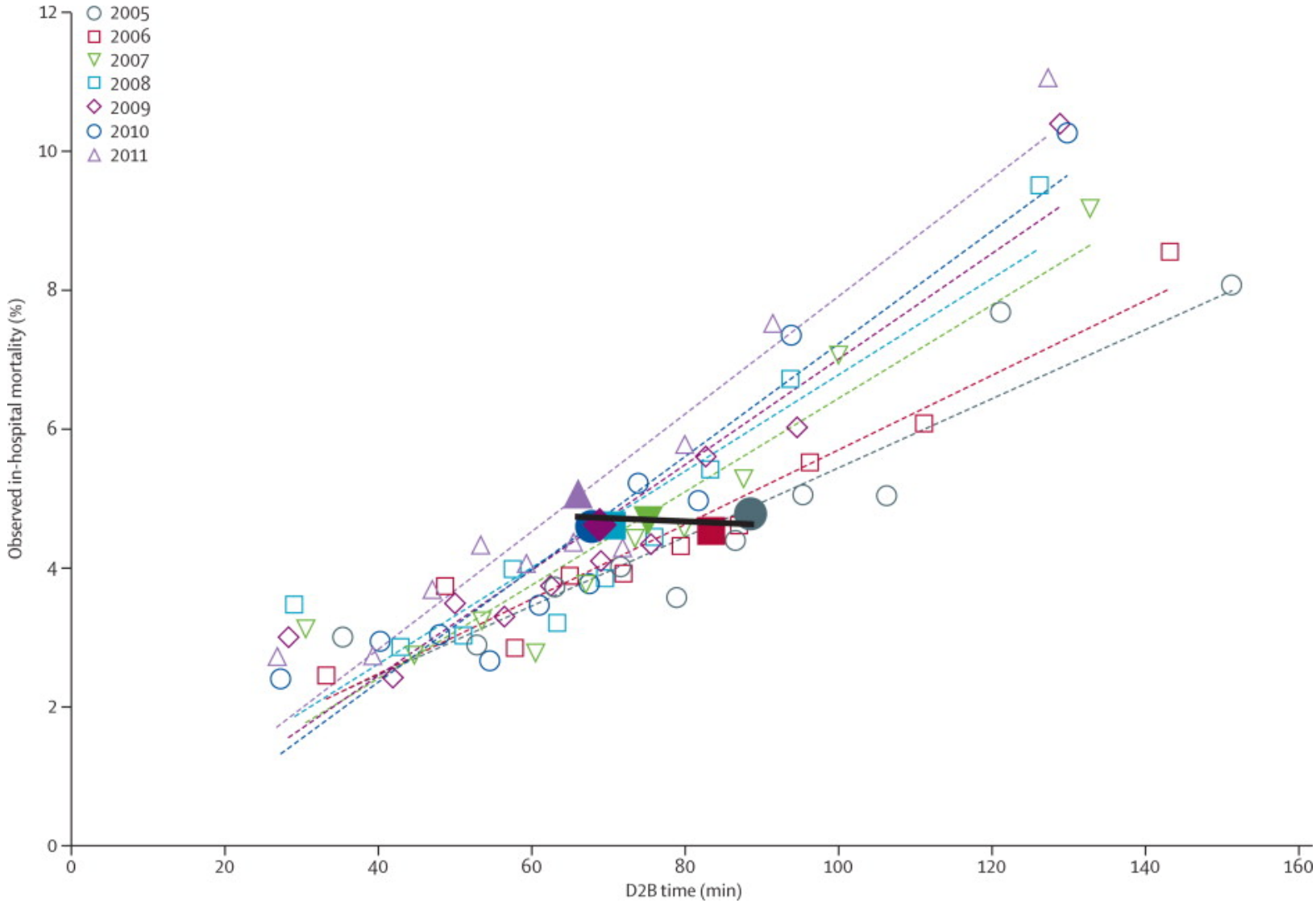
- 150,116 pPCI procedures were done in 146,940 patients at 423 hospitals from 1/05-12/11
- 55% more patients underwent pPCI in 2011 than in 2005
- Annual D2B times in the pPCI population decreased significantly from a median of 86 min in 2005 to 63 min in 2011 ($p<0{\cdot}0001$).
- Unadjusted in-hospital mortality was 4.7%
- 6-month mortality was 13·5% in the cohort of patients aged 65 years or older (CMS cohort)
- Risk-adjusted mortality increased:
  - in-hospital mortality: non-significantly from 4.7% to 5.3%; $p=0{\cdot}06$
  - 6-month mortality: increased significantly from 12.9% to 14.4%; $p=0{\cdot}001$

Predicted in-hospital and 6-month mortality across years related to secular trends at the population-level Predicted in-hospital mortality.



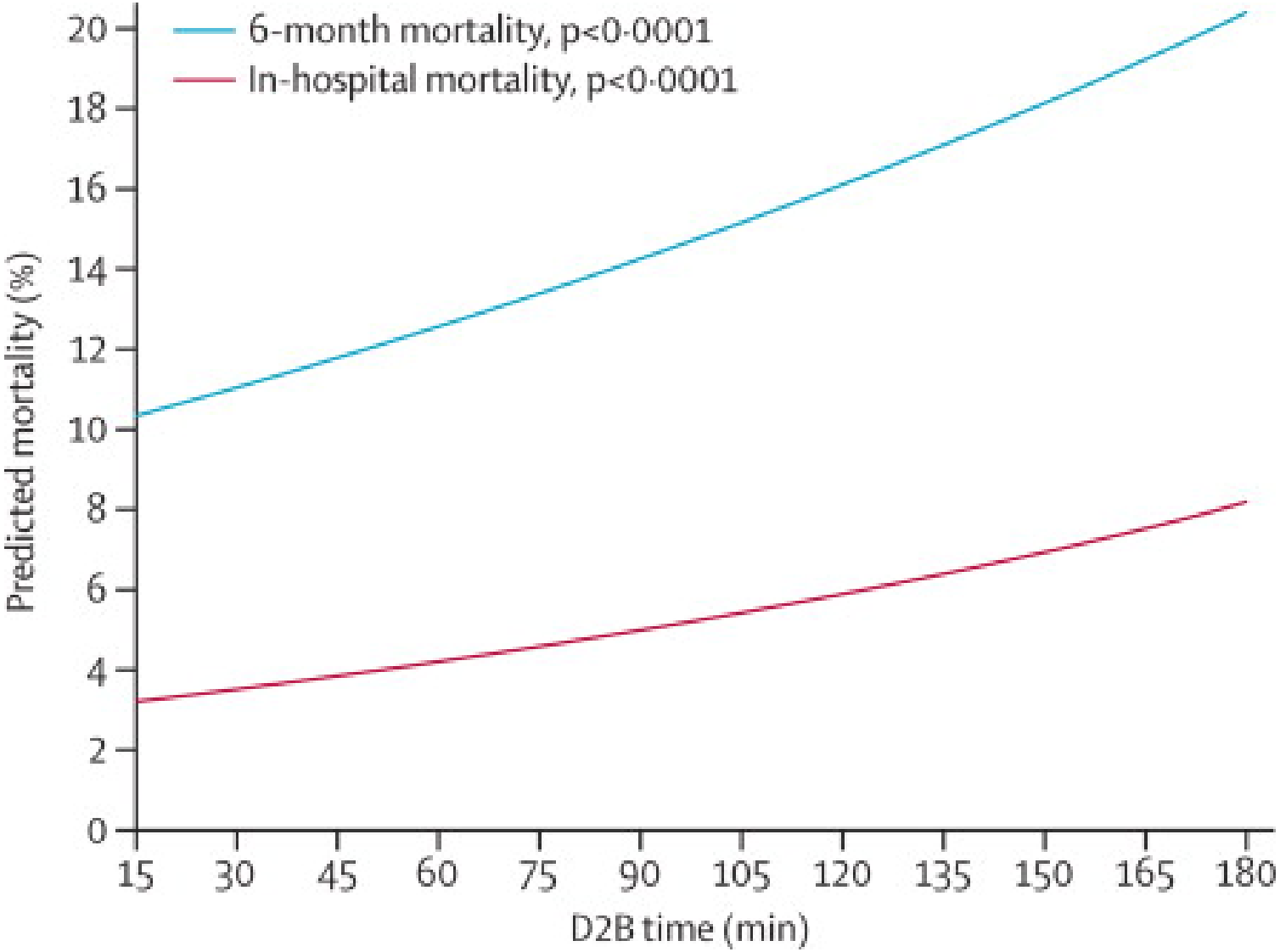
Brahmajee K Nallamothu , Sharon-Lise T Normand , Yongfei Wang , Timothy P Hofer , John E Brush Jr , John C Messeng...

Relation between observed in-hospital mortality and annual D2B times across years (solid boxes) and deciles of patient-specific D2B times within years (open boxes).



Brahmajee K Nallamothu , Sharon-Lise T Normand , Yongfei Wang , Timothy P Hofer , John E Brush Jr , John C Messeng...

Predicted in-hospital and 6-month mortality from the multilevel model over a range of patient-specific D2B times



Brahmajee K Nallamothu , Sharon-Lise T Normand , Yongfei Wang , Timothy P Hofer , John E Brush Jr , John C Messeng...

Results

- The individual-level relation between D2B times and mortality showed that decreases in patient-specific D2B times were consistently associated with decreased in-hospital mortality within each year of the study period
- The population-level relation showed little correlation between decreases in annual D2B times and mortality across years
- Longer delays in patient-specific D2B time were associated with increasing mortality over the years of the study
- An increase in mortality was noted across years in the last decile of D2B times (longer times):
  - in 2005 was 154 min with an unadjusted in-hospital mortality of 8·1%
  - in 2011 was 127 min with an unadjusted in-hospital mortality of 11·0%

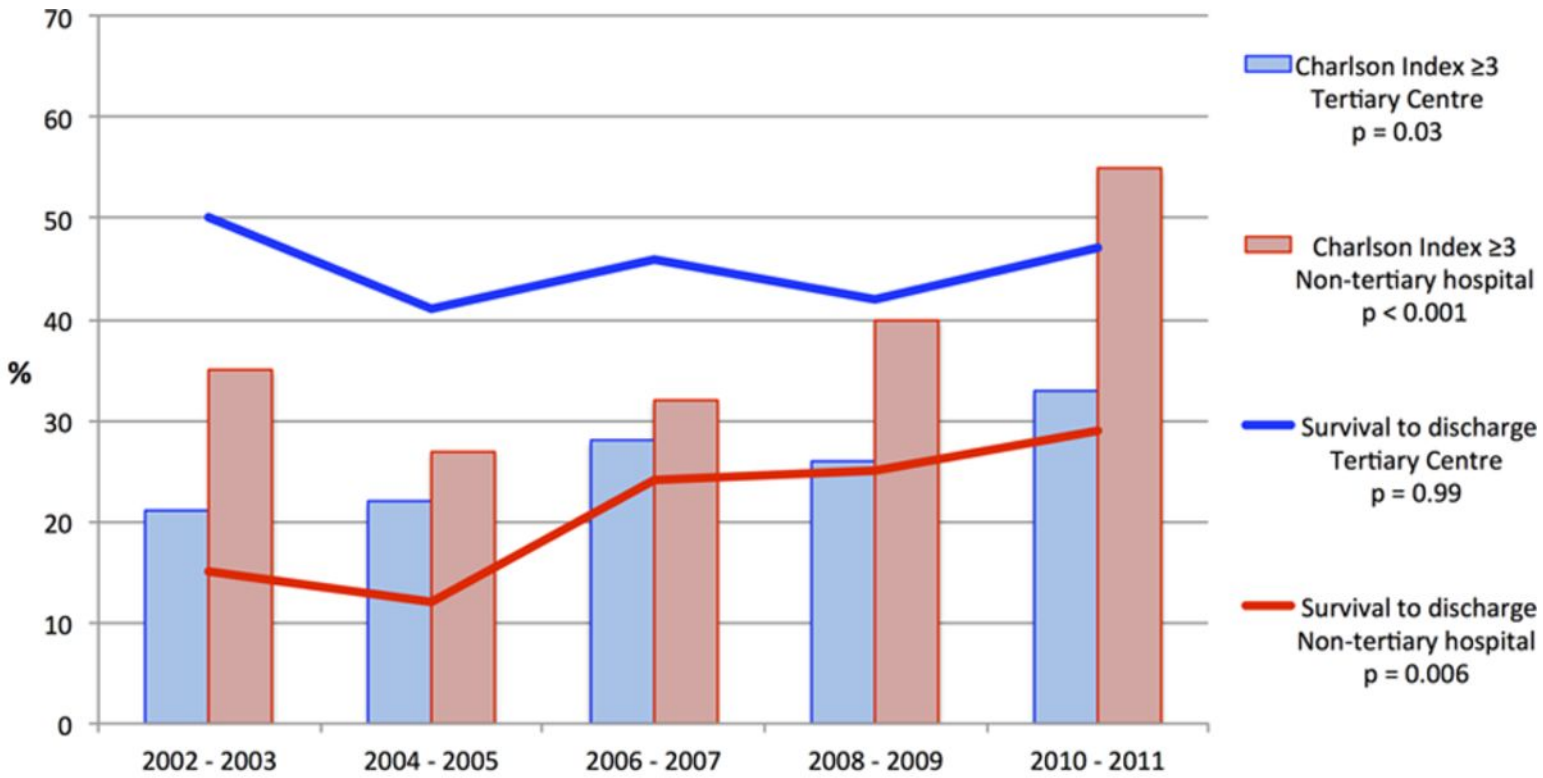
Reasons for Differences In Results

- Why have decreases in mortality over time not occurred in the pPCI population despite reductions in D2B time?
- Expanding use of pPCI
  - the annual number of pPCIs reported within this cohort of hospitals increased by >50% between 2005 and 2011
  - Estimates of pPCI use grew from 40% to 80% of patients with STEMI in the USA
  - While STEMI incidence decreased nationally
- Changing population of patients with STEMI undergoing the procedure

Conclusions

- The relationship between door to balloon time and mortality is complex and depends on:
  - Patient population:
    - Transfers
    - Cardiac arrest
  - Number and type of hospitals included
  - Changes in care over time
- Recent analyses indicate that Door to balloon time DOES matter!
- Better phrased, total time to reperfusion (direct presenter, EMS, transfers) is
  - Associated with lower mortality
  - Remains an appropriate goal for patients presenting with STEMI undergoing primary PCI
  - A key measure of performance, both at the hospital and the system

Temporal trends in overall survival to discharge, and comorbidity according to Charlson Comorbidity Index ≥3 in patients admitted to tertiary heart centers and nontertiary hospitals.



No. of OHCA-patients:

Tertiary centre	54	63	116	178	175
Non-tertiary	54	49	97	156	136

Helle Søholm et al. Circ Cardiovasc Qual Outcomes. 2015;8:268-276

American Heart Association.

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