Impact of regionalization of ST elevation myocardial infarction care on treatment times and outcomes for emergency medical services transported patients presenting to hospitals with percutaneous coronary intervention

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Introduction

- There is significant variability across the United States in the timely reperfusion and mortality of patients with ST-segment elevation myocardial infarction (STEMI).
- Most of this variation is related to differences in the organization and delivery of emergency cardiovascular care.

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Introduction

Building on the Accelerator-1 Project, we hypothesized that time to reperfusion could be further reduced with the addition of full-time regional coordinators supported by the study and ongoing engagement of national faculty mentorship.

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Objective

To increase the rate of timely coronary reperfusion by organizing coordinated STEMI care on a regional basis.

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Study Design

Recruitment of 12 Metropolitan Statistical Regions
2015 Q2 – 2016 Q1

↓

Gap Analyses - Strategic Planning - Regional Leadership Meetings
2015 Q2 – 2015 Q3

↓

Regional Education Intervention
2015 Q2 – 2016 Q1
Focus on pre-hospital activation and common regional plans for reperfusion

↓

12 Regions Met Study Requirements
Quarterly data review, ongoing mentorship, establish and execute protocols

↓

21,160 STEMI Patients with Symptoms <12 Hours
April 2015 – March 2017

10,730 STEMI Patients Presented by EMS Ambulance Directly to Primary PCI Hospitals
April 2015 – March 2017

Goal:
Increase the % patients reaching guideline goals

STUDY REQUIREMENTS
Regional Leadership
Common Protocols
Hospital participation in ARG
Enter all consecutive STEMI patients during the study period

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Study Sponsored Through Research and Educational Grants by:

- AstraZeneca
- The Medicines Company

Organization: Duke Clinical Research Institute
in Collaboration with The American Heart Association

Regional Leadership*

AHA National and Affiliate Leadership
Lori Hollowell
Zainab Magdon-Ismail
ReAnne Archangel
Loni Denne
Ron Loomis
Molly Perini
Alex Kuhn

12 US Metropolitan Regions

139 Primary PCI Hospitals*

971 EMS Agencies

Study Coordinating Center
DCRI

Central Organizing Committee
Christopher B. Granger, MD
James G. Jollis, MD
Mayme Lou Roettig, RN, MSN
Michele Bolles, American Heart Association

DCRI Project Team & Statistics
Lisa Monk, MSN, RN
Hussein Al-Khalidi, PhD
Shannon Doerfler, PhD
Jay Shavadia, MD
Ajar Kochar, MD
Matthew Cantania, JD

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Regional Leadership

Blue text indicates Regional Coordinator.

REGIONS	REGIONAL LEADERSHIP	AFFILIATION	AHA LEADERSHIP
Albany, NY	Edward Philbin, MD Michael Dailey, MD	Albany Medical Center	**Meghan Carnowski** **Tatum Weishaupt** Christine Rutan Zainab Magdon-Ismail
Cincinnati, OH (including northern Kentucky)	Timothy Smith, MD David Kong, MD	University of Cincinnati The Christ Hospital	**Jeffrey Gaylor** Alex Kuhn
Denver and Colorado State Expansion	Jeb Burchenal, MD Fred Severyn, MD	South Denver Cardiology University of CO Health System	**Cathleen Williams** **Julie Blakie** Loni Denne
Hartford, CT (including all Connecticut expansion)	Richard Kamin, MD C. Steven Wolf, MD	John Dempsey Hospital/UCONN Health Center Saint Francis Hospital & Medical Center	**Alana Davis** Lisa Bemben Zainab Magdon-Ismail
Houston, TX	James McCarthy, MD Todd Caliva Catherine Bissell & Darryl Pile	Memorial Hermann Texas Medical Center West Houston Medical Center SouthEast Texas Regional Advisory Council	**Larry Brown** Kate Ramos Loni Denne
Las Vegas, Clarke County, NV	Sean Ameli, MD Christian Young, MD	Ameli Heart Center Southern Nevada Health District Department of Emergency Medicine	**Aaron Leesch** Ron Loomis Rea Anne Arcangel
Lexington, KY (including all Eastern Kentucky)	Khaled M Ziada, MD Julia Martin, MD	University of Kentucky Kentucky EMS Medical Advisor	**Bud Cook** Alex Kuhn
Little Rock, Central AK	Mack Hutchison Aravind Rao, MD	MEMS CHI St Vincent/Heart Clinic Arkansas Metropolitan	**Vicki Meyer** Cammie Marti Loni Denne
New York City, NY	Jacqueline Tamis Holland, MD Norma Keller, MD Glenn Asaeda, MD	Mount Sinai St. Luke's NYC Health + Hospitals/Bellevue New York Fire Department	**Sheree Murphy** Molly Perini Zainab Magdon-Ismail
Portland, OR	Sandra Lewis, MD Saurabh Gupta, MD Jonathan Jui, MD Mohamud Daya, MD	Legacy Health Oregon Health & Science University (OSHU) OSHU, Multnomah County EMS OHSU, Tualatin Valley Fire & Rescue, Forest Grove Fire & Rescue, Banks Fire District 12, Washington County	**Amber Hoover** Ron Loomis Rea Anne Arcangel
Seattle-Tacoma, WA	Tom Rea, MD Michael Sayre, MD Mickey Eisenberg, MD	University of Washington (UW) UW UW	**Jamie Emert** Elizabeth Peterson Rea Anne Arcangel
Tidewater (Including Norfolk and Virginia City, Virginia)	Monica Reed Sherwood Moore Shannon Ferguson Nelle Linz, MD	Bon Secours Heart & Vascular Chesapeake Regional Med Center Sentara Naval Medical Center Portsmouth	**Paula Feather** John Dugan

Organization
National Faculty

PHYSICIAN FACULTY

Peter Berger, MD—Interventional Cardiologist
New York City, New York

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B. Hadley Wilson, MD—Interventional Cardiology
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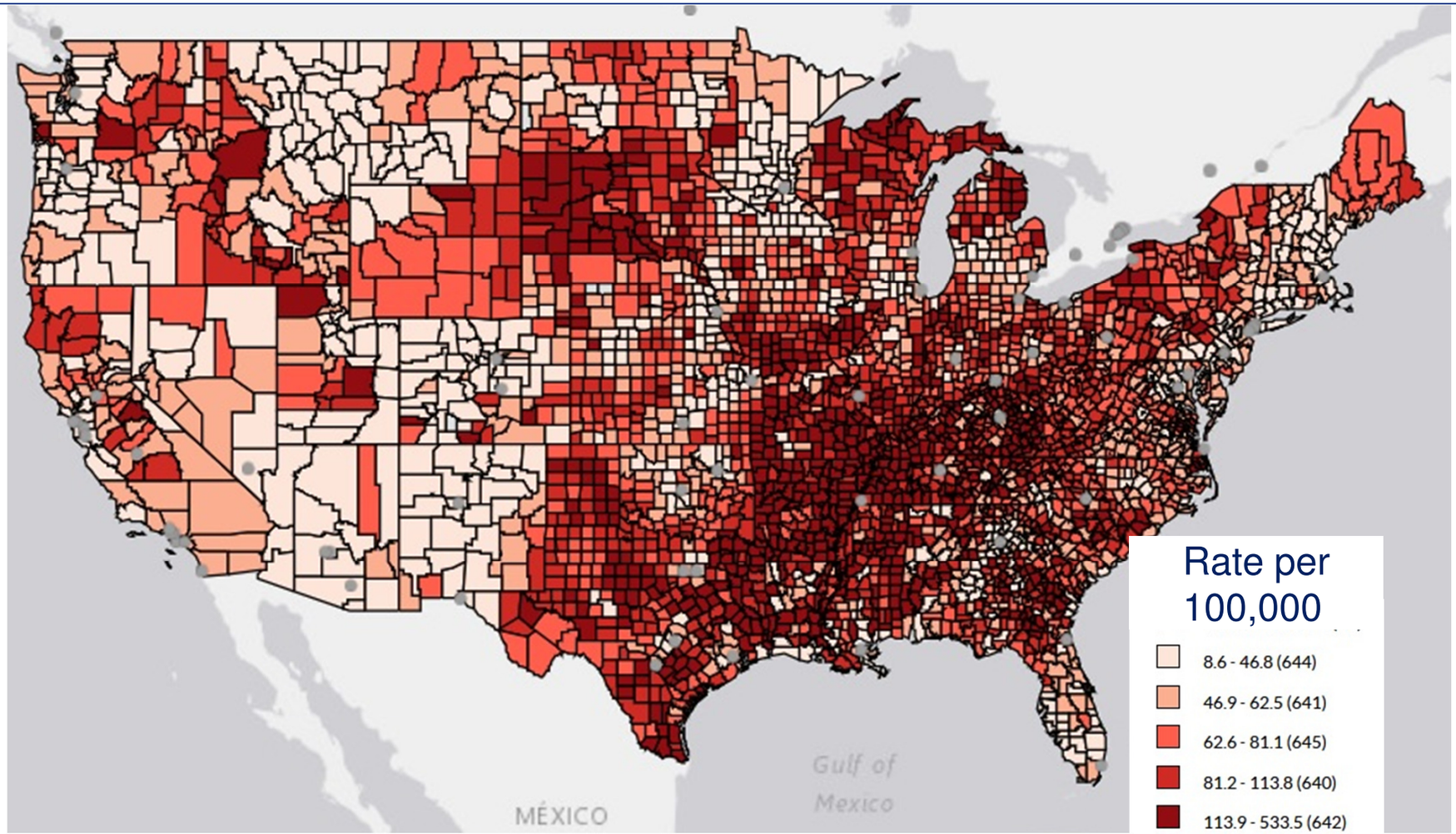
Acute MI Deaths per 100,000, 35+, 2013–2015



Interactive Atlas of Heart Disease and Stroke, Department of Health and Human Services, Centers for Disease Control and Prevention; Atlanta, GA:2017 Cited 15 October 2017 https://nccd.cdc.gov/DHDSPAtlas/?state=County&ol=[10]

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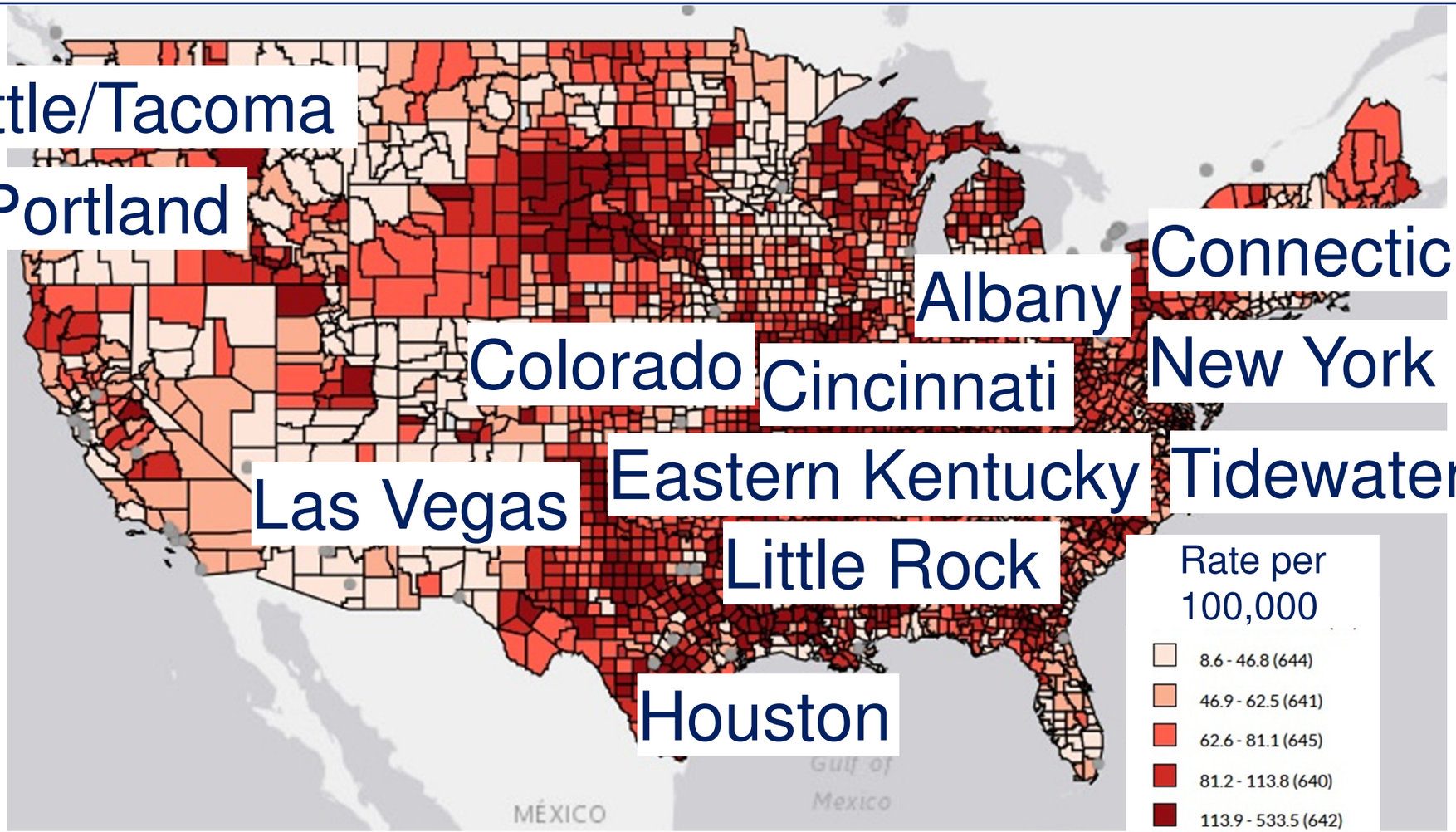
ACCELERATOR-2 Regions

Acute MI Deaths per 100,000, 35+, 2013–2015

STEMI Accelerator 2



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Operations Manual

STEMI Accelerator 2

Regional Systems ACCELERATOR

Duke Clinical Research Institute

American Heart Association. | MISSION: LIFELINE

Table of Contents

Optimal system specifications by point of care

- EMS
- Non-PCI and PCI ED
- Transfer
- Catheterization lab
- Other system issues—payers, regulations
- Choice of PCI or lytic reperfusion regimens

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Baseline Patient Characteristics by Arrival
2015 Q2 – 2017 Q1 (all study quarters)

	All EMS	Baseline	Final	P baseline vs. final
Number	6,695	974	972	
Age (median)	61	61	61	NS
Female	27%	29%	26%	NS
No insurance	9.6%	9.1%	9.1%	NS

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Baseline Patient Characteristics by Arrival

	Baseline	Final	P baseline vs. final
Diabetes	26%	25%	NS
On presentation:			
Cardiac arrest	6%	5%	NS
Shock	6%	6%	NS

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Baseline Patient Characteristics by Arrival

	Baseline	Final	P baseline vs. final
Symptom onset to FMC (median min.)	50	50	NS
Systolic BP	139	138	NS
PCI	100%	100%	NS

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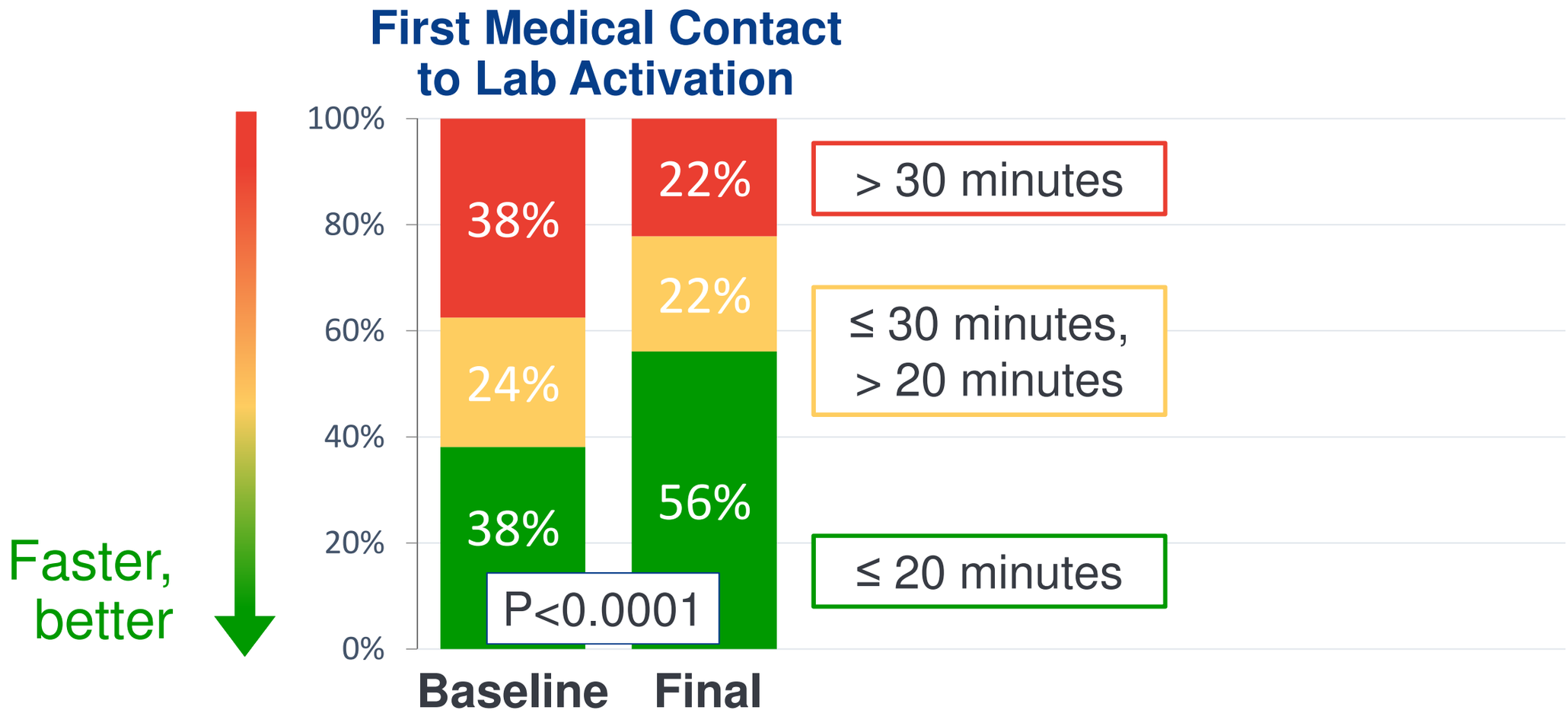
Treatment Times



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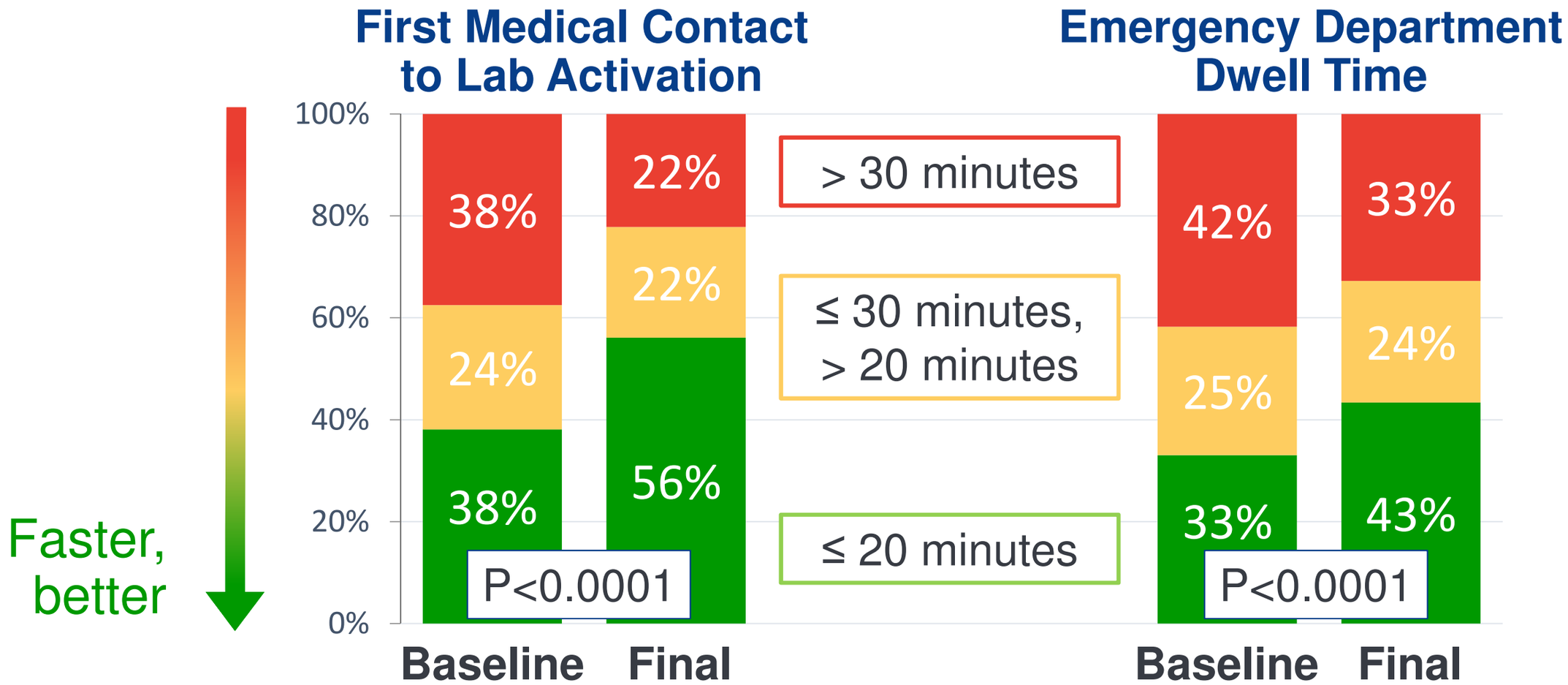

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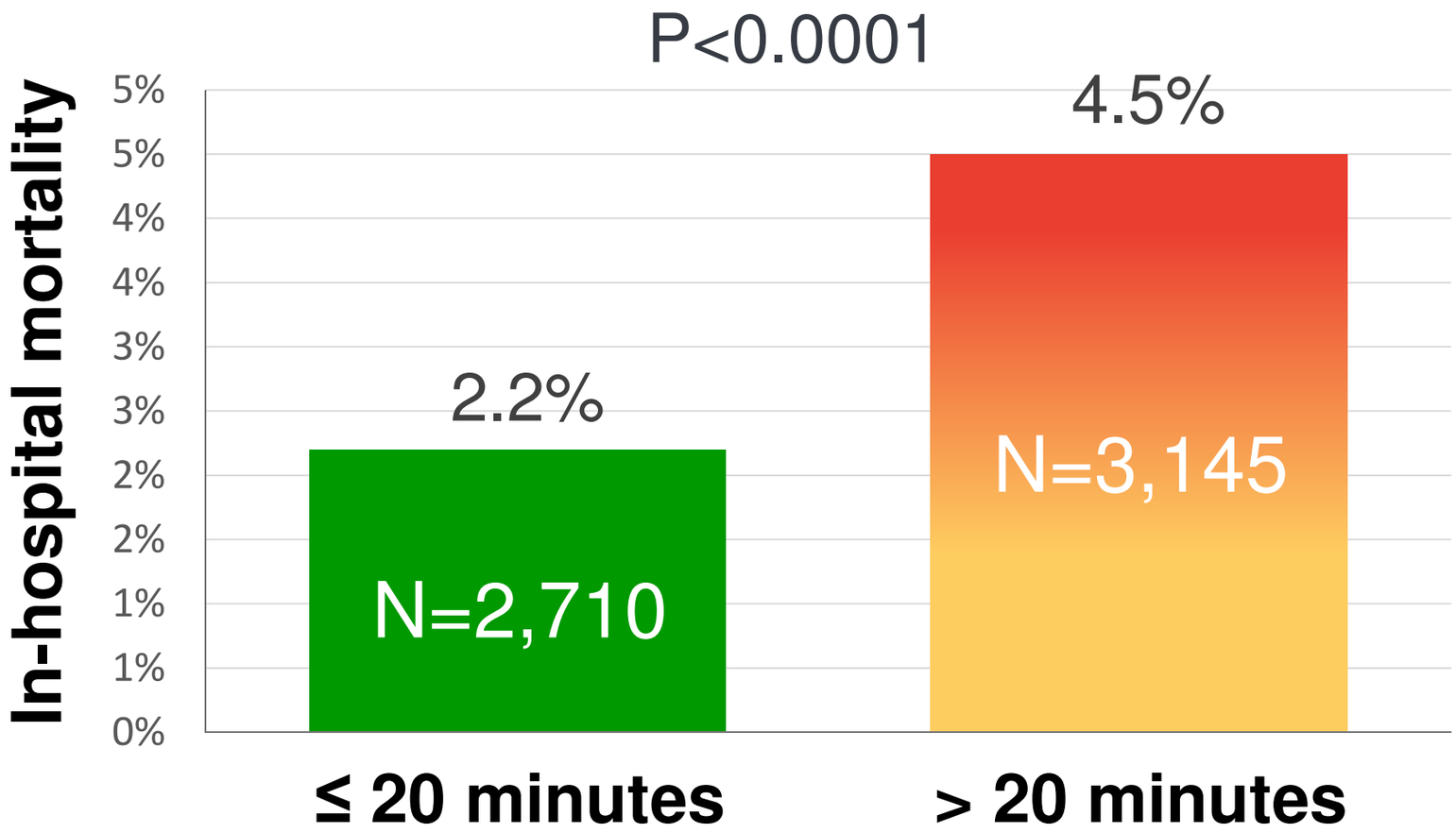
In-hospital Mortality by First Medical Contact to Catheterization Laboratory Activation Time



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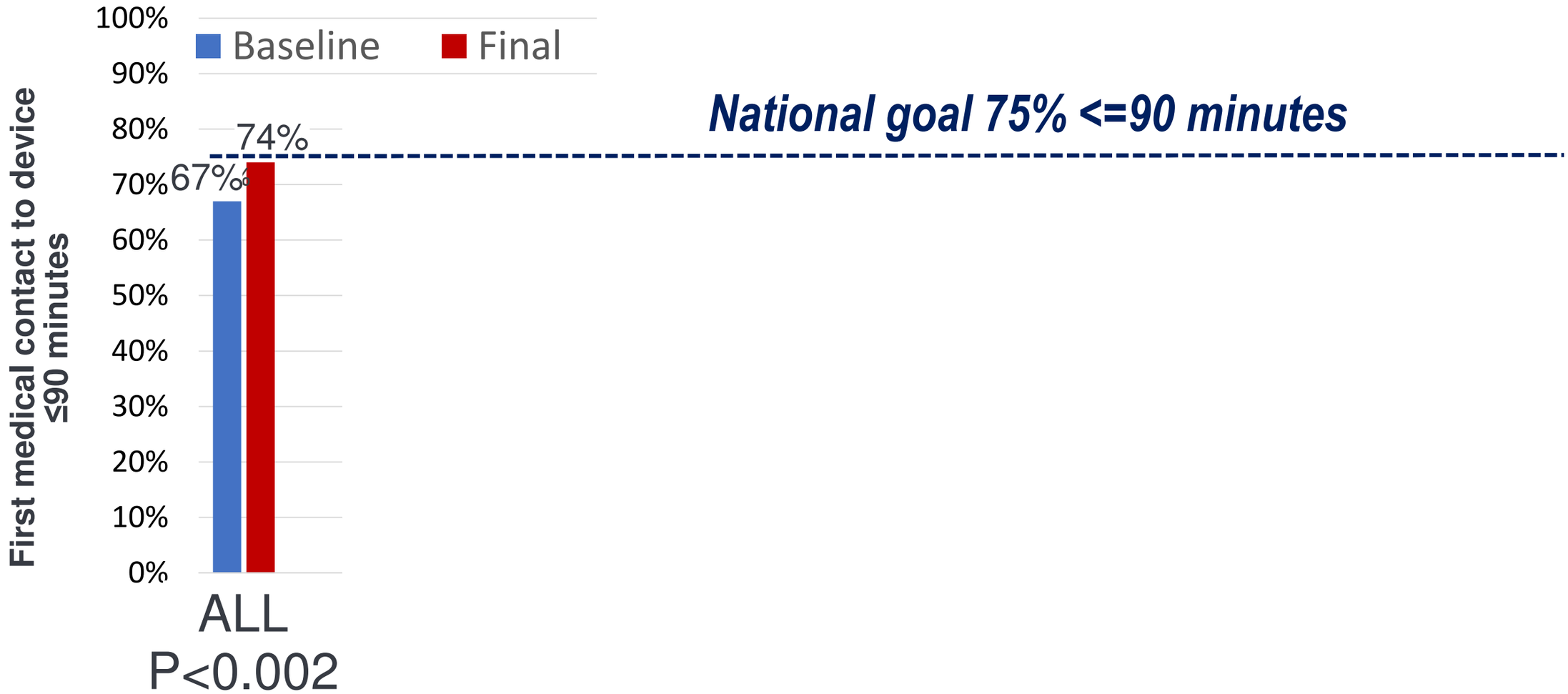
Treatment Times

First medical contact to device ≤90 minutes, all regions



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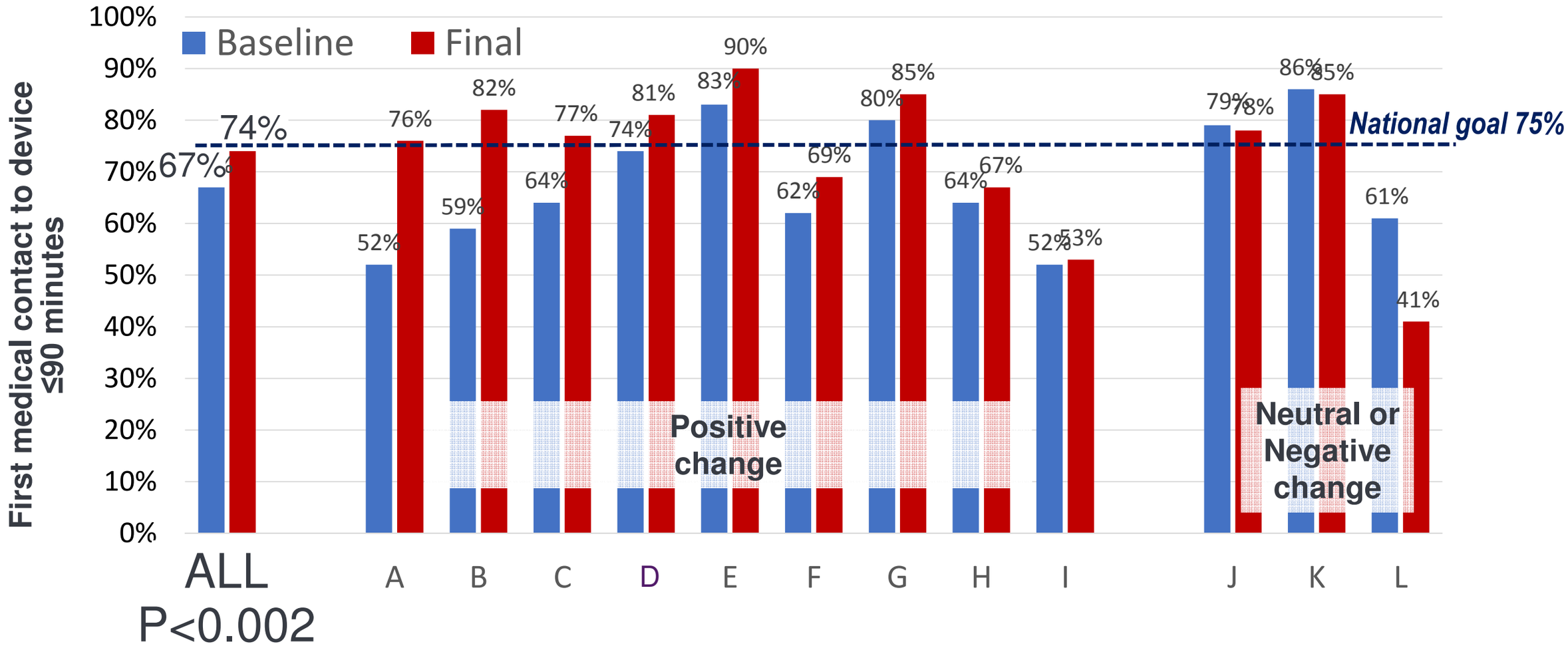
Treatment Times

First medical contact to device ≤90 minutes by region, baseline and final quarters, sorted by descending order of changes



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In-hospital outcomes
Baseline vs. Final

	Baseline	Final	P baseline vs. final
Major bleeding	3.4%	4.2%	NS
Stroke	0.8%	0.3%	NS
Cardiogenic shock	7.7%	7.6%	NS
Congestive heart failure	7.4%	5.0%	0.03
In-hospital death	4.4%	2.3%	0.008

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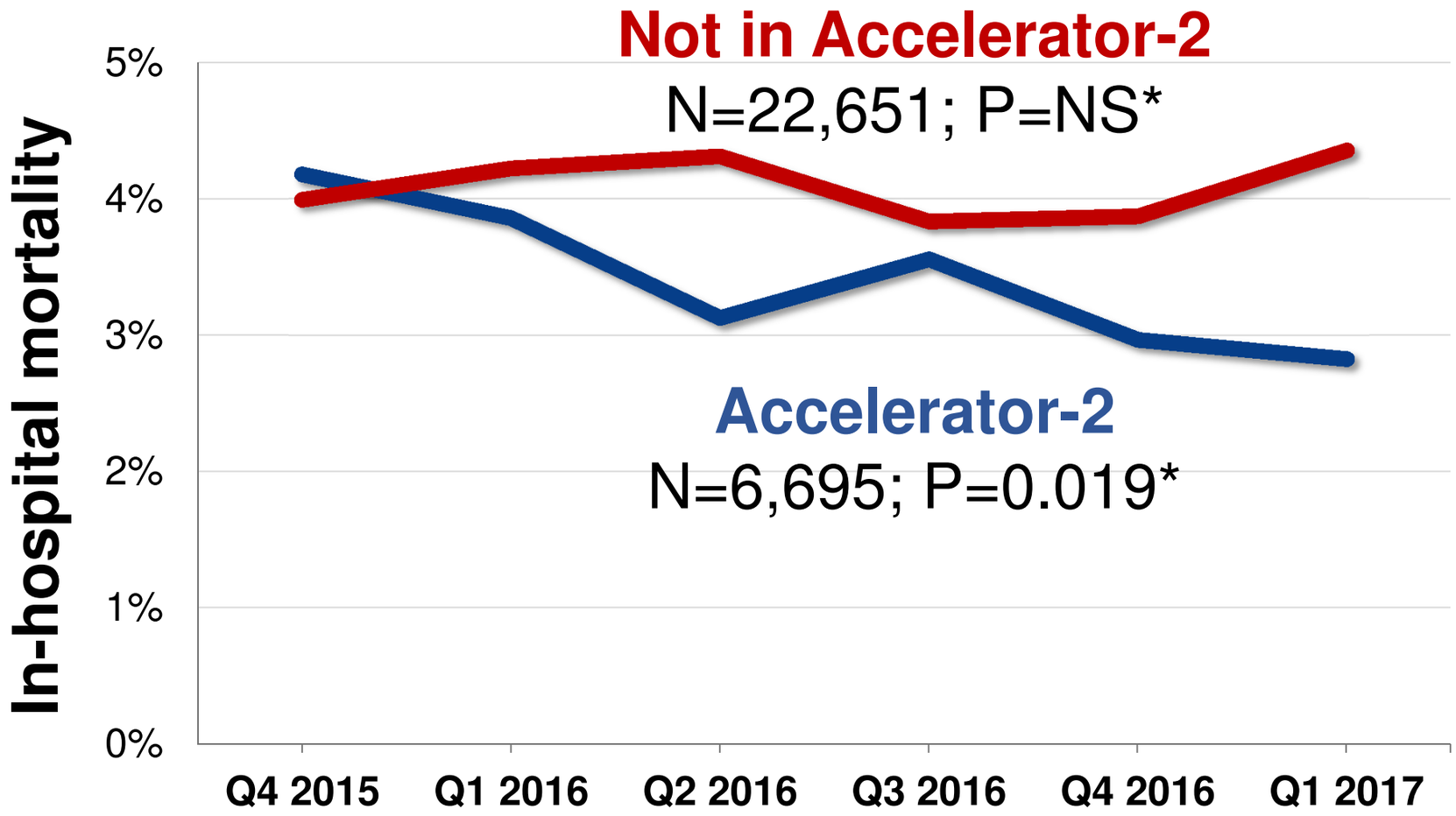
In-hospital Mortality



*Adjusted P-value for trend

Mission: Lifeline Participating U.S. Hospitals

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Conclusions

Organization of care among EMS and hospitals in 12 regions was associated with statistically and clinically significant reductions in time to reperfusion in patients with STEMI.

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Conclusions

The relative success of this intervention compared to prior work is likely related to ongoing support by neutral mentors and full time regional coordinators.

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Conclusions

This enhanced organization corresponded with statistically significant reductions in morbidity and mortality among patients with STEMI,

and the reduction in mortality was independent of temporal trends among other hospitals participating in Mission: Lifeline during the same time period.

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Conclusions

The relatively modest improvements in treatment time compared to marked declines in mortality suggests that other factors related to regional organization contributed to better outcomes.

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Conclusions

This generalizable model of emergency cardiovascular care including regional protocols, measurement and feedback in a single common national registry, and ongoing support by regional coordinators has the potential to optimize treatment and outcomes of STEMI patients if broadly applied.

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