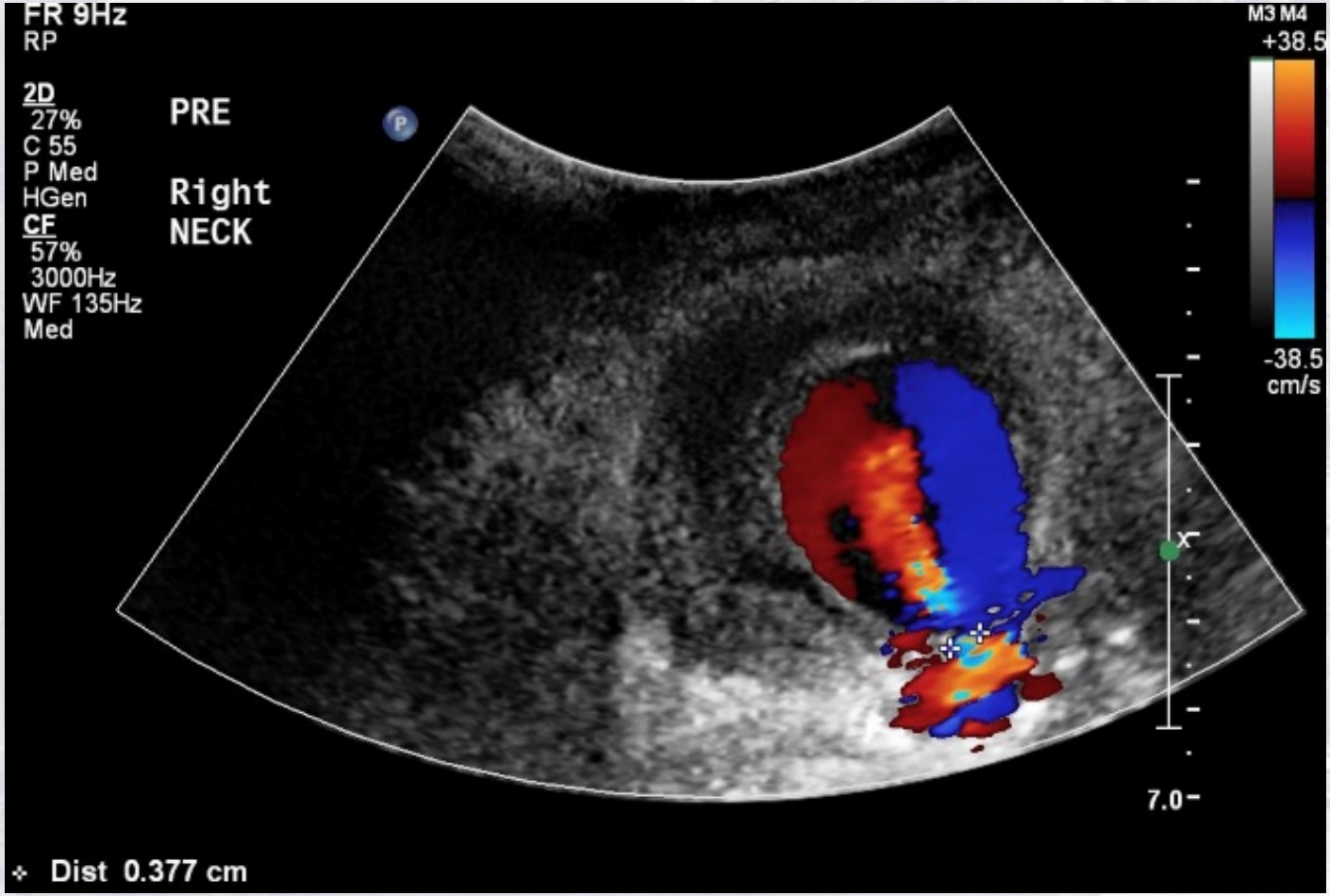
Allina Health
ABBOTT NORTHWESTERN HOSPITAL

MINNEAPOLIS HEART INSTITUTE

Minneapolis Heart Institute® at Abbott Northwestern Hospital

Radial vs Femoral

Or
Really?
Is that still a thing?


FR 9Hz
RP
2D
27%
C 55
P Med
HGen
CF
57%
3000Hz
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PRE
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NECK
M3 M4
+38.5
-38.5
cm/s
7.0
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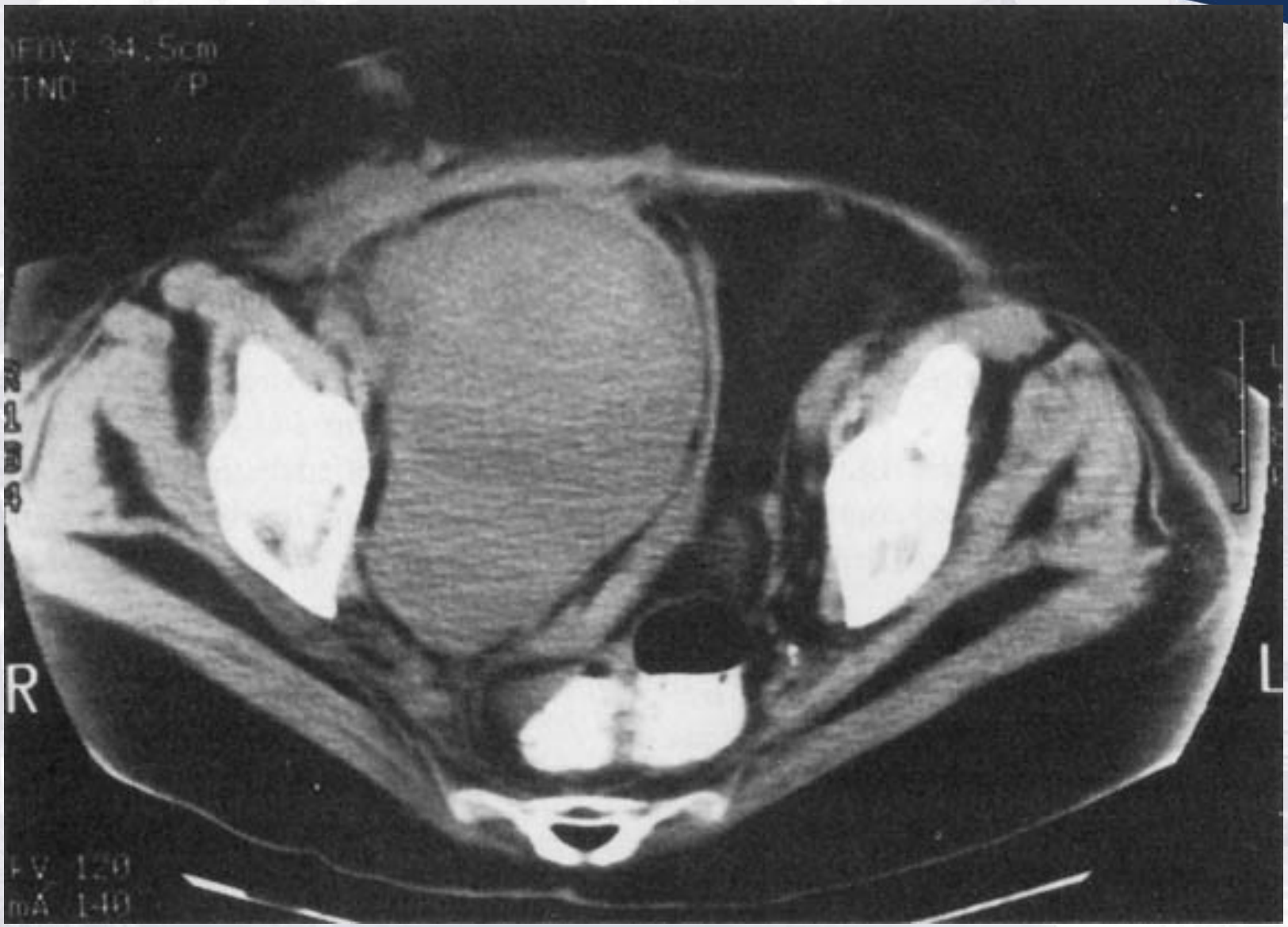
b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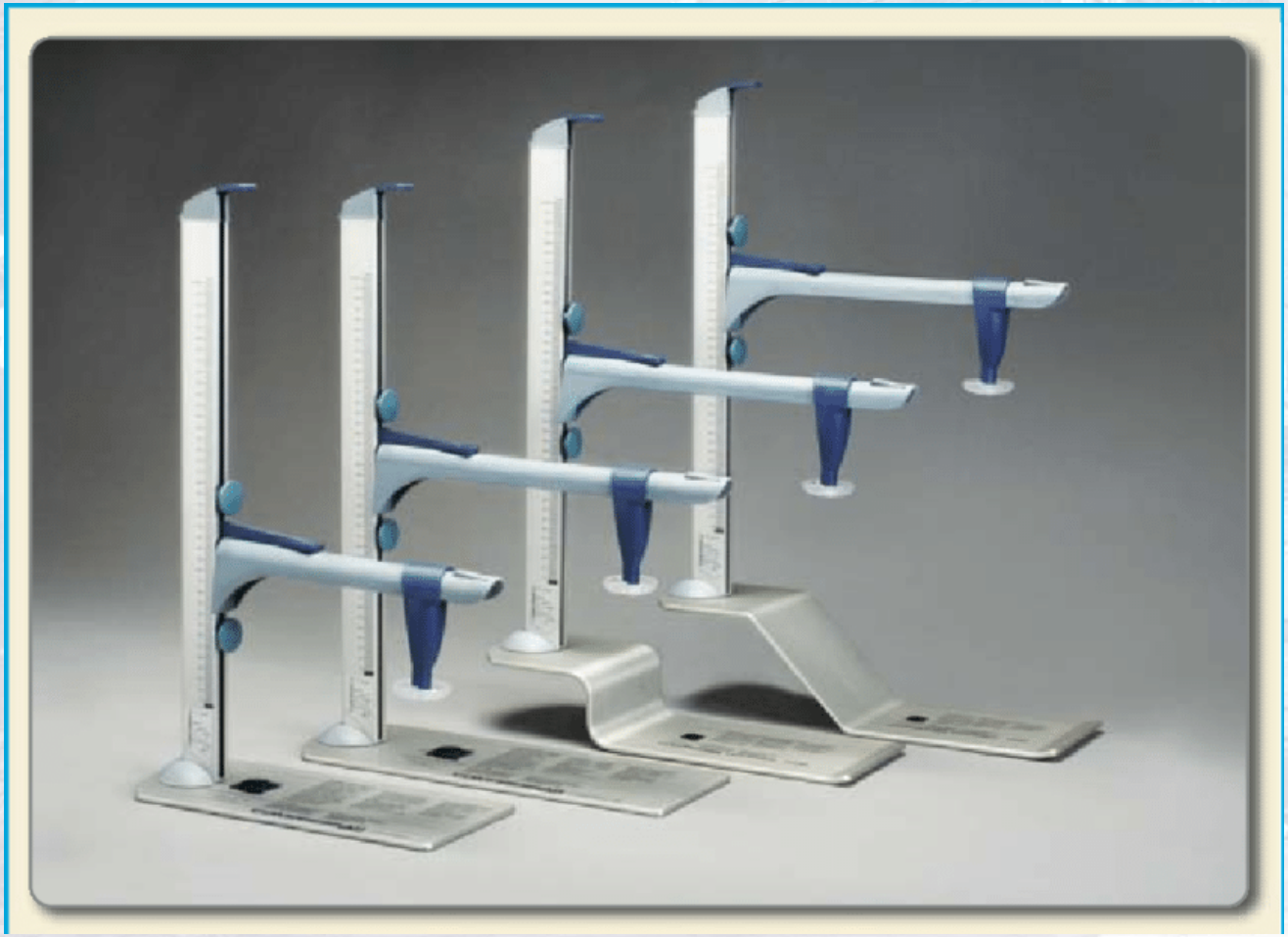


SCAI QIT
Quality Improvement Toolkit

Quality Initiatives to Prevent and Manage Major Femoral Access-Site Bleeding

This Tip of the Month summarizes effective strategies for the prevention and management of major femoral bleeding following percutaneous coronary intervention (PCI).

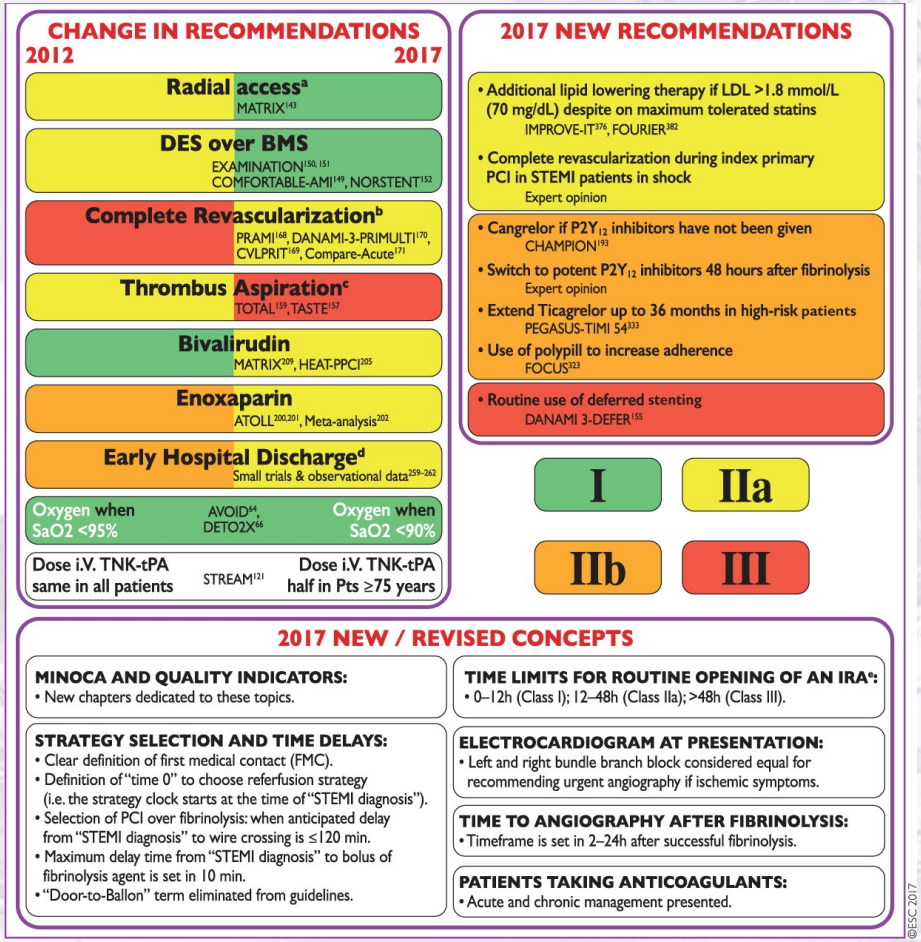
Read the Tip

For more information on quality improvement in the cath lab, **check out our QI toolkit**, including modules on procedural quality, facility and environmental issues, and care coordination.

SCAI Quality Measures for Prevention of Major Femoral Bleeding:

1st recommendation:

Use radial instead of femoral access for PCI, if possible, especially in patients at high risk of bleeding, including ACS. In the RIVAL trial, transradial PCI was associated with a 64% reduction in access-site bleeding (ACUITY trial definition) compared with transfemoral PCI in patients with both non-STEMI and STEMI.



Eur Heart J, Volume 39, Issue 2, 07 January 2018, Pages 119–177, https://doi.org/10.1093/eurheartj/ehx393

Bleeding complications have decreased but are still bad!

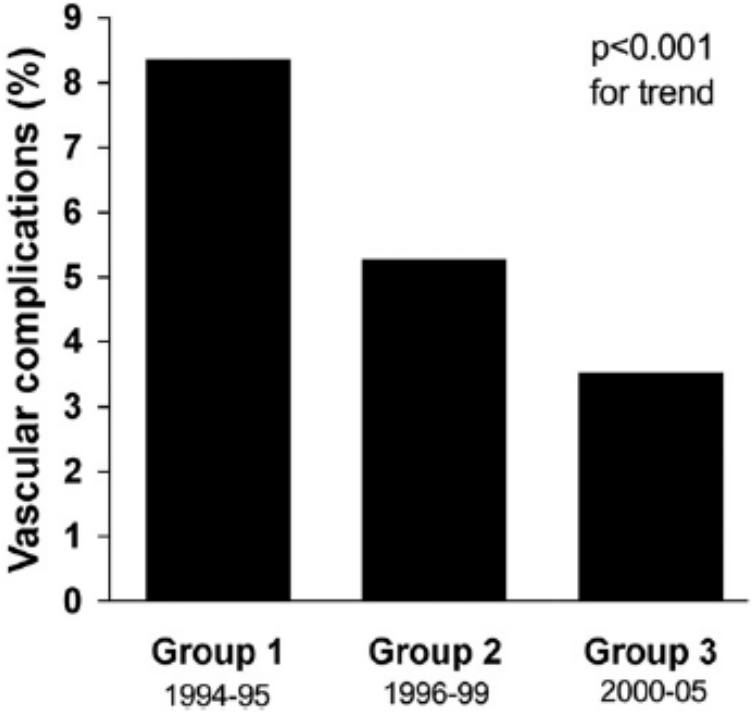
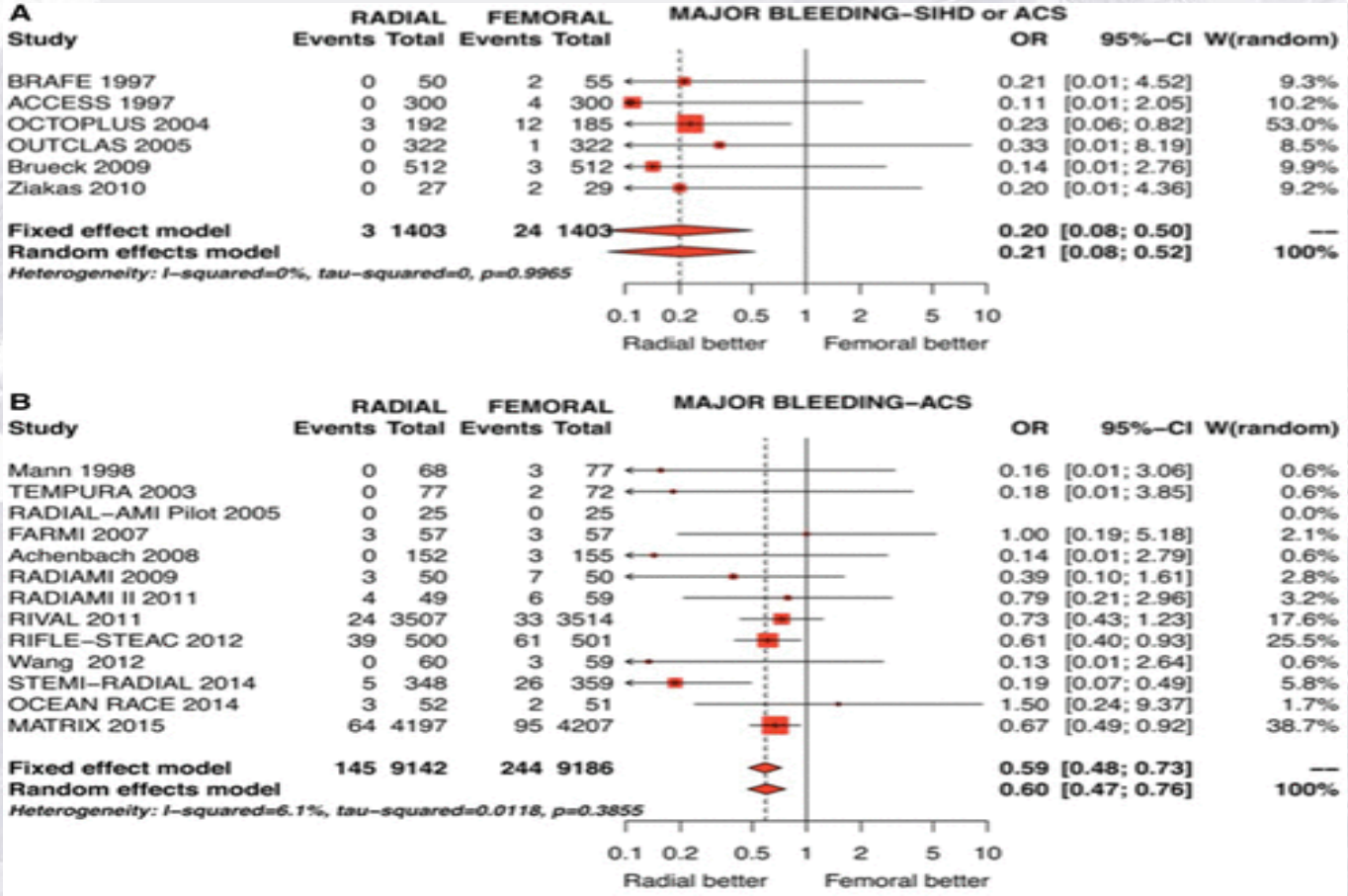


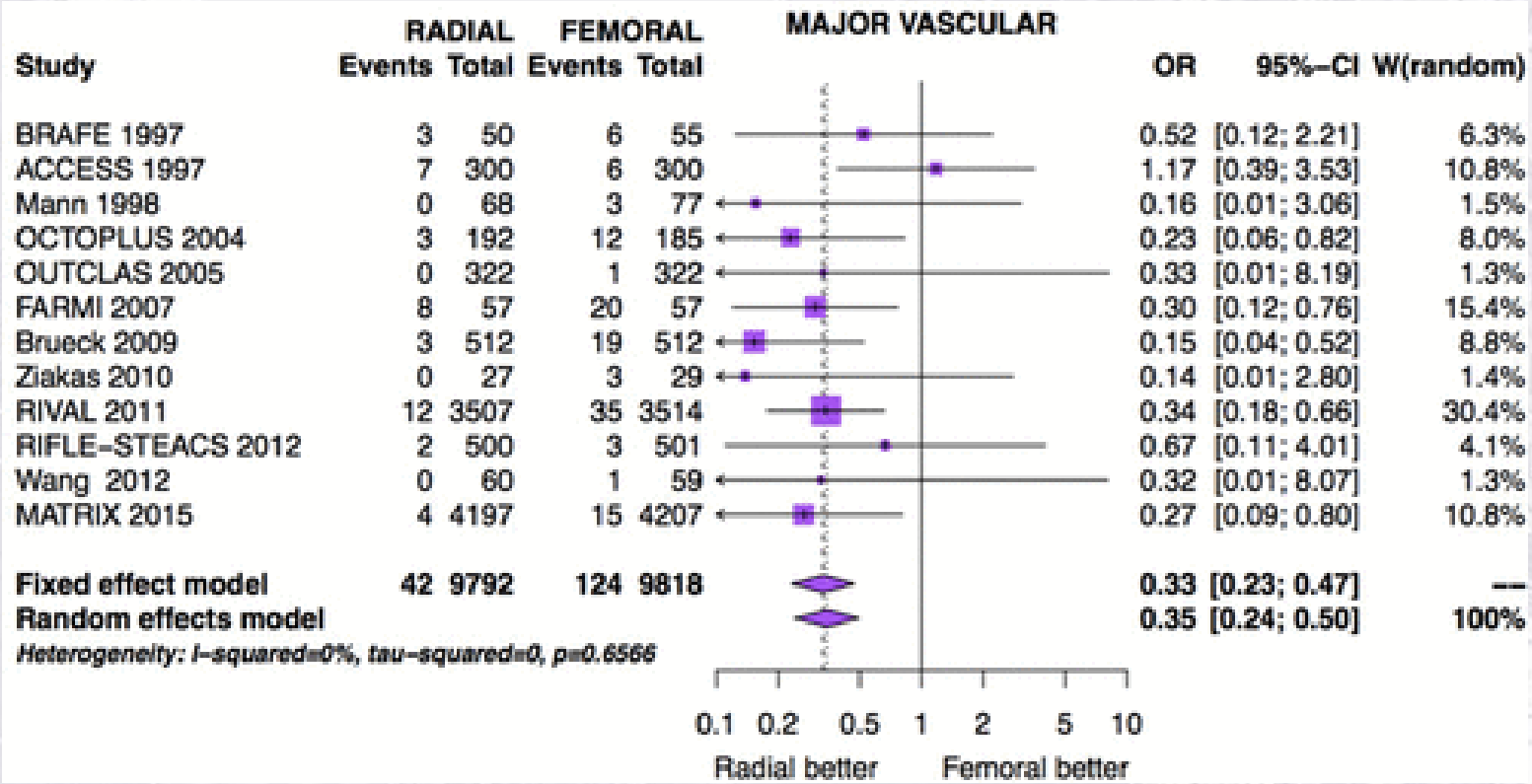
Figure 1. Changing Incidence of Major Femoral Bleeding Complications From 1994 to 2005

The incidence of major femoral bleeding declined significantly from the earliest (8.4%) to the contemporary time period (3.5%).

JACC CI 2008;1:202-9



Peter J. Mason. Circulation: Cardiovascular Interventions. An Update on Radial Artery Access and Best Practices for Transradial Coronary Angiography and Intervention in Acute Coronary Syndrome: A Scientific Statement From the American Heart Association, Volume: 11, Issue: 9, DOI: (10.1161/HCV.0000000000000035)



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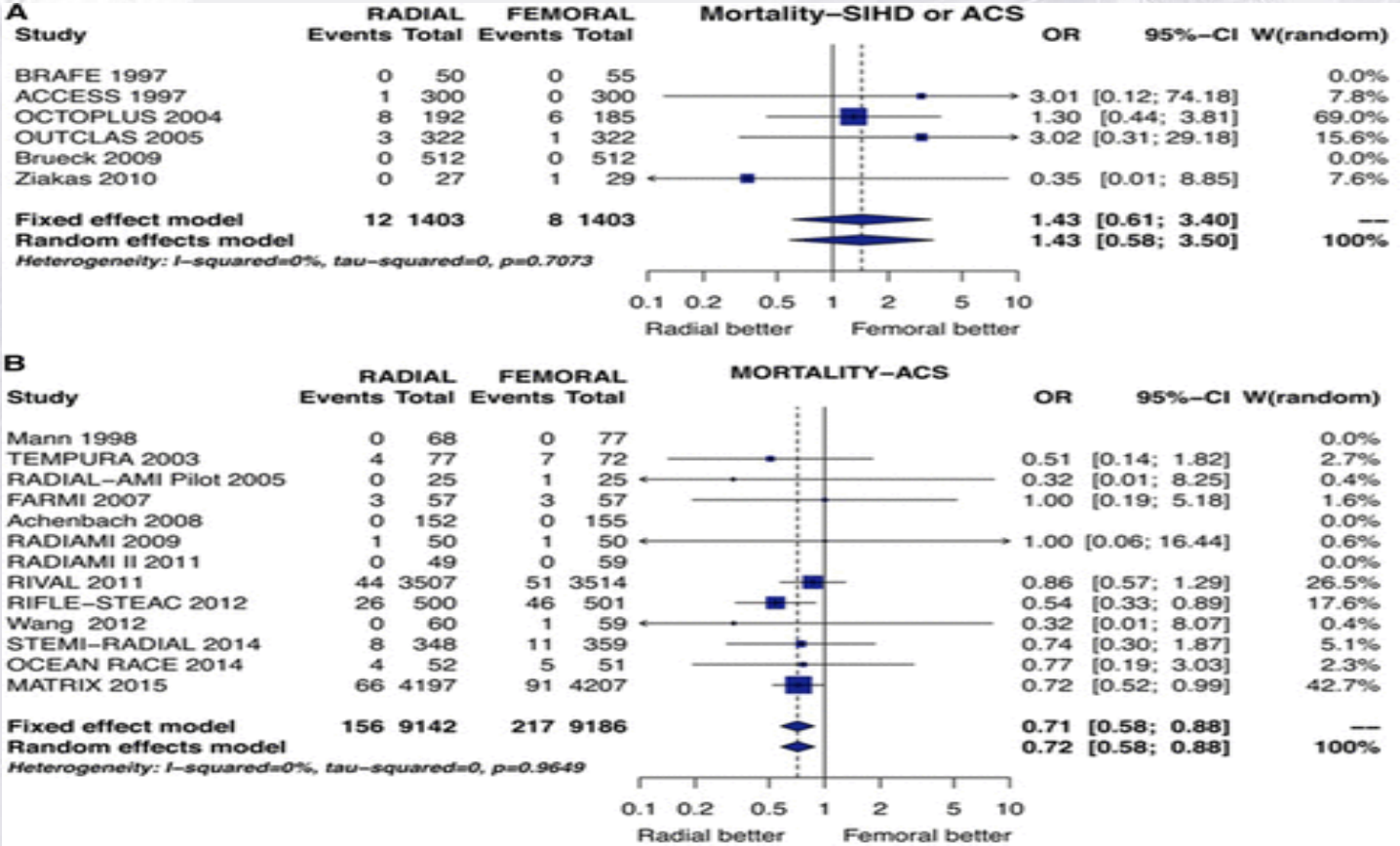


Peter J. Mason. Circulation: Cardiovascular Interventions. An Update on Radial Artery Access and Best Practices for Transradial Coronary Angiography and Intervention in Acute Coronary Syndrome: A Scientific Statement From the American Heart Association, Volume: 11, Issue: 9, DOI: (10.1161/HCV.0000000000000035)

Mortality is lower with radial access in STEMI

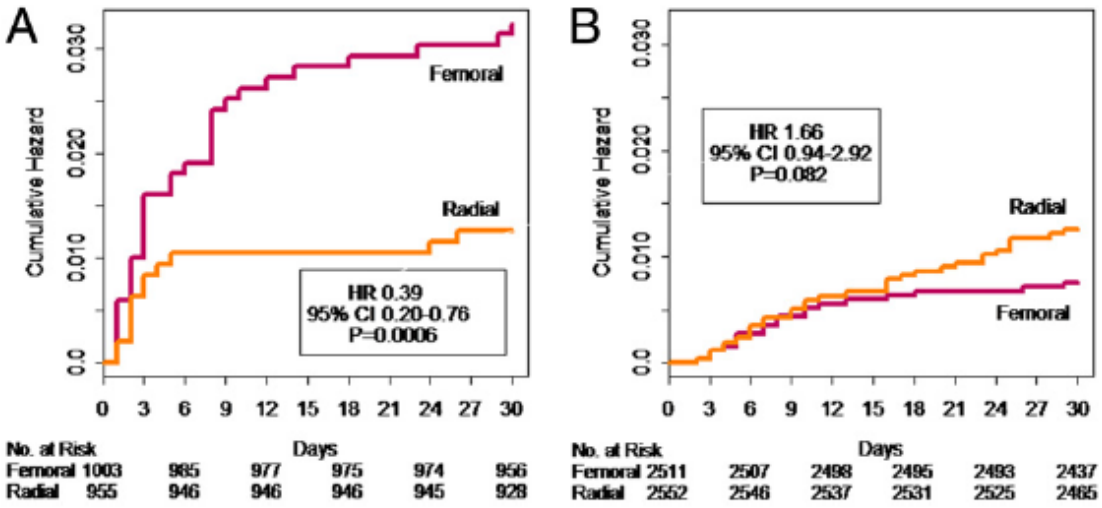
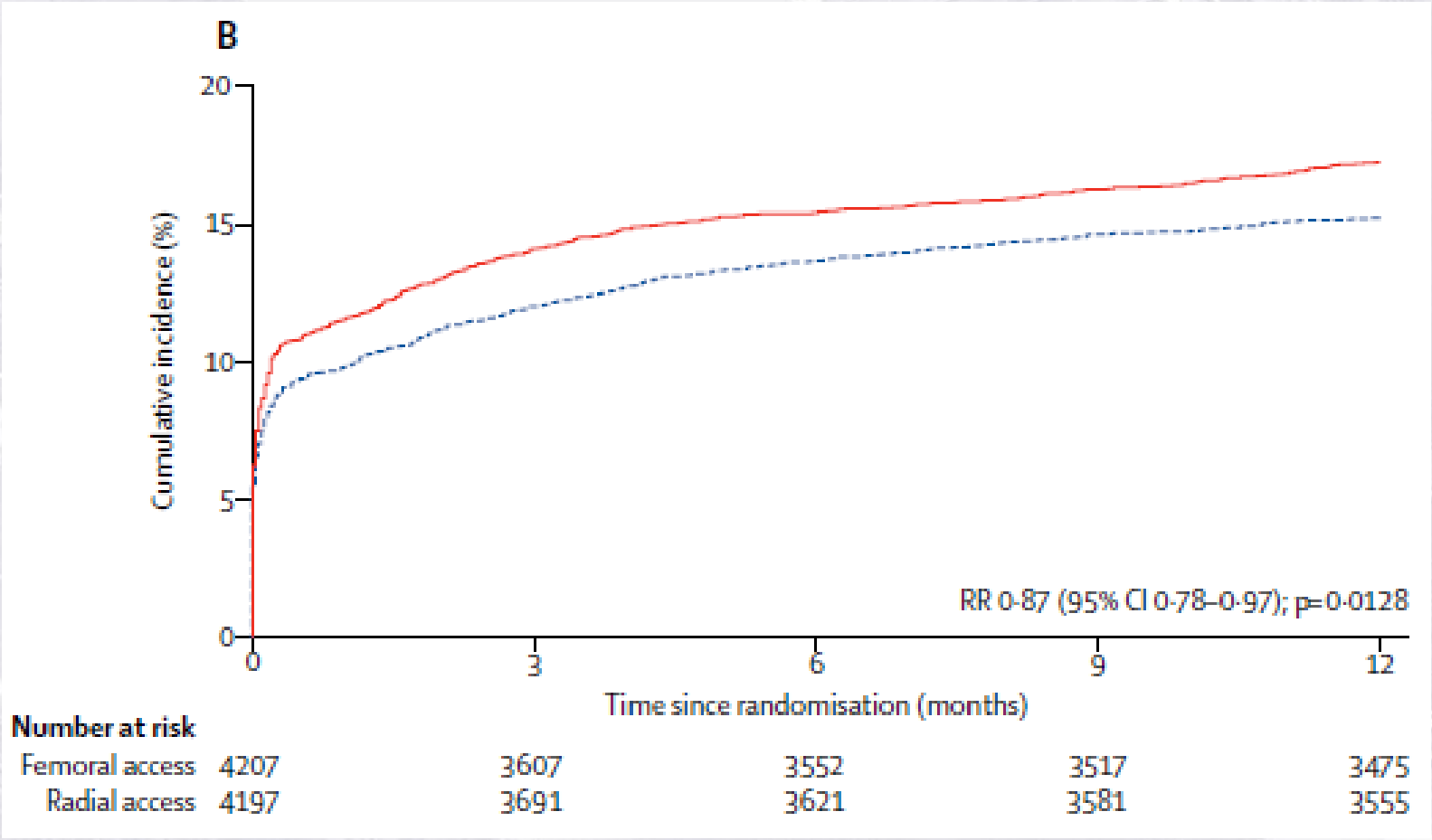


Figure 2 **Death In Patients With STEMI and NSTEACS**

For death, there was a significant interaction between access site allocation (radial or femoral) and acute coronary syndrome type (STEMI or NSTEACS) with an interaction p value of 0.001. In patients with STEMI **(A)**, radial artery access reduced the mortality compared with femoral artery access, whereas in patients with NSTEACS **(B)**, there was no significant difference in mortality between radial and femoral artery access. Abbreviations as in Figure 1.

Rival Trial; Mehta et al J AM Coll Cardiol 2012;60:2490-9

Matrix: improved outcomes with radial



Lancet 2018;392:835-848

Most common rationalization for using femoral access

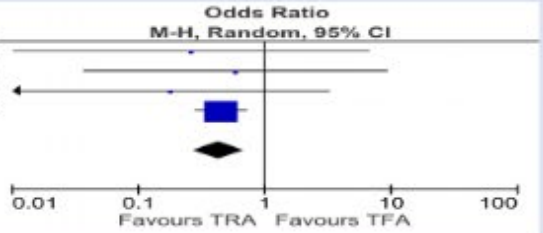
" It's better for high risk or complex interventions"

Central Illustration: Bleeding Outcomes For LM PCI- Radial versus Femoral access

(A) Major Bleeding

Study or Subgroup	TRA Events	TRA Total	TFA Events	TFA Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Tomassini et al.	0	27	1	22	2.0%	0.26 [0.01, 6.72]	2013
Gao et al.	1	508	1	297	2.8%	0.58 [0.04, 9.37]	2014
Chung et al.	0	161	5	322	2.6%	0.18 [0.01, 3.25]	2015
Kinnaird et al.	29	4292	39	2611	92.6%	0.45 [0.28, 0.73]	2018
Total (95% CI)		**4988**		**3252**	**100.0%**	**0.44 [0.27, 0.69]**	
Total events	30		46				

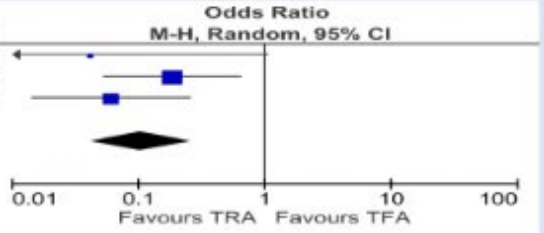
Heterogeneity: Tau² = 0.00; Chi² = 0.52, df = 3 (P = 0.91); I² = 0%
Test for overall effect: Z = 3.50 (P = 0.0005)



(B) Access Site Bleeding

Study or Subgroup	TRA Events	TRA Total	TFA Events	TFA Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Hsueh et al.	0	116	1	15	7.9%	0.04 [0.00, 1.07]	2008
DeMaria et al.	3	244	14	221	52.6%	0.18 [0.05, 0.65]	2015
Kinnaird et al.	2	4292	20	2611	39.5%	0.06 [0.01, 0.26]	2018
Total (95% CI)		**4652**		**2847**	**100.0%**	**0.11 [0.04, 0.26]**	
Total events	5		35				

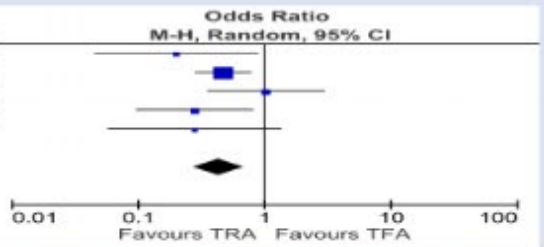
Heterogeneity: Tau² = 0.00; Chi² = 1.64, df = 2 (P = 0.44); I² = 0%
Test for overall effect: Z = 4.83 (P < 0.00001)



(C) Any Bleeding

Study or Subgroup	TRA Events	TRA Total	TFA Events	TFA Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Yang et al.	2	353	13	468	8.9%	0.20 [0.04, 0.89]	2010
Gao et al.	29	508	34	297	50.6%	0.47 [0.28, 0.79]	2014
Almudarra et al.	5	1602	10	3266	16.2%	1.02 [0.35, 2.99]	2014
Chung et al.	4	161	27	322	16.4%	0.28 [0.10, 0.81]	2015
Gili et al.	2	177	7	177	7.9%	0.28 [0.06, 1.36]	2017
Total (95% CI)		**2801**		**4530**	**100.0%**	**0.43 [0.27, 0.69]**	
Total events	42		91				

Heterogeneity: Tau² = 0.04; Chi² = 4.57, df = 4 (P = 0.33); I² = 12%
Test for overall effect: Z = 3.56 (P = 0.0004)



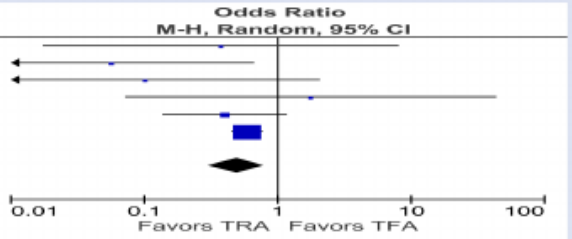
WILEY

In-Hospital Outcomes For LM PCI

(A) In-Hospital Mortality

Study or Subgroup	TRA Events	TRA Total	TFA Events	TFA Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Ziakas et al.	0	27	2	53	2.4%	0.37 [0.02, 8.08]	2004
Hsueh et al.	1	116	2	15	3.6%	0.06 [0.00, 0.67]	2008
Tomassini et al.	0	27	3	22	2.4%	0.10 [0.00, 2.07]	2013
Gao et al.	1	508	0	297	2.2%	1.76 [0.07, 43.31]	2014
DeMaria et al.	5	244	11	221	16.4%	0.40 [0.14, 1.17]	2015
Kinnaird et al.	105	4292	107	2611	73.1%	0.59 [0.45, 0.77]	2018
Total (95% CI)		**5214**		**3219**	**100.0%**	**0.49 [0.31, 0.79]**	
Total events	112		125				

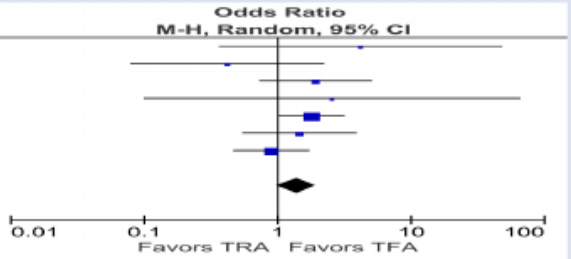
Heterogeneity: $Tau^2 = 0.06$; $Chi^2 = 5.59$, df = 5 (P = 0.35); $I^2 = 11\%$
Test for overall effect: Z = 2.92 (P = 0.004)



(B) In-Hospital MI

Study or Subgroup	TRA Events	TRA Total	TFA Events	TFA Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Ziakas et al.	2	27	1	53	2.1%	4.16 [0.36, 48.08]	2004
Hsueh et al.	7	116	2	15	4.4%	0.42 [0.08, 2.23]	2008
Yang et al.	10	353	7	468	13.0%	1.92 [0.72, 5.10]	2010
Tomassini et al.	1	27	0	22	1.2%	2.55 [0.10, 65.66]	2013
Gao et al.	50	508	17	297	38.1%	1.80 [1.02, 3.18]	2014
Gili et al.	10	177	7	177	12.7%	1.45 [0.54, 3.91]	2017
Kinnaird et al.	22	4292	15	2611	28.6%	0.89 [0.46, 1.72]	2018
Total (95% CI)		**5500**		**3643**	**100.0%**	**1.38 [0.97, 1.97]**	
Total events	102		49				

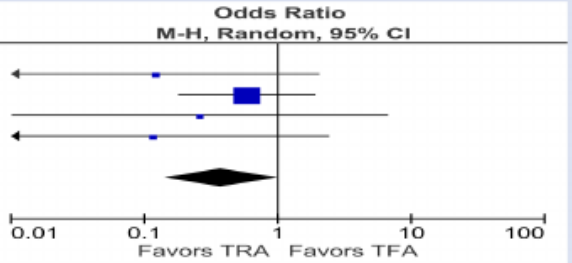
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 5.86$, df = 6 (P = 0.44); $I^2 = 0\%$
Test for overall effect: Z = 1.81 (P = 0.07)



(C) In- Hospital TVR

Study or Subgroup	TRA Events	TRA Total	TFA Events	TFA Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Ziakas et al.	0	27	0	53		Not estimable	2004
Hsueh et al.	1	116	1	15	12.0%	0.12 [0.01, 2.06]	2008
Yang et al.	4	353	9	468	68.4%	0.58 [0.18, 1.91]	2010
Tomassini et al.	0	27	1	22	9.1%	0.26 [0.01, 6.72]	2013
Gao et al.	0	508	2	297	10.4%	0.12 [0.01, 2.43]	2014
Total (95% CI)		**1031**		**855**	**100.0%**	**0.38 [0.14, 1.01]**	
Total events	5		13				

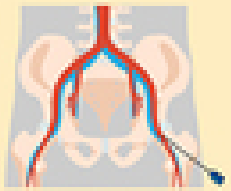
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1.77$, df = 3 (P = 0.62); $I^2 = 0\%$
Test for overall effect: Z = 1.93 (P = 0.05)



Radial vs. Femoral Approach in Chronic Total Occlusion Percutaneous Coronary Intervention

Meta-analysis of 9 observational studies (10,590 patients)

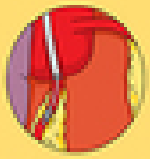
Radial approach, 4591 patients



Femoral approach, 5999 patients

Lower complexity

2.3 +/- 1.2



J-CTO score
p <0.001

2.5 +/- 1.3

Similar success

78.7 %

Technical success
p=0.24

78.5 %

Lower risk

0.73 %

Access-site complications
p<0.001

1.79 %

0.18%

Major bleeding
p<0.001

0.9 %

Similar risk

Q-wave myocardial infarction
p=0.13

In-hospital mortality
p=0.07

Pericardial tamponade
p=0.8

Coronary perforation
p=0.83

Emergency bypass surgery
p=0.63

Michael Megaly. Circulation: Cardiovascular Interventions. Radial Versus Femoral Access in Chronic Total Occlusion Percutaneous Coronary Intervention, Volume: 12, Issue: 6, DOI: (10.1161/CIRCINTERVENTIONS.118.007778)

In Favor of Femoral Access

Radial Vs Femoral Access for Cath/PCI

Mario Goessl, MD PhD

Director, Transcatheter Valve Therapies
LAAO Program
IC Fellowships

DISCLOSURES

- I HAVE NEVER LOST A DEBATE … **EVER**

Pre Debate

Post Debate

Why Go Radial … earlier mobilization?

Journal of Cardiovascular Nursing
Vol. 00, No. 0, pp. 00–00

Is It Safe to Mobilize Patients Very Early After Transfemoral Coronary Procedures? (SAMOVAR)

A Randomized Clinical Trial

Marianne Wetendorff Nørgaard, PhD, RN; Jane Færch, MSc, RN; Francis R. Joshi, MD, PhD, FRCP; Dan E. Høfsten, MD, PhD; Thomas Engstrøm, MD, PhD, DMSc; Henning Kelbæk, MD, DMSc

Journal of Cardiovascular Nursing 2021, ahead of print

SAMOVAR

- Immediate vs 2h mobilization
- No difference
- Of 2027 patients (IM, 1010; BR, 1017), 40% underwent PCI. The **primary outcome* was recorded in 0.7% patients randomized to IM versus 0.5% in BR (P = .58).** There was no difference in the incidence of small hematoma, whereas persistent oozing was seen slightly more often after IM compared with BR (12% vs 9%, P = .04).

*The primary end point was a composite of greater than 5 cm of groinhematoma, retroperitoneal hematoma, pseudoaneurysm,and/or bleeding requiring transfusion.

Why Go Radial …

Comparative Study > Eur Heart J. 2008 Jan;29(1):63-70. doi: 10.1093/eurheartj/ehm508.
Epub 2007 Nov 13.

Comparison of operator radiation exposure with optimized radiation protection devices during coronary angiograms and ad hoc percutaneous coronary interventions by radial and femoral routes

Camille Brasselet [1], Thierry Blanpain, Sophie Tassan-Mangina, Alain Deschildre, Sébastien Duval, Fabien Vitry, Nathalie Gaillot-Petit, Jean Paul Clément, Damien Metz

Radial Radiation

- **Radiation expos** **ly higher using the radial route** wh ute for both CAs and CAs followed by croSv vs. 13.0 [1.0-164.0] microSv; microSv vs. 41.0 [2.0-360.0] microSv; **radiation exposure of patients was** **dial route** when compared with nd CAs followed by ad hoc PCIs.

Why Go Radial …
the mortality myth?

Radial Versus Femoral Access for Coronary Interventions Across the Entire Spectrum of Patients With Coronary Artery Disease

A Meta-Analysis of Randomized Trials

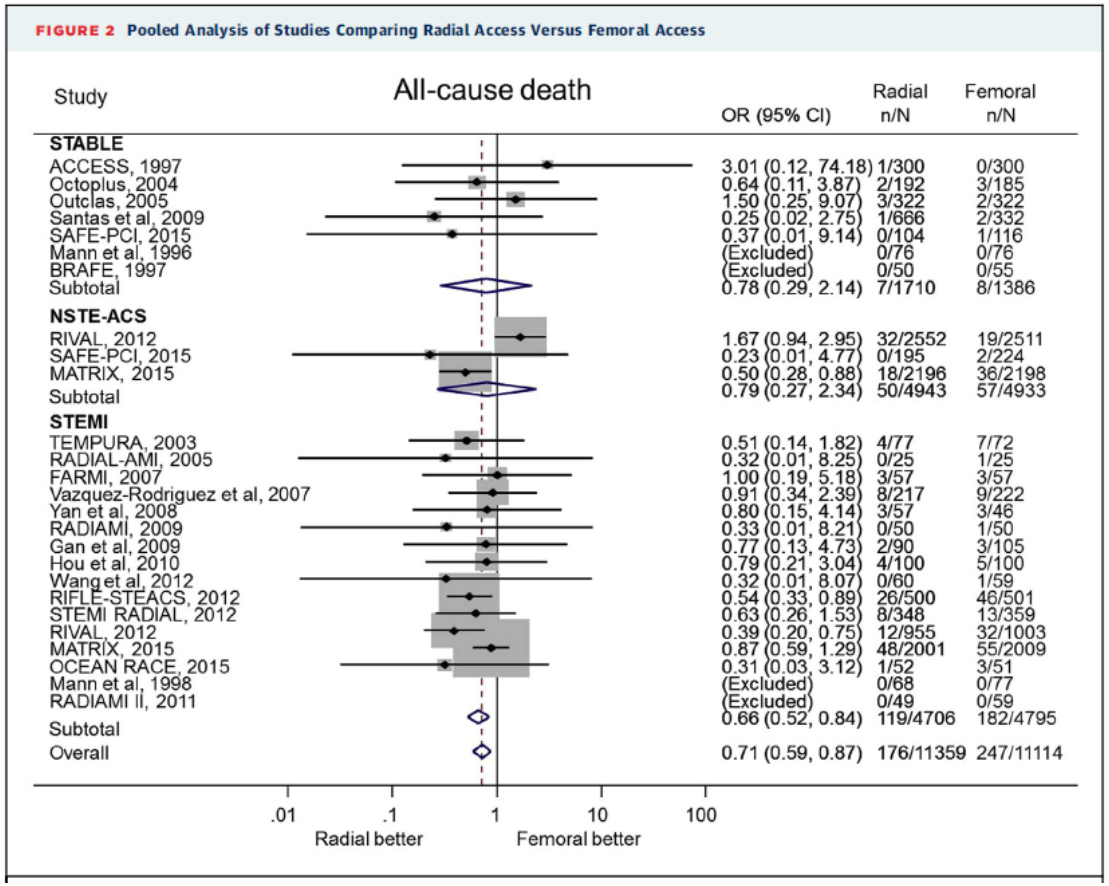
J Am Coll Cardiol Intv 2016;9:1419–34

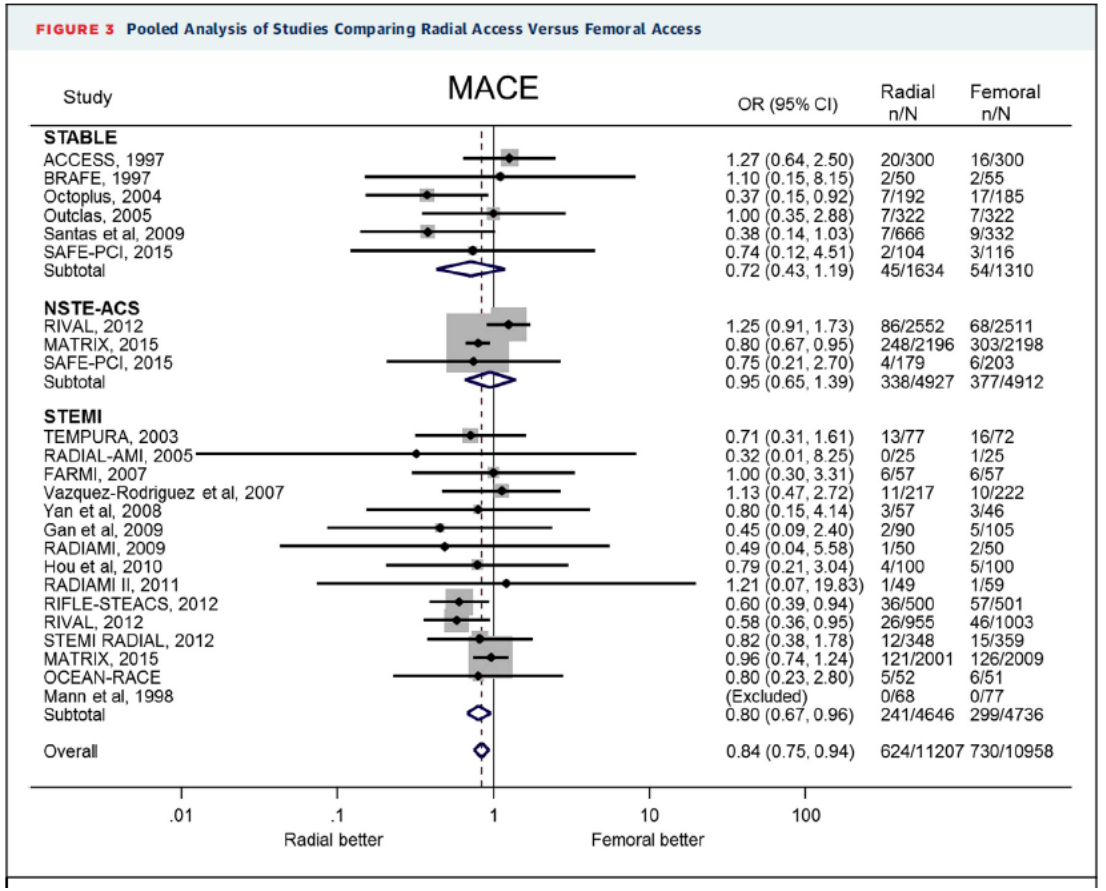
RESULTS

Twenty-four studies **enrolling 22,843 participants** were included.
Compared with femoral access, radial access was associated with a significantly **lower risk for all-cause mortality** (odds ratio [OR]: 0.71; 95% confidence interval [CI]:0.59 to 0.87; p=0.001, **number needed to treat to benefit [NNTB] =160**), **major adverse cardiovascular events** (OR: 0.84; 95% CI: 0.75 to 0.94; p=0.002; **NNTB=99**), **major bleeding** (OR: 0.53; 95% CI: 0.42 to 0.65; p <0.001; **NNTB=103**), and **major vascular complications** (OR: 0.23; 95% CI: 0.16 to 0.35; p < 0.001; **NNTB=117**).

Learning curve … ~ 50 PCI necessary

J Am Coll Cardiol Intv 2016;9:1419–34





For RIVAL data needed to be extracted, corresponding author etc

J Am Coll Cardiol Intv 2016;9:1419–34

RIVAL (the original)

Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL): a randomised, parallel group, multicentre trial

*Sanjit S Jolly, Salim Yusuf, John Cairns, Kari Niemelä, Denis Xavier, Petr Widimsky, Andrzej Budaj, Matti Niemelä, Vicent Valentin, Basil S Lewis, Alvaro Avezum, Philippe Gabriel Steg, Sunil V Rao, Peggy Gao, Rizwan Afzal, Campbell D Joyner, Susan Chrolavicius, Shamir R Mehta, for the RIVAL trial group**

***Lancet* 2011; 377: 1409–20**

RIVAL (the original)

Interpretation

Radial and femoral approaches are both safe and effective for PCI. However, the lower rate of local vascular complications may be a reason to use the radial approach.

RIVAL (the treatment effect analysis)

Journal of the American College of Cardiology
© 2012 by the American College of Cardiology Foundation
Published by Elsevier Inc.

Vol. 60, No. 24, 2012
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2012.07.050

Effects of Radial Versus Femoral Artery Access in Patients With Acute Coronary Syndromes With or Without ST-Segment Elevation

Shamir R. Mehta, MD, MSc,* Sanjit S. Jolly, MD, MSc,* John Cairns, MD,†
Kari Niemela, MD, PhD,‡ Sunil V. Rao, MD,§ Asim N. Cheema, MD, PhD,‖
Philippe Gabriel Steg, MD,¶ Warren J. Cantor, MD,# Vladimír Džavík, MD,**
Andrzej Budaj, MD, PhD,†† Michael Rokoss, MD,* Vicent Valentin, MD,‡‡ Peggy Gao, MSc,*
Salim Yusuf, MBBS, DPhil,* for the RIVAL Investigators

Hamilton, Toronto, Newmarket, Ontario, Vancouver, British Columbia, Canada; Tampere, Finland; Durham, North Carolina; Paris, France; Warsaw, Poland; and Valencia, Spain

Conclusions

In patients with **STEMI**, radial artery access reduced the primary outcome and mortality. **No such benefit** was observed in patients with **NSTEACS**. The radial approach may be preferred in STEMI patients when the operator has considerable radial experience.

… if a reduction in bleeding-related complications was associated with lower mortality, it might **most likely be detected in the STEMI group of patients**.

… higher rate of PCIs (90%) compared with NSTEACS patients (50% to 60%), exposing them to a higher frequency of access site complications.

… more potent initial and subsequent antiplatelet and antithrombotic therapies (as well as fibrinolytic therapy) … the risk-adjusted rate of bleeding (particularly access-site bleeding) is higher, **making the association between bleeding and mortality more readily detectable in this population**

STEMI subgroup:

30-day mortality was significantly lower with radial access (1.3%vs 3.2%), **which cannot be explained by the very low rates of bleeding at 0.84% (radial access) vs 0.91% (femoral access).**

The majority of deaths occurred in patients who had neither a major bleed nor an access site complication.

Because randomization did not stratify patients by STEMI and non-STEMI, any comparison in the patients with STEMI is a subgroup analysis and prone to potential differences between access groups that may confound the relationship.

Research

JAMA Cardiology | Original Investigation

Safety and Efficacy of Femoral Access vs Radial Access in ST-Segment Elevation Myocardial Infarction

The SAFARI-STEMI Randomized Clinical Trial

Michel Le May, MD; George Wells, PhD; Derek So, MD; Aun Yeong Chong, MD; Alexander Dick, MD; Michael Froeschl, MD; Christopher Glover, MD; Benjamin Hibbert, MD; Jean-Francois Marquis, MD; Melissa Blondeau, BSc; Christina Osborne, BSc; Andrea MacDougall, MD; Malek Kass, MD; Vernon Paddock, MD; Ata Quraishi, MBBS; Marino Labinaz, MD

JAMA Cardiol. 2020;5(2):126-134

SAFARI-STEMI

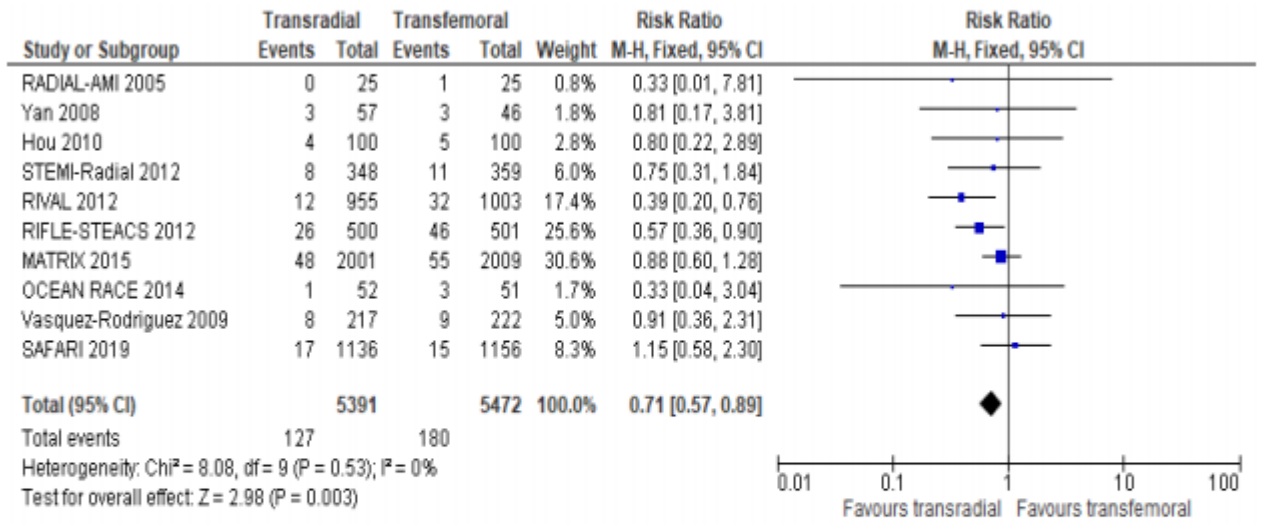
- **CONCLUSIONS AND RELEVANCE** **No significant differences** were found for survival or other clinical end points at 30 days after the use of radial access vs femoral access in patients with STEMI referred for primary PCI. However, small absolute differences in end points cannot be definitively refuted given the premature termination of the trial.

- Kapadia: best clinical practice vs real world may be the difference? >> do we need to teach better femoral access?

JAMA Cardiol. 2020;5(2):126-134

SAFARI-STEMI – Updated Meta-Analysis

eFigure 2. Updated Meta-analysis



The primary outcome of 30-day all-cause mortality was not significant between radial access and femoral access groups. As illustrated, the comparisons between the 2 groups are consistently nonsignificant across all subgroups. Squares represent mean values, with error bars representing 95% CIs. RR indicates relative risk; BMI, body mass index calculated as weight in kilograms divided by height in meters squared. To convert creatinine clearance to milliliters per second, multiply by 0.0167.

JAMA Cardiol. 2020;5(2):126-134

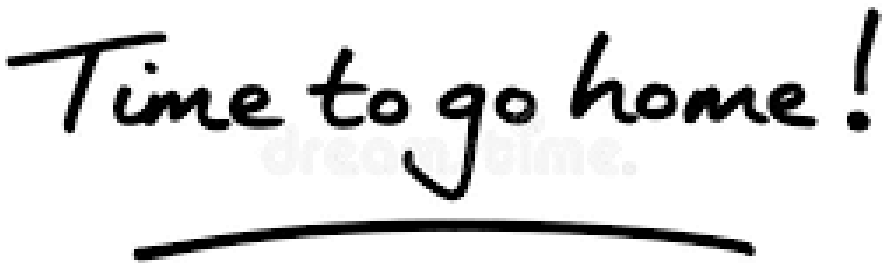
Conclusions

- Stable CAD ?
- NSTEMI ?

- Radial STEMI appeared to be the one MANTRA
  >> **debunked by SAFARI**

- PLUS: what if we do ultrasound-guided access? REBIRTH

Burke …



Thank you!

MATRIX

Radial versus femoral access in patients with acute coronary syndromes undergoing invasive management: a randomised multicentre trial

*Marco Valgimigli, Andrea Gagnor, Paolo Calabró, Enrico Frigoli, Sergio Leonardi, Tiziana Zaro, Paolo Rubartelli, Carlo Briguori, Giuseppe Andò, Alessandra Repetto, Ugo Limbruno, Bernardo Cortese, Paolo Sganzerla, Alessandro Lupi, Mario Galli, Salvatore Colangelo, Salvatore Ierna, Arturo Ausiello, Patrizia Presbitero, Gennaro Sardella, Ferdinando Varbella, Giovanni Esposito, Andrea Santarelli, Simone Tresoldi, Marco Nazzaro, Antonio Zingarelli, Nicoletta de Cesare, Stefano Rigattieri, Paolo Tosi, Cataldo Palmieri, Salvatore Brugaletta, Sunil V Rao, Dik Heg, Martina Rothenbühler, Pascal Vranckx, Peter Jüni, for the MATRIX Investigators**

***Lancet* 2015; 385: 2465–76**

Findings

We randomly assigned 8404 patients with acute coronary syndrome, with or without ST-segment elevation, to radial (4197) or femoral (4207) access for coronary angiography and percutaneous coronary intervention. 369 (8・8%) patients with radial access had **major adverse cardiovascular events**, compared with 429 (10・3%) patients with femoral access (rate ratio [RR] 0・85, 95% CI 0・74–0・99; p=0・0307), **non-significant** at α of 0・025. 410 (9・8%) patients with radial access had **net adverse clinical events** compared with 486 (11・7%) patients with femoral access (0・83, 95% CI 0・73–0・96; p=0・0092). **The difference was driven by BARC major bleeding** unrelated to coronary artery bypass graft surgery (1・6% *vs* 2・3%, RR 0・67, 95% CI 0・49–0・92; p=0・013) **and all-cause mortality** (1・6% *vs* 2・2%, RR 0・72, 95% CI 0・53–0・99; **p=0・045).**

Interpretation In patients with acute coronary syndrome undergoing invasive management, radial as compared with femoral access reduces **net adverse clinical events, through a reduction in major bleeding and all-cause mortality.**

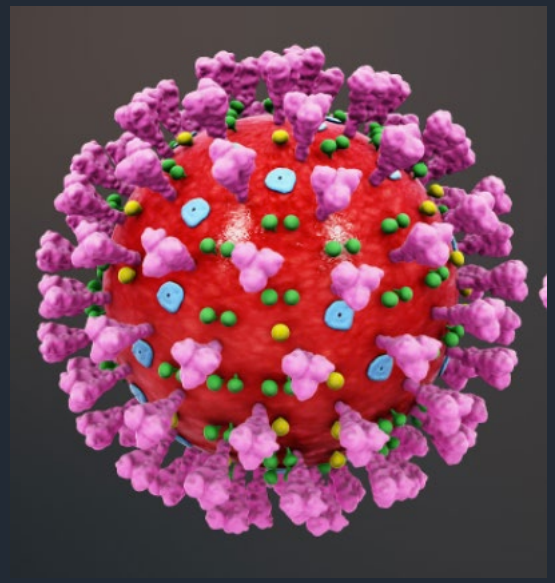
How on earth does mortality improve when we go radial?

- Different stents >>> No
- Different procedure time >>> No
- Same proceduralists

- Is it all about the bleeding?

- Is it really true?

The North American COVID-19 STEMI Registry



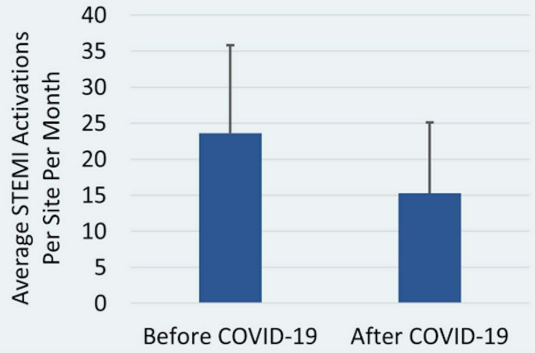
Santiago Garcia, MD

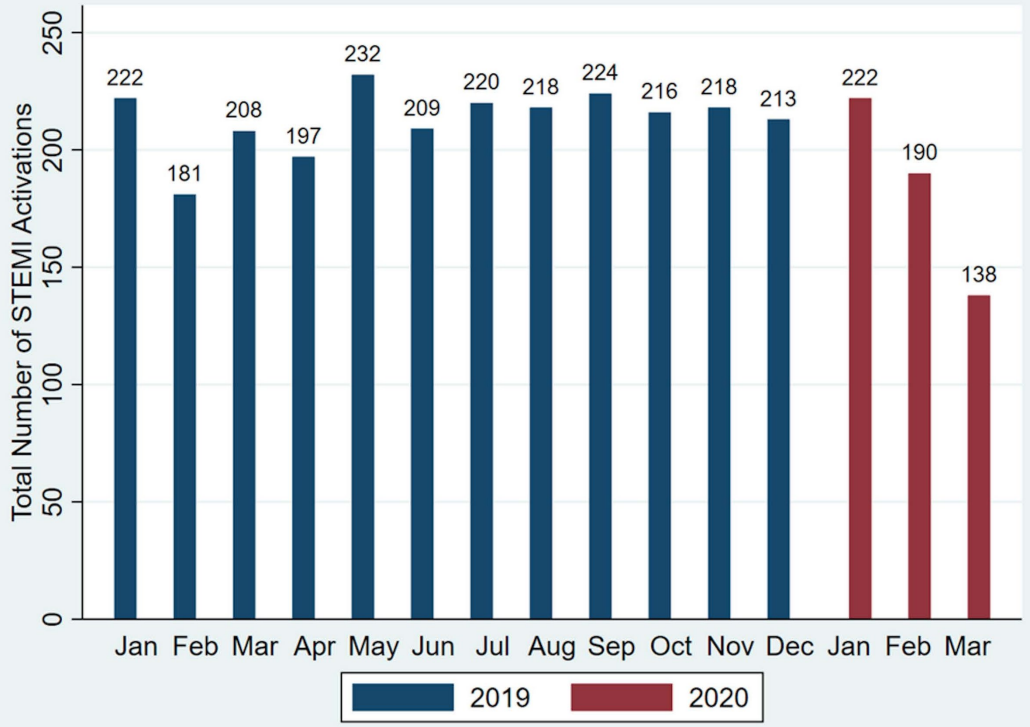
On Behalf of NACMI Investigators

Outline

1. STEMI and other CV emergencies during COVID-19 pandemic
2. Late Presentations/OHCA data
3. NACMI- Main results and subgroups

Where did the heart attacks go?

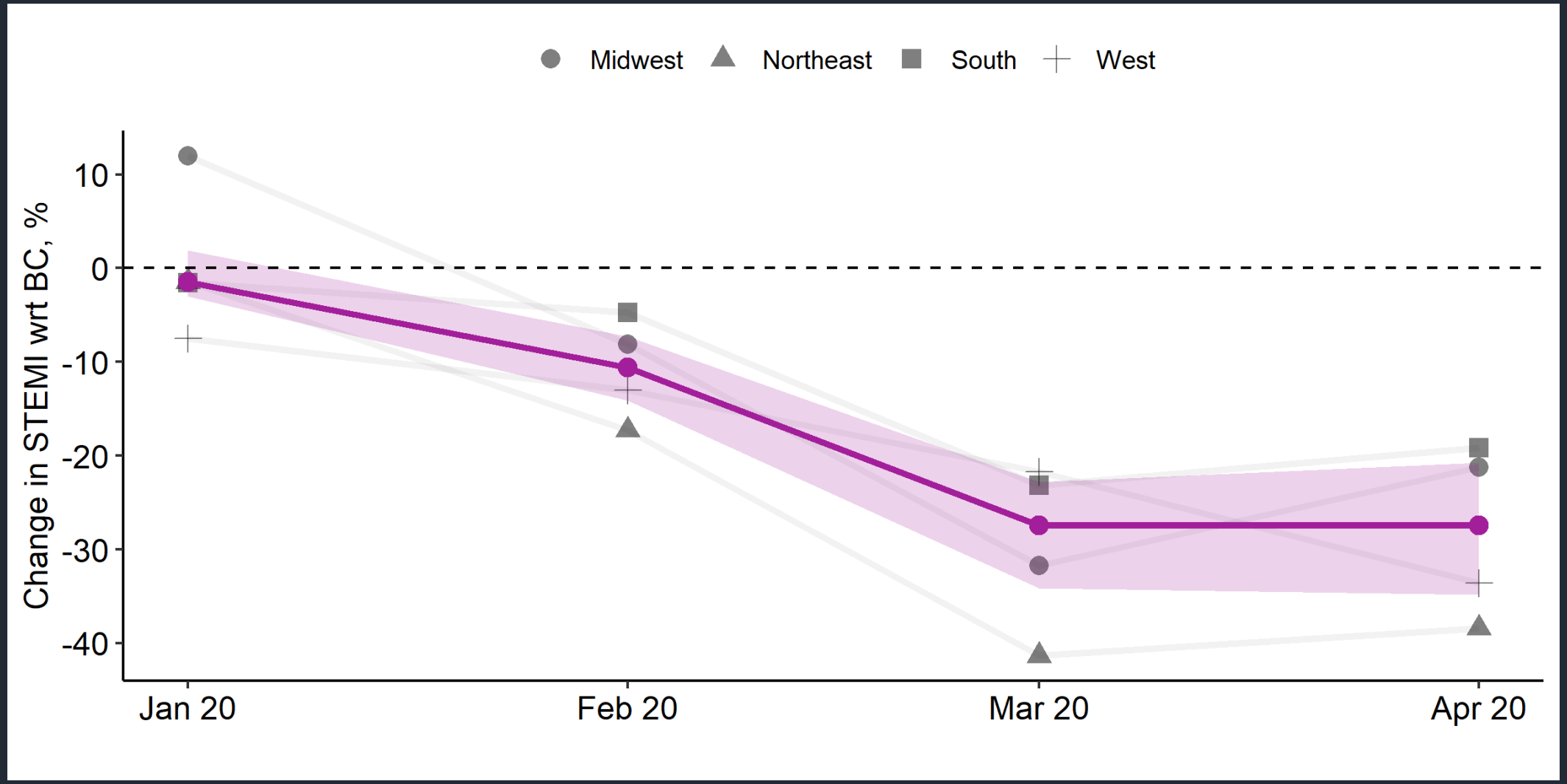




Garcia et al. JACC 2020

Where did the heart attacks go?

Expanded analysis 17 STEMI Program, 4 US regions



Garcia et al. CCI 2020

Where did the heart attacks go?

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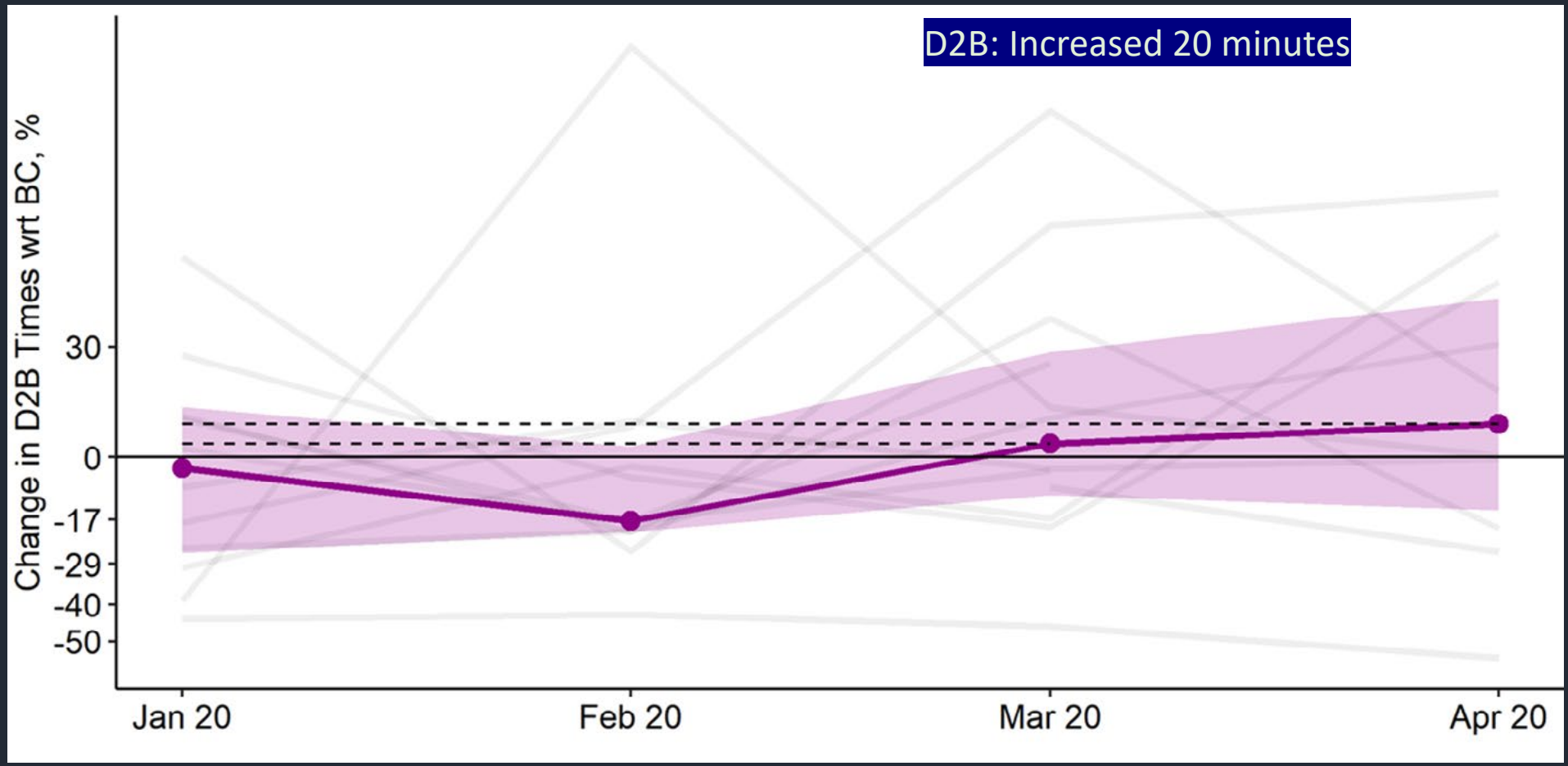
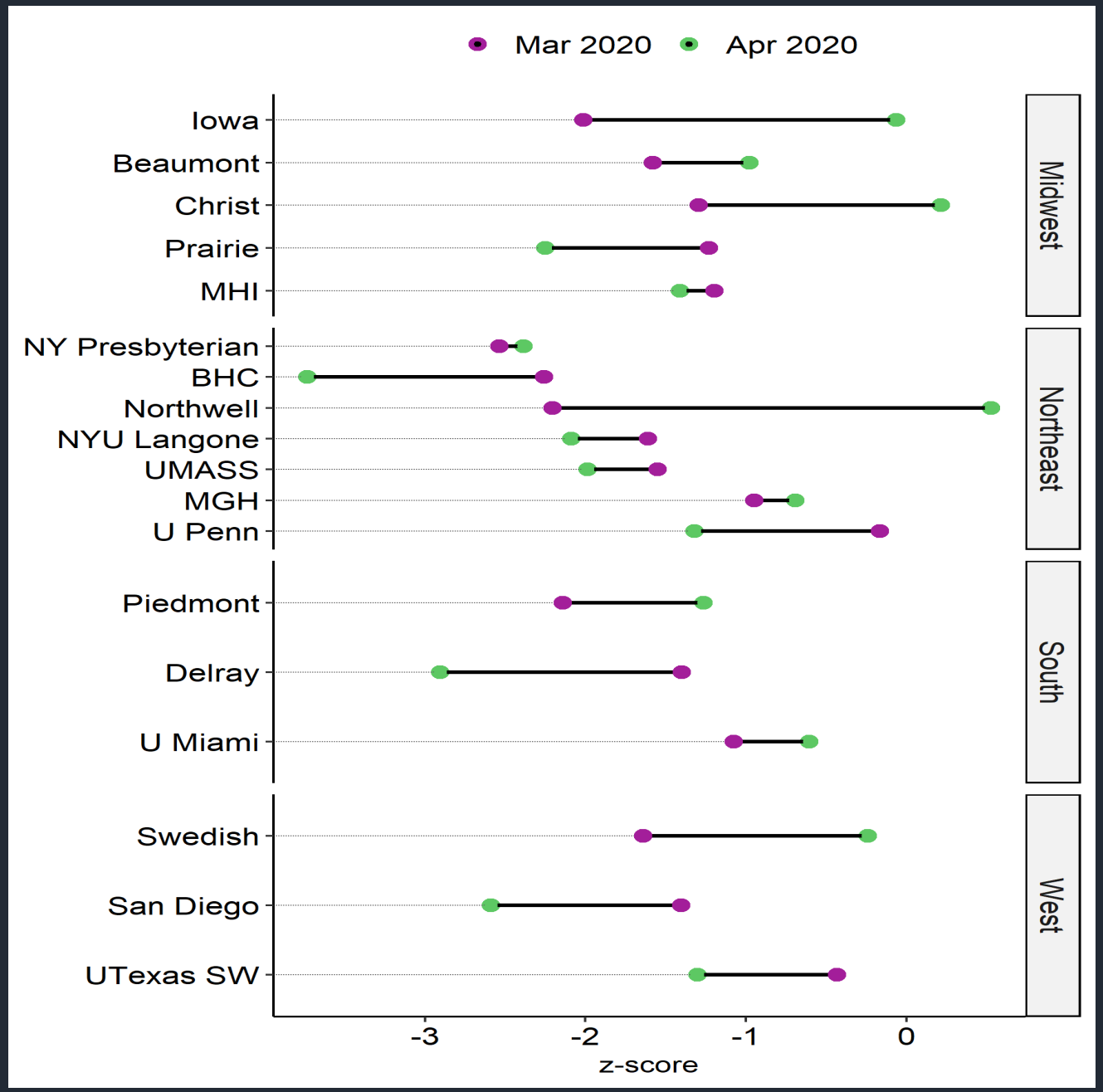
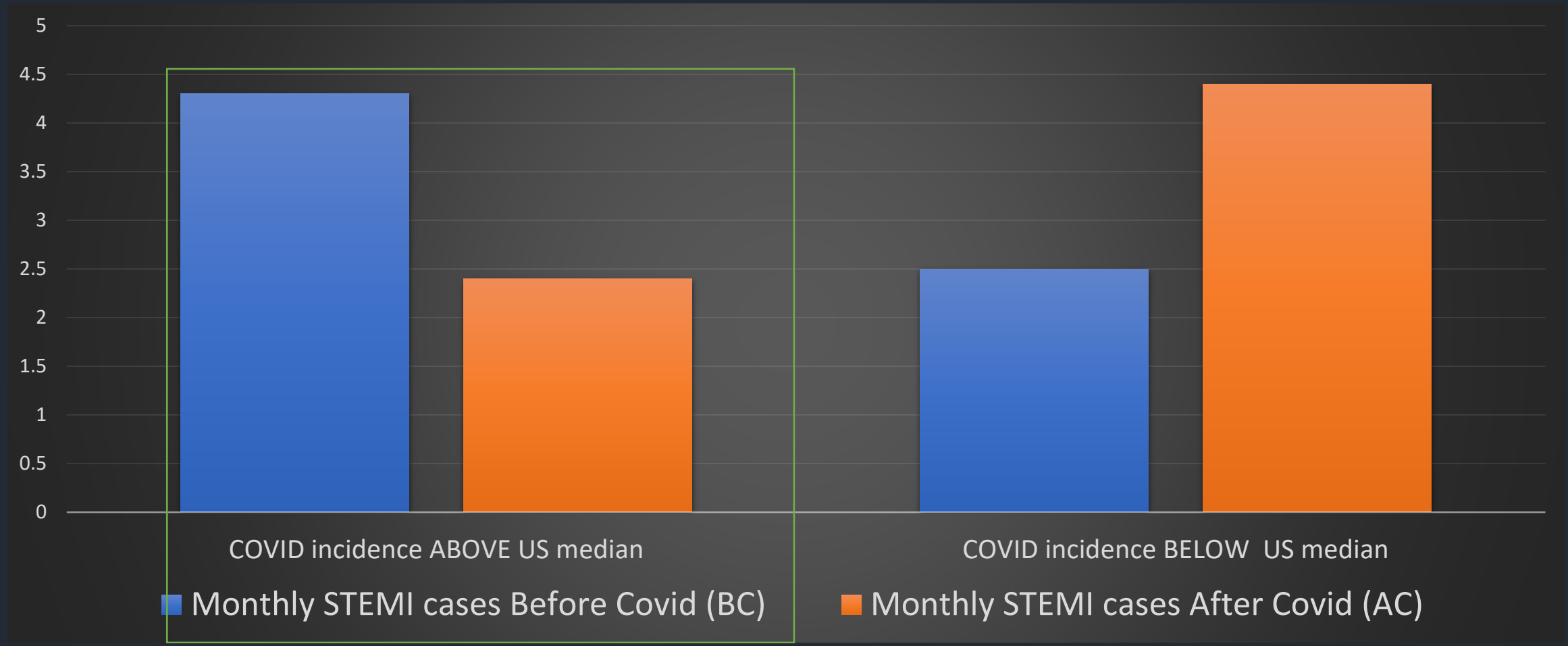


Garcia et al. CCI 2020

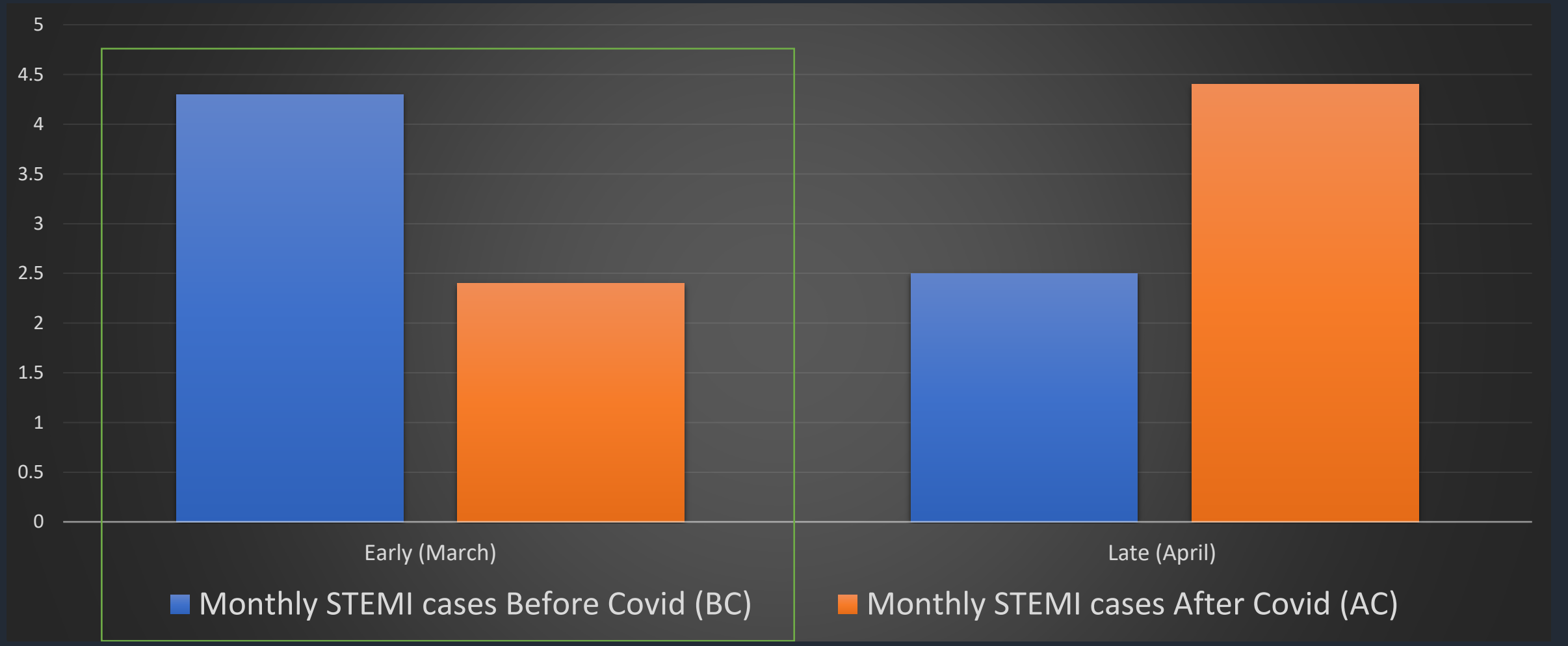

Mar 2020
Apr 2020
Iowa
Beaumont
Christ
Prairie
MHI
NY Presbyterian
BHC
Northwell
NYU Langone
UMASS
MGH
U Penn
Piedmont
Delray
U Miami
Swedish
San Diego
UTexas SW
Midwest
Northeast
South
West
-3
-2
-1
0
z-score

STEMI Volume Comparison by *COVID Incidence*



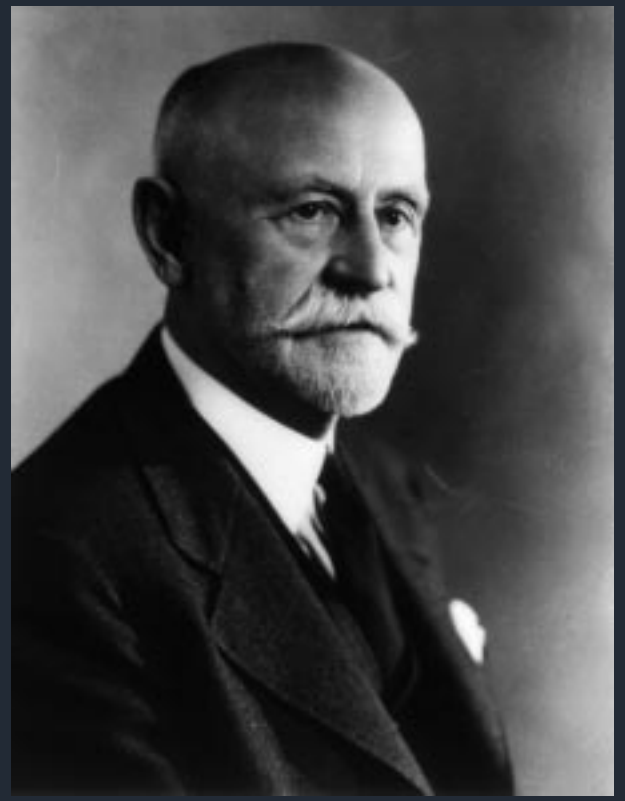
AC periods includes only Early phase of the pandemic March –April 2020

STEMI Volume
Comparison by Initiation of stay at home orders

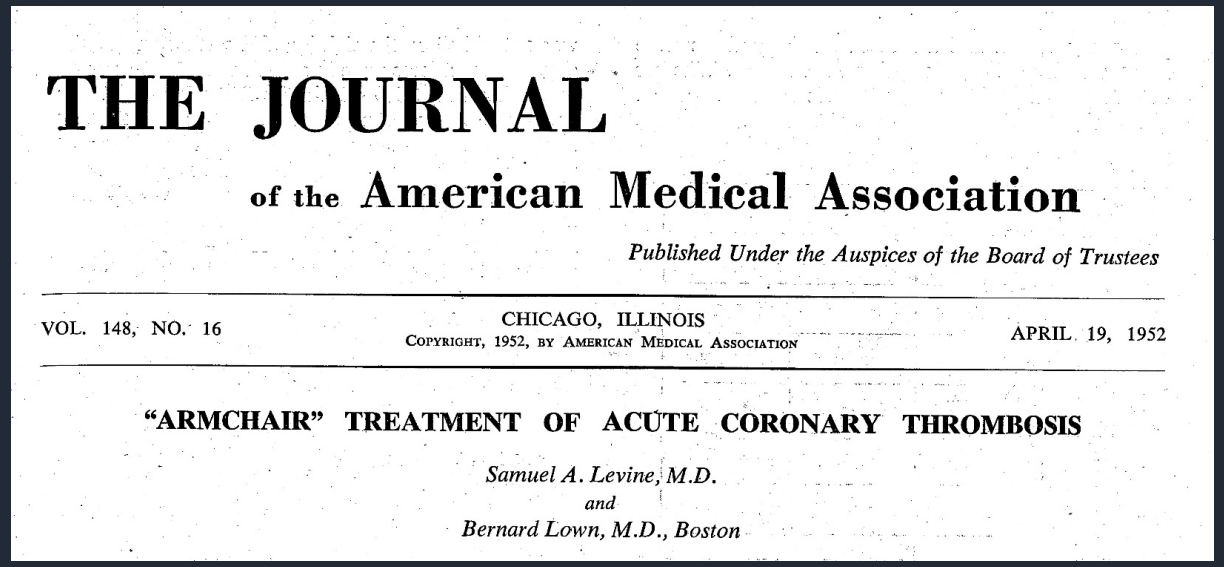


James B Herrick (1861–1954)

Certain clinical features of sudden obstruction of the coronary arteries.
JAMA 1912; 59:2015-20



"The importance of absolute rest in bed for several days is clear."



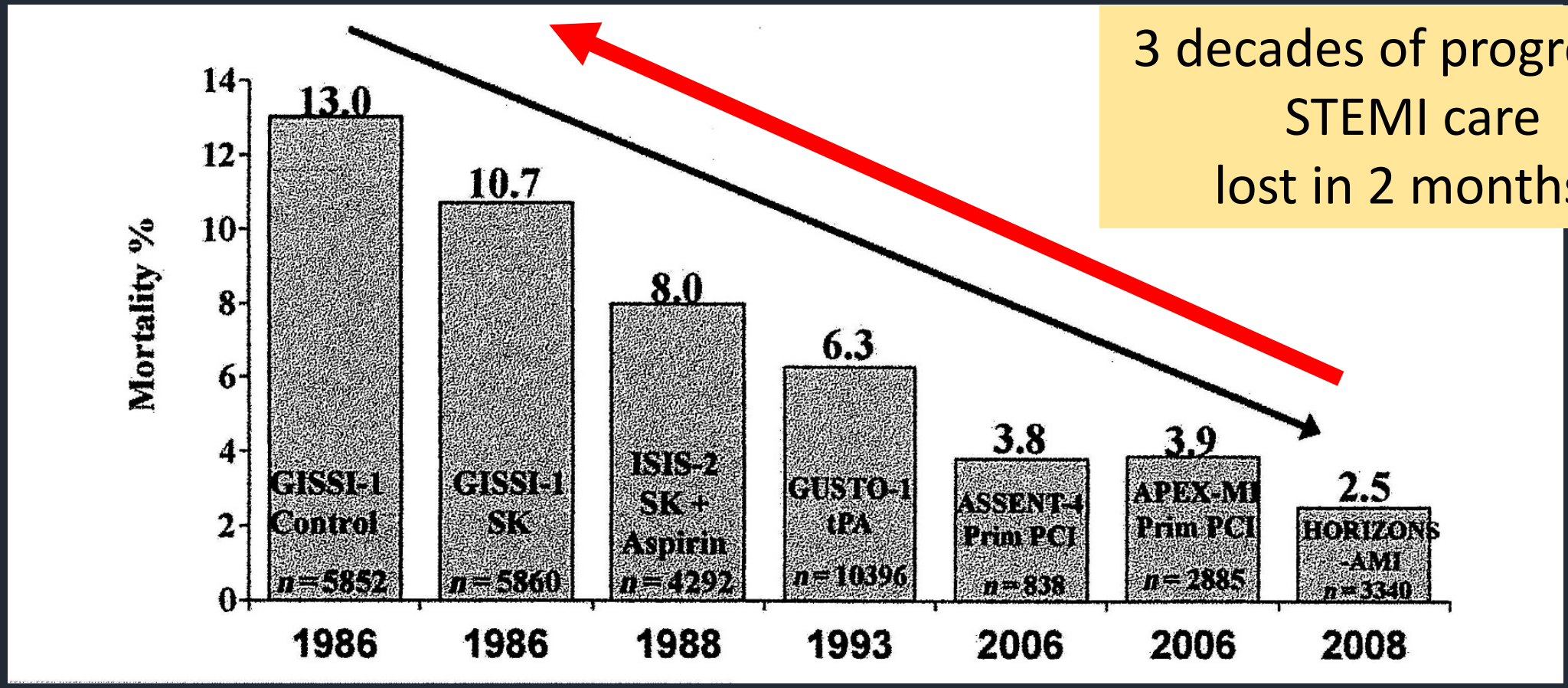
THE JOURNAL
of the American Medical Association
Published Under the Auspices of the Board of Trustees
VOL. 148, NO. 16 CHICAGO, ILLINOIS APRIL 19, 1952

"ARMCHAIR" TREATMENT OF ACUTE CORONARY THROMBOSIS

Samuel A. Levine, M.D.
and
Bernard Lown, M.D., Boston

"The prevailing view is that patients with cardiac disease are expected to die in bed. If fatalities occur out of bed, the physician is held culpable"

Myocardial mortality rates in the early era of coronary reperfusion

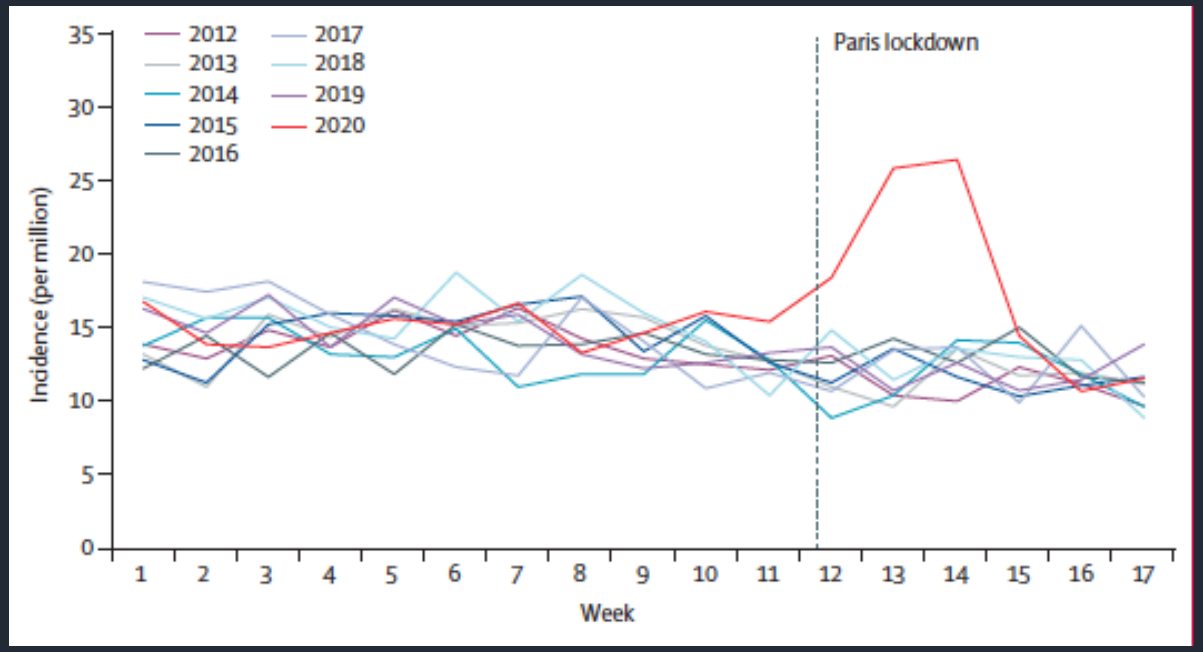


3 decades of progress in STEMI care
lost in 2 months?

From Ven de Werf. Eur Heart J 2014;35:2510-15.

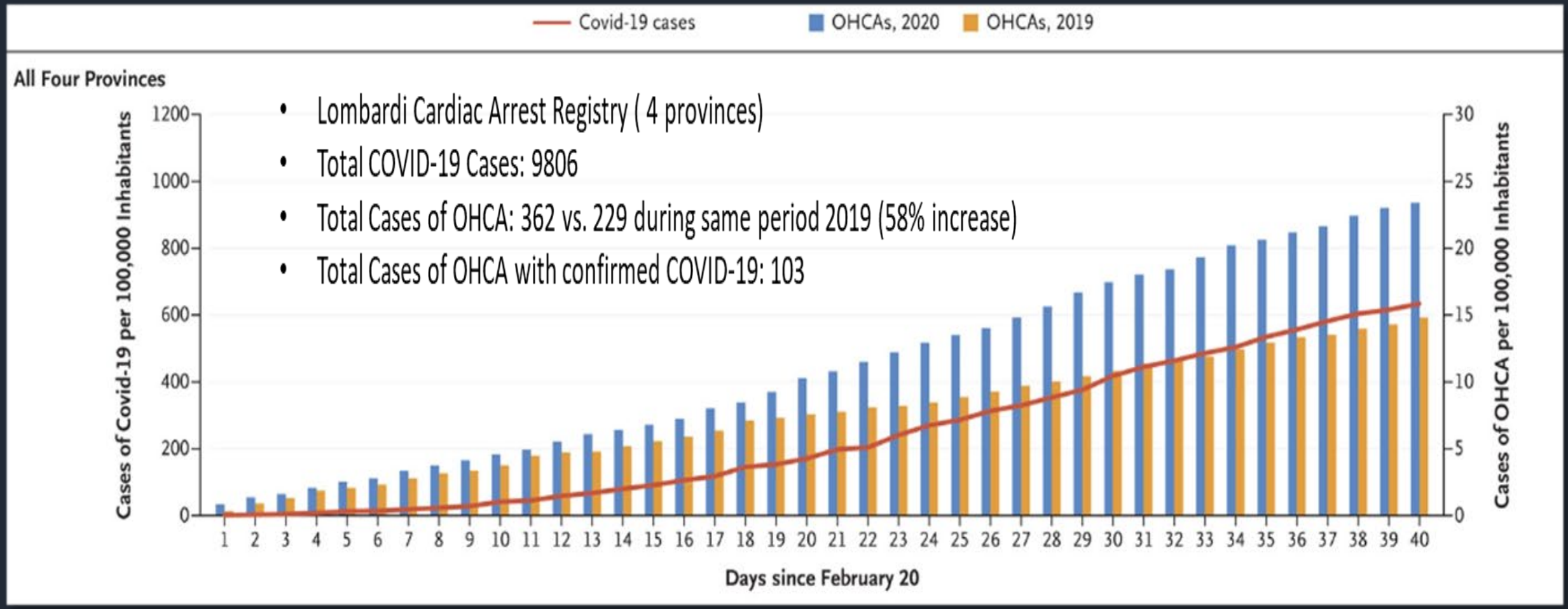
Where did the heart attacks go?
To the morgue

Out-of-hospital cardiac arrest during the COVID-19 pandemic in Paris, France: a population-based, observational study



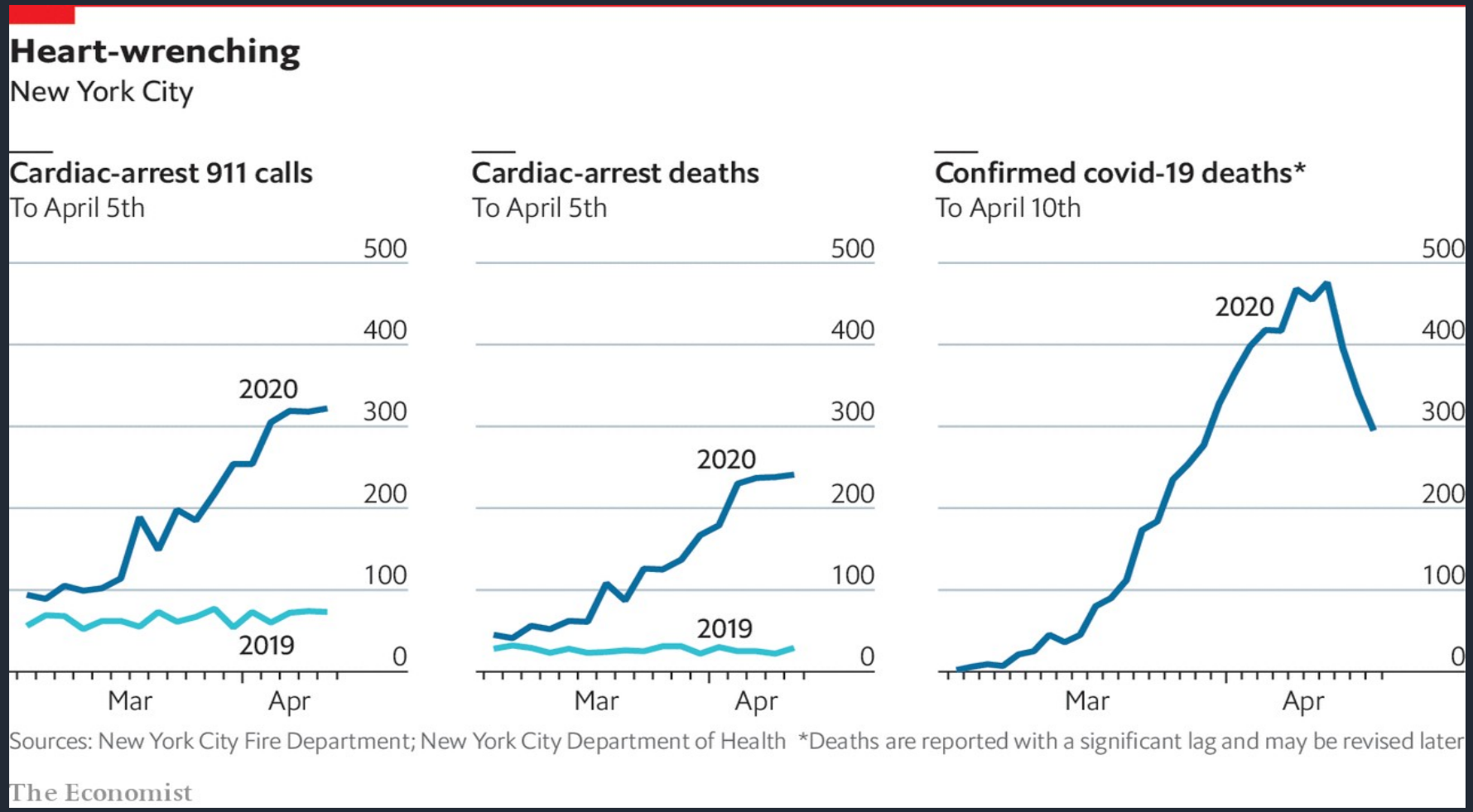
Marijon et al. Lancet 2020

58% Increase in out of hospital cardiac arrest in Italy



Cardiac Arrest

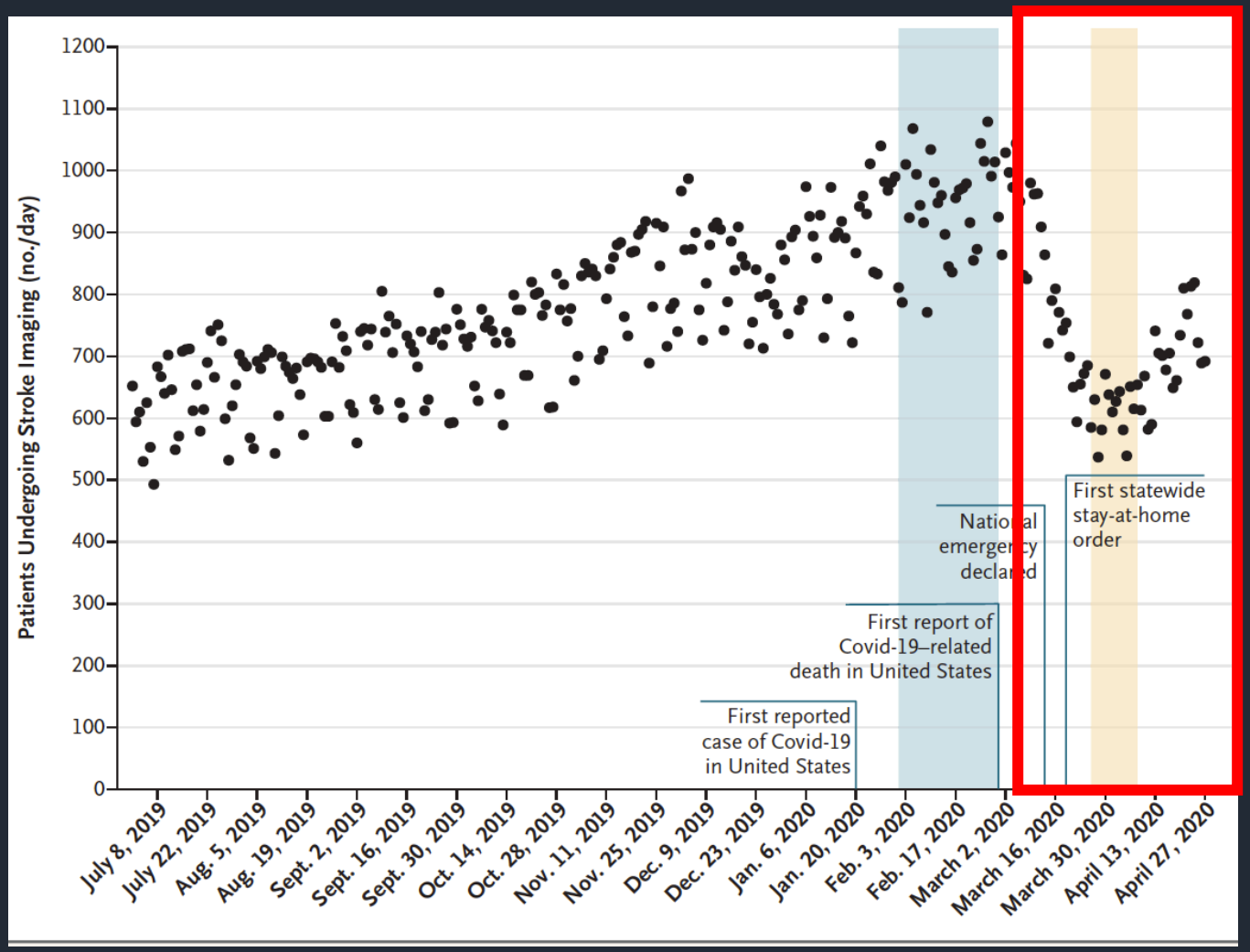
911 Calls in NYC



The Economist. graphic-detail/2020/04/13/

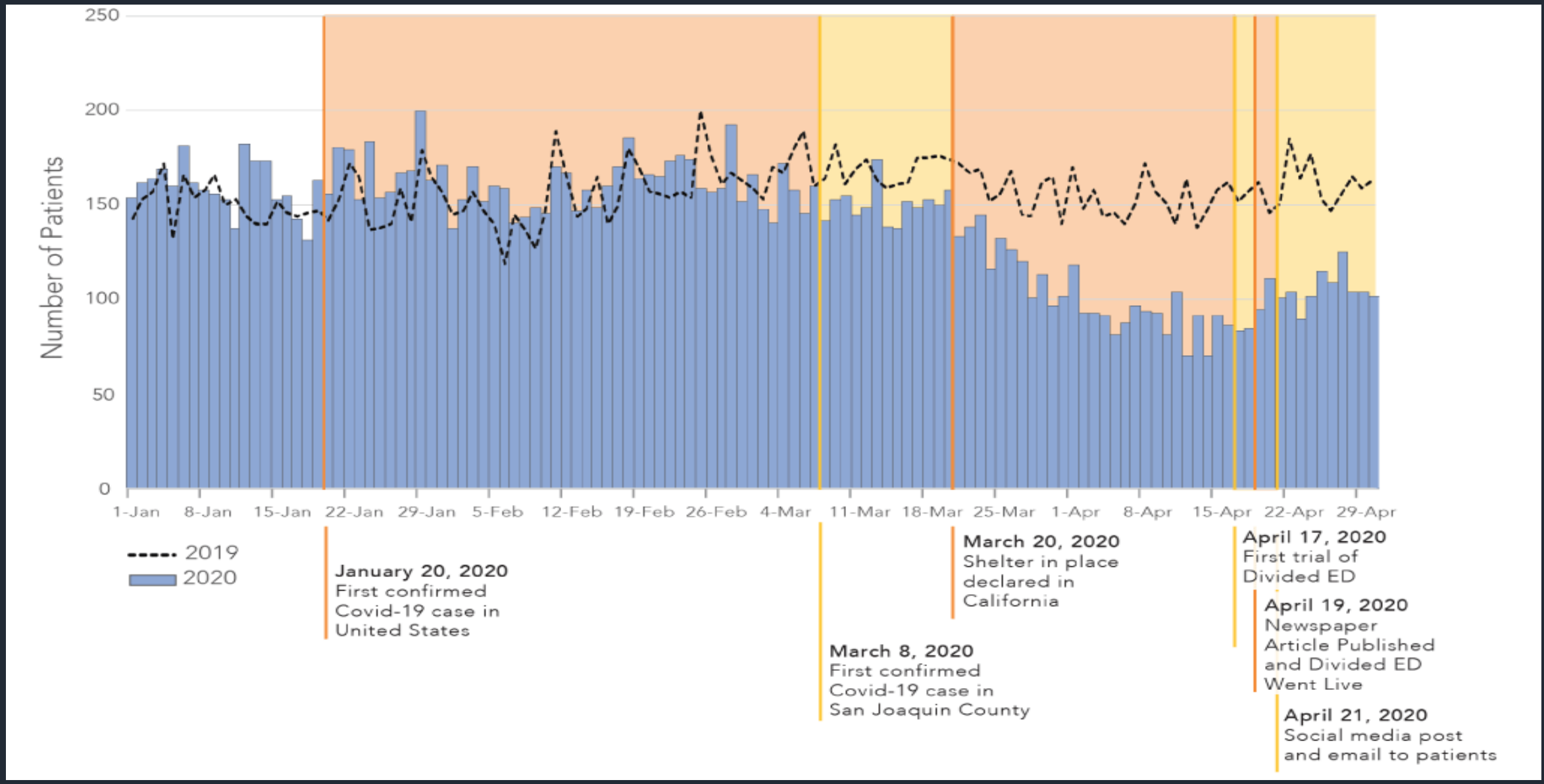
Other CV Emergencies: Where did the strokes go?

Use of neuroimaging



NEJM May 2020

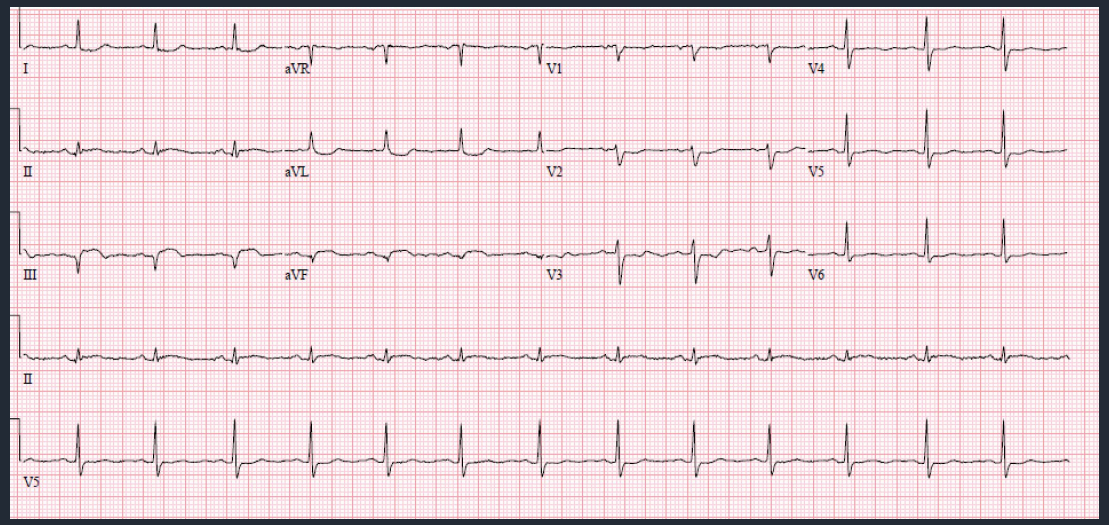
Emergency Department Volume by Day and Timeline of Key Events

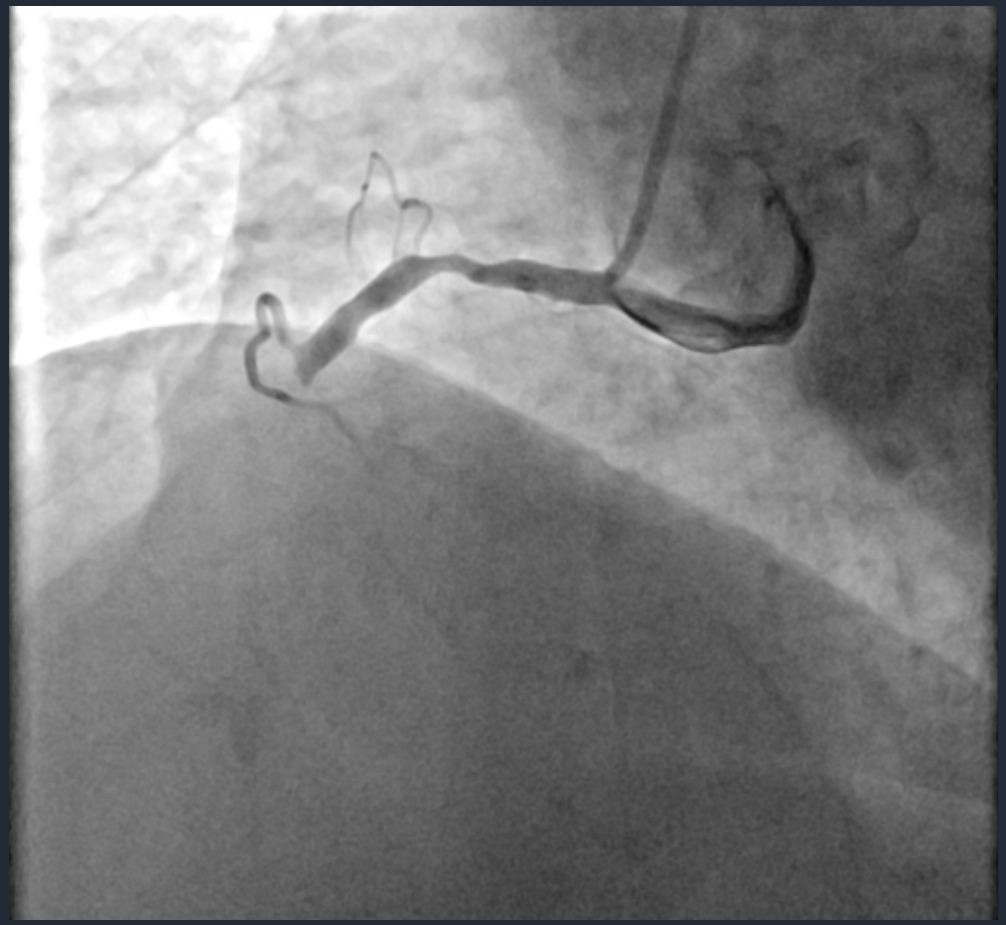


Wong L, et al. Catalyst Published May 14, 2020. doi: 10.1056/CAT.20.0193

Late Presentations

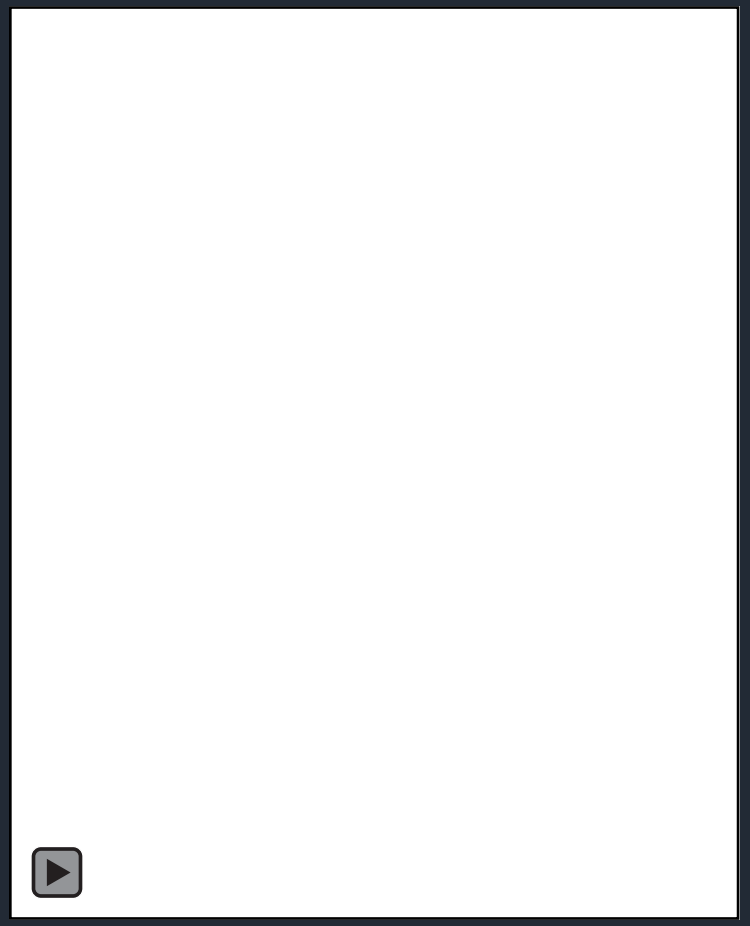
- 67 yo female
- Did not present to ED due to fear of contracting COVID
- 14 hours later Q-waves inferiorly
- Failed PCI





Alsidawi S et al. JACC Case reports.

Late Presentations
5-days later



Alsidawi S et al. JACC Case reports.

MHI Case #2

Anterior MI, fear of contracting COVID, presented 1 week later in heart failure
Elected palliative care, died from free wall rupture

When COVID and Heart attacks Coexist

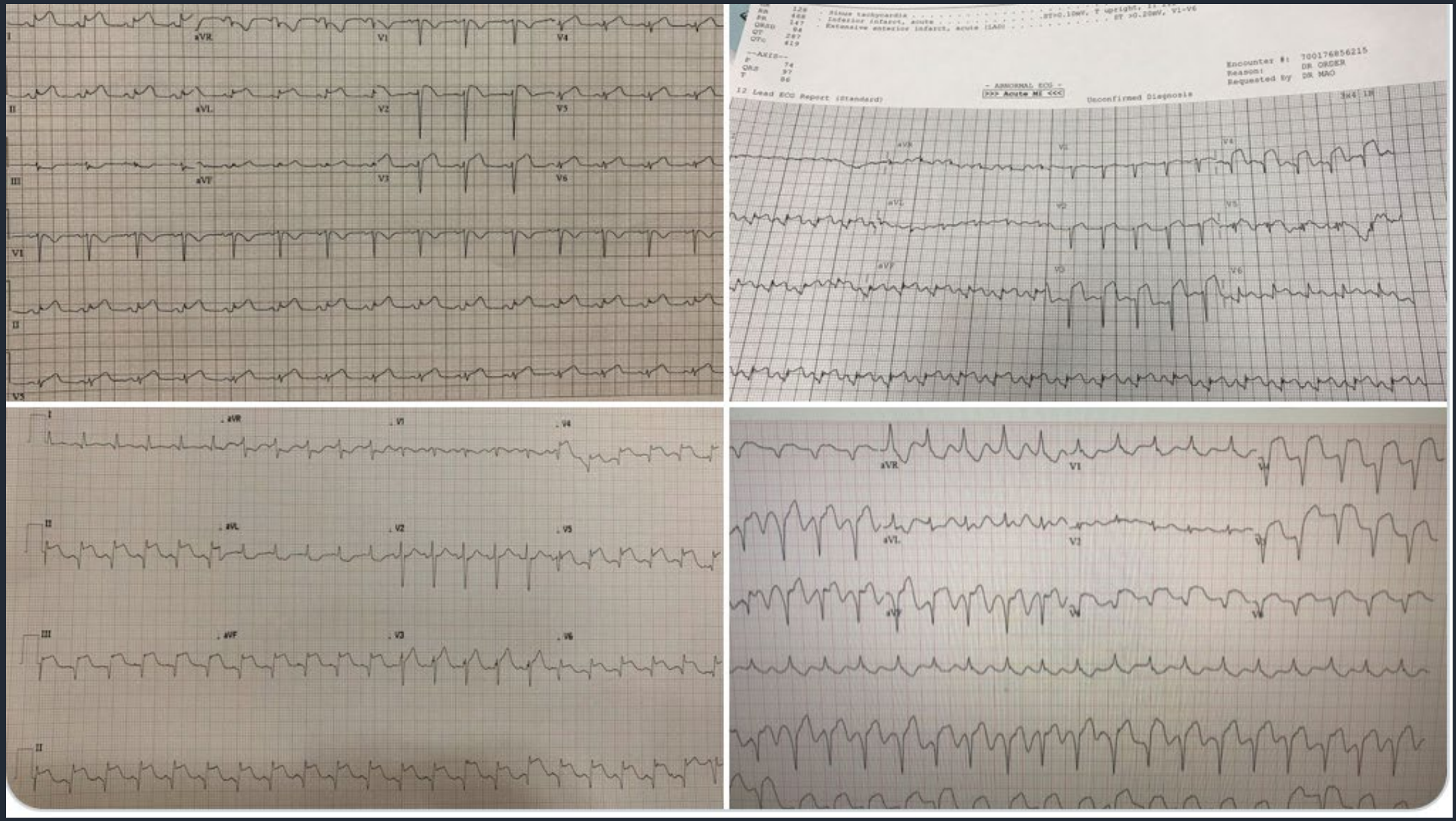
- Patients with cardiovascular disease have increased risk of mortality with COVID-19
- 15-28% of COVID+ patients admitted to the hospital have elevated Troponin
- Some advocated for a shift to pharmacological reperfusion
- Dismal prognosis (72% mortality in NYC)

Futility ??

STEMI Series IN COVID 19 – Literature review

	New York Series , n =18	Lombardy Series, n= 28	London Series, n= 39	French series, n=11	International, n=78
Population	6 Hospitals in New York, USA, n of 18	All PCI capable hospitals (?n) in Lombardy Italy, n of 28	115 Consecutive STEMI patients at Barts Heart centre (39 positive for COVID-19)	83 Consecutive STEMI patients at University of Hospital of Nancy, France, (11 positive for COVID 19)	Lithuania, Italy, Spain and Iraq –
Time Frame	March 2020	Feb 20th – March 30th, 2020	March 01 to May 20, 2020	Feb 26th – May20, 2020	Feb1st to April 15th, 2020
Demographics	Median age 63, 83% Male, 67% intubated	Mean age 68, 71% Male	Mean age of 62, 85% Male, 13% intubated	Mean age of 63.6, 64% male	median age of 65, 63% me n
COVID 19 Diagnosis	N/A	Reverse transcriptase PCR	Reverse transcriptase PCR **OR** symptoms + chest imaging	Reverse transcriptase PCR **OR** symptoms + chest imaging	Confirmed - positive result on PCR testing of a nasopharyngeal sample.
Chest pain as initial symptom	6/18 (33%) had chest pain	22/28 (79%)	11/39 had cardiac arrest as initial presentation	4/11 had cadiac arrest as initial presentation	18% were intubated
Strength of the study	First paper to describe STEMI		Looked at thrombus grade for Grade 5 thrombus, TIMI flow, Blush score 3 interventionalists blinded to study looked at images	2 angiographers scored angiograms for thrombotic MINOCA independently	Multi-center
LVEF	9/17 (53%) had abnormal LVEF	LVEF Mean of 42%	LVEF median of 43%	8/11 had LVEF of < 45%	Median of 39% in PPCI group Median of 44% in lytic group
Angiograms	9/18 had angiograms; 6/9 (67%) had Obstructive CAD	28/28 had angiograms 17/28 (61%) had Obstructive CAD	39/39 had angiograms 32/39 had TIMI 0/1 (82.1%)	6 of 11 (54%) had thrombotic MINOCA (non-atherosclerotic), compared to	19/78 (25%) had PCI asd primary reperfusion strategy 4/19 had stent thrombosis 18/19 had obstructive CAD
Hosp Mortality	13/18 (72%)	11/28 (39.3%)	7/39 (18%)	3/11 (27%)	9/78 (12%) - (26% in PCI group, and 7% in fibrinolytic group)

#CardioTwitter : STEMI in COVID with non-obstructive CAD

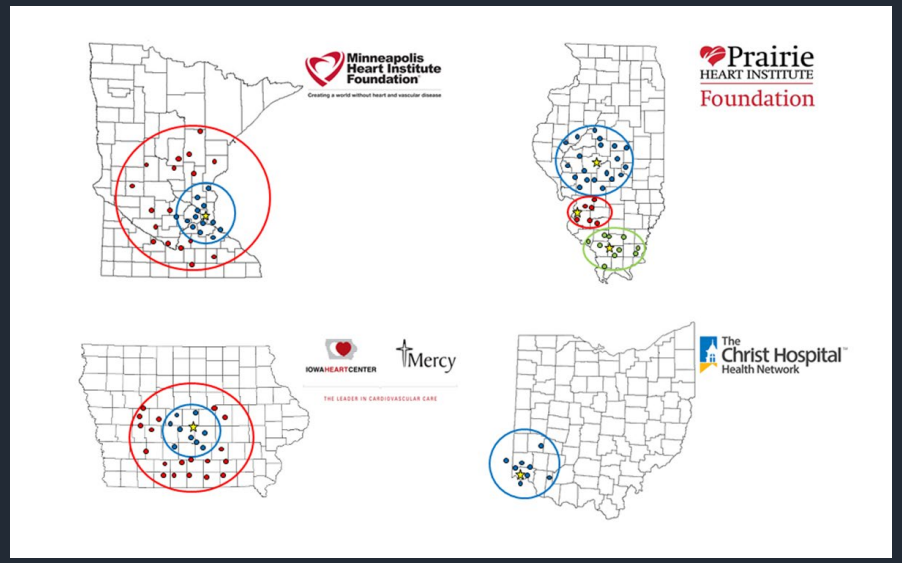


North American COVID Myocardial Infarction Registry (NACMI): A Unique Collaboration

SCAI
Society for Cardiovascular Angiography & Interventions

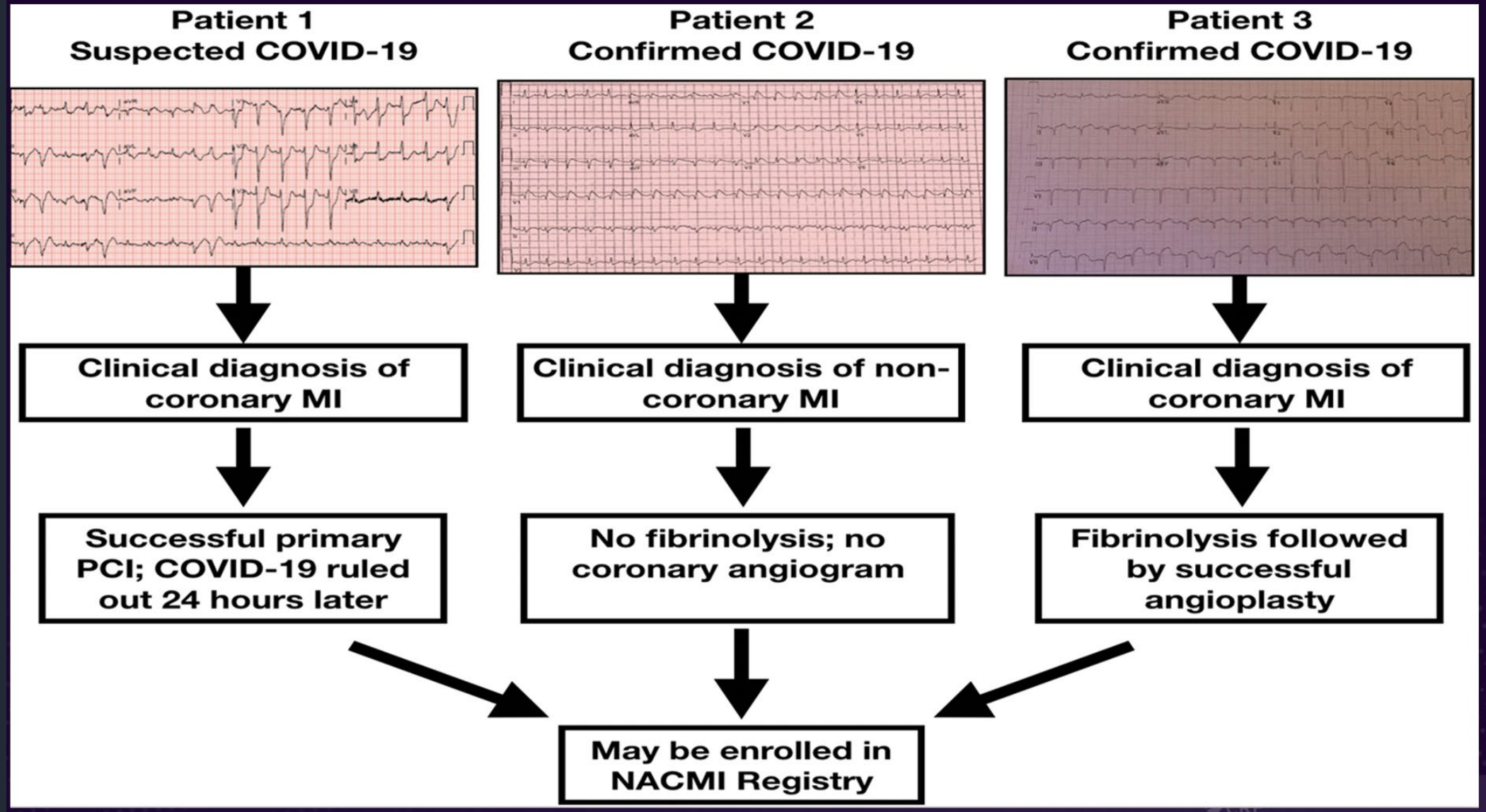
CAIC ACCI

AMERICAN COLLEGE of CARDIOLOGY

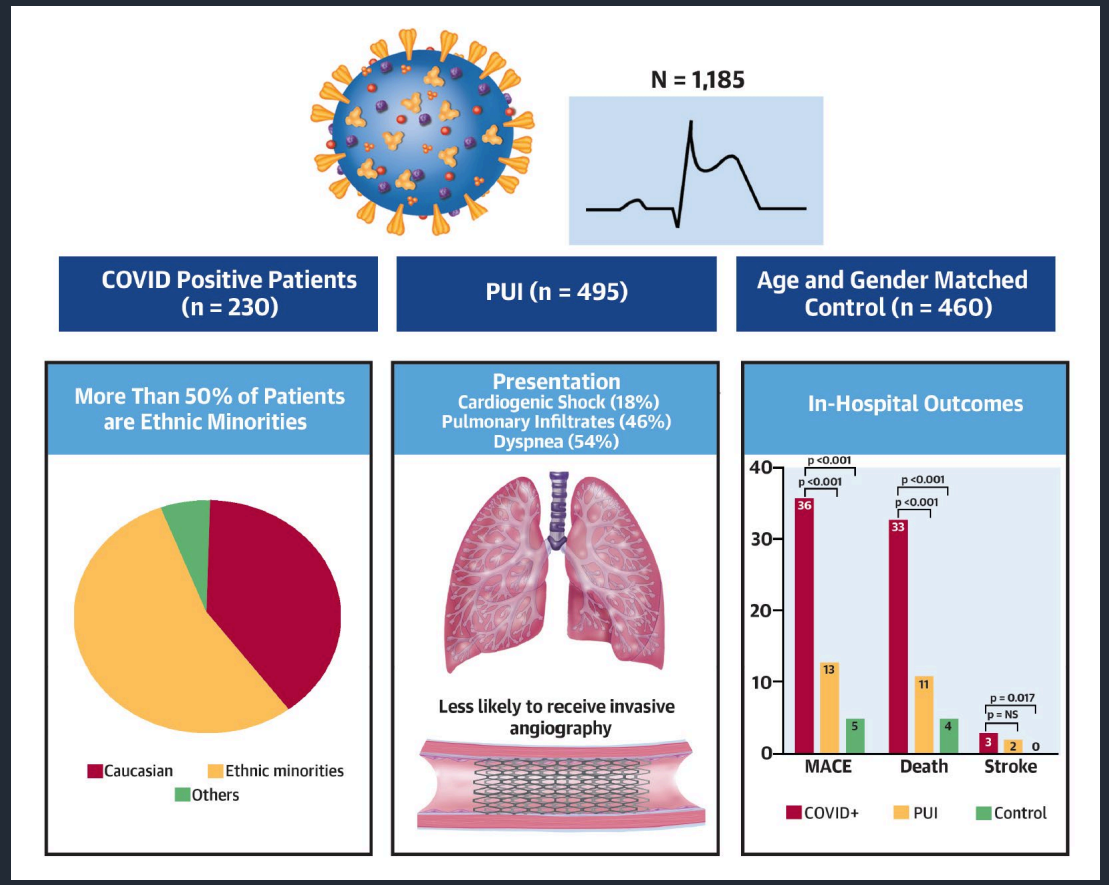


Am Heart J. 2020 Sep;227:11-18.

Pathways for enrollment into NACMI



NACMI-Initial Results



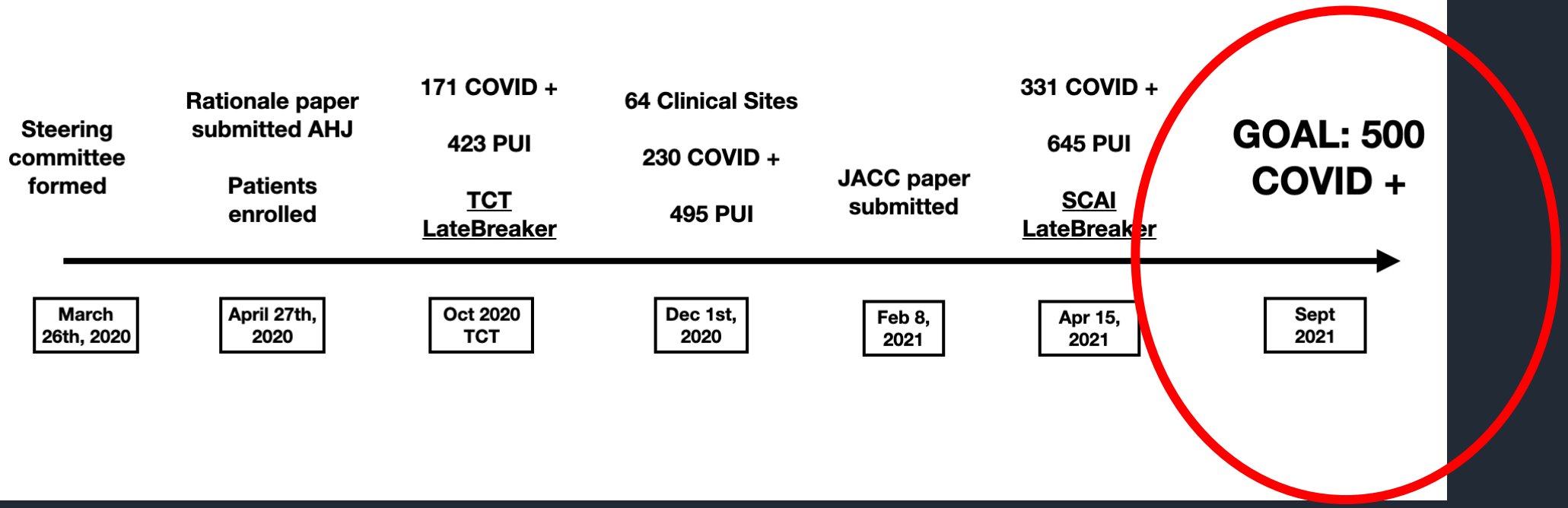
JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY VOL. 77, NO. 16, 2021

Initial Findings From the North American COVID-19 Myocardial Infarction Registry

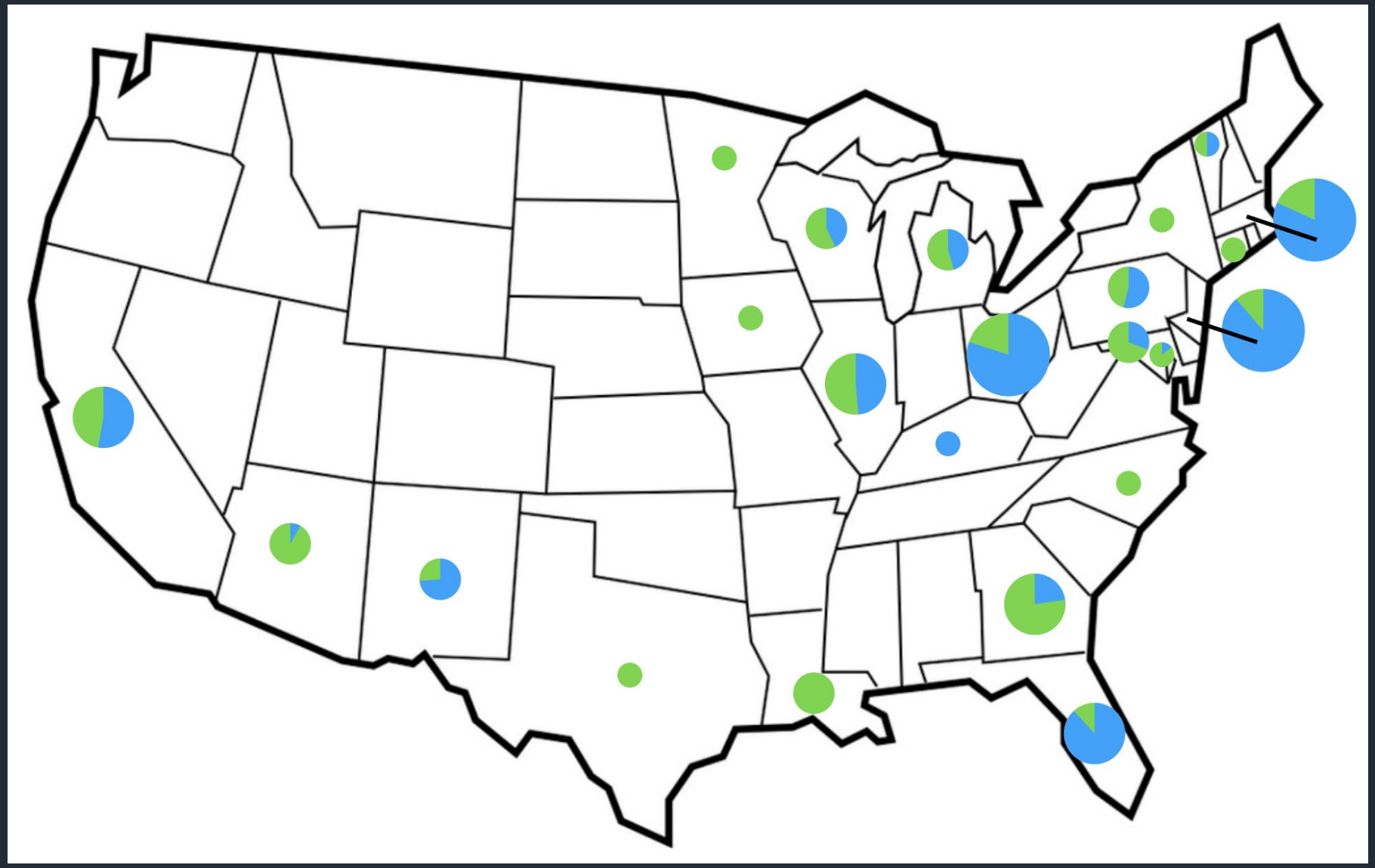
Santiago Garcia, MD,[a] Payam Dehghani, MD,[b] Cindy Grines, MD,[c,d] Laura Davidson, MD,[e] Keshav R. Nayak, MD,[f] Jacqueline Saw, MD,[g] Ron Waksman, MD,[h] John Blair, MD,[i] Bagai Akshay, MD,[j] Ross Garberich, MS, MBA,[a] Christian Schmidt, MS,[a] Hung Q. Ly, MD, SM,[k] Scott Sharkey, MD,[a] Nestor Mercado, MD,[l] Carlos E. Alfonso, MD,[m] Naoki Misumida, MD,[n] Deepak Acharya, MD,[o] Mina Madan, MD,[p] Abdul Moiz Hafiz, MD,[q] Nosheen Javed, MD,[r] Jay Shavadia, MD,[s] Jay Stone, MD,[t] M. Chadi Alraies, MD,[u] Wah Htun, MD,[v] William Downey, MD,[w] Brian A. Bergmark, MD,[x] Jospeh Ebinger, MD,[y] Tareq Alyousef, MD,[z] Houman Khalili, MD,[aa] Chao-Wei Hwang, MD, PHD,[bb,cc] Joshua Purow, MD,[dd] Alexander Llanos, MD,[dd] Brent McGrath, MD,[ee] Mark Tannenbaum, MD,[ff] Jon Resar, MD,[gg] Rodrigo Bagur, MD,[hh] Pedro Cox-Alomar, MD,[ii] Ada C. Stefanescu Schmidt, MD, MSc,[jj] Lindsey A. Cilia, MD,[jj] Farouc A. Jaffer, MD, PHD,[jj] Michael Gharacholou, MD,[kk] Michael Salinger, MD,[ll] Brian Case, MD,[h] Ameer Kabour, MD,[mm] Xuming Dai, MD,[nn] Osama Elkhateeb, MD,[oo] Taisei Kobayashi, MD,[pp] Hahn-Ho Kim, MD,[qq] Mazen Roumia, MD,[rr] Frank V. Aguirre, MD,[ss] Jeffrey Rade, MD,[tt] Aun-Yeong Chong, MD,[uu] Hurst M. Hall, MD,[vv] Shy Amlani, MD,[ww] Alireza Bagherli, MD,[xx] Rajan A.G. Patel, MD,[yy] David A. Wood, MD,[zz] Frederick G. Welt, MD,[aaa,bbb] Jay Giri, MD, MPH,[pp] Ehtisham Mahmud, MD,[ccc] Timothy D. Henry, MD,[ddd] on behalf of the Society for Cardiac Angiography and Interventions, the Canadian Association of Interventional Cardiology, and the American College of Cardiology Interventional Council

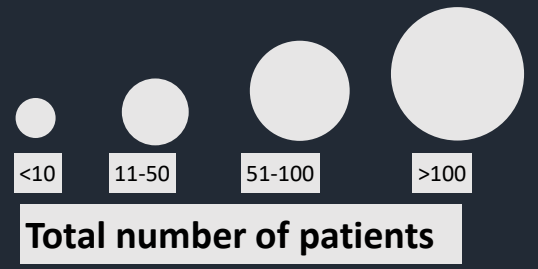
Garcia et al. JACC 2021

Registry Timeline

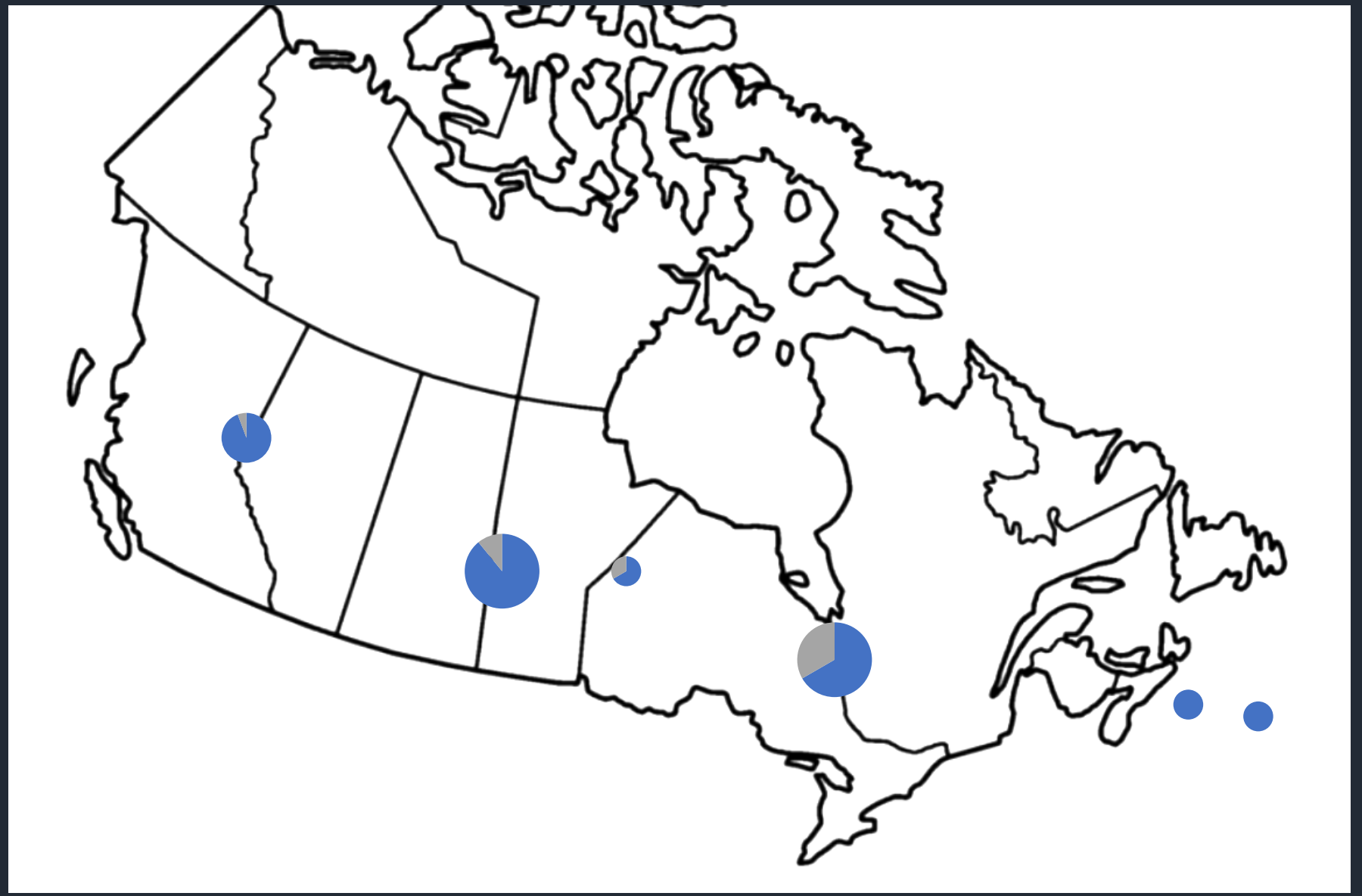


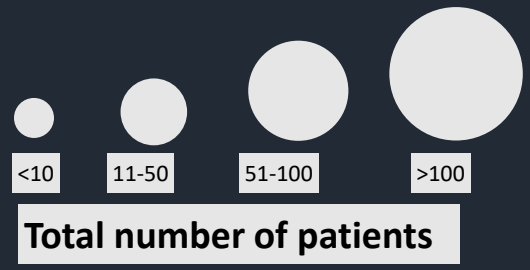
US NACMI 305 COVID Positive 521PUI





Canada NACMI 26 COVID Positive 124 PUI





Baseline characteristics of COVID Positive and PUI

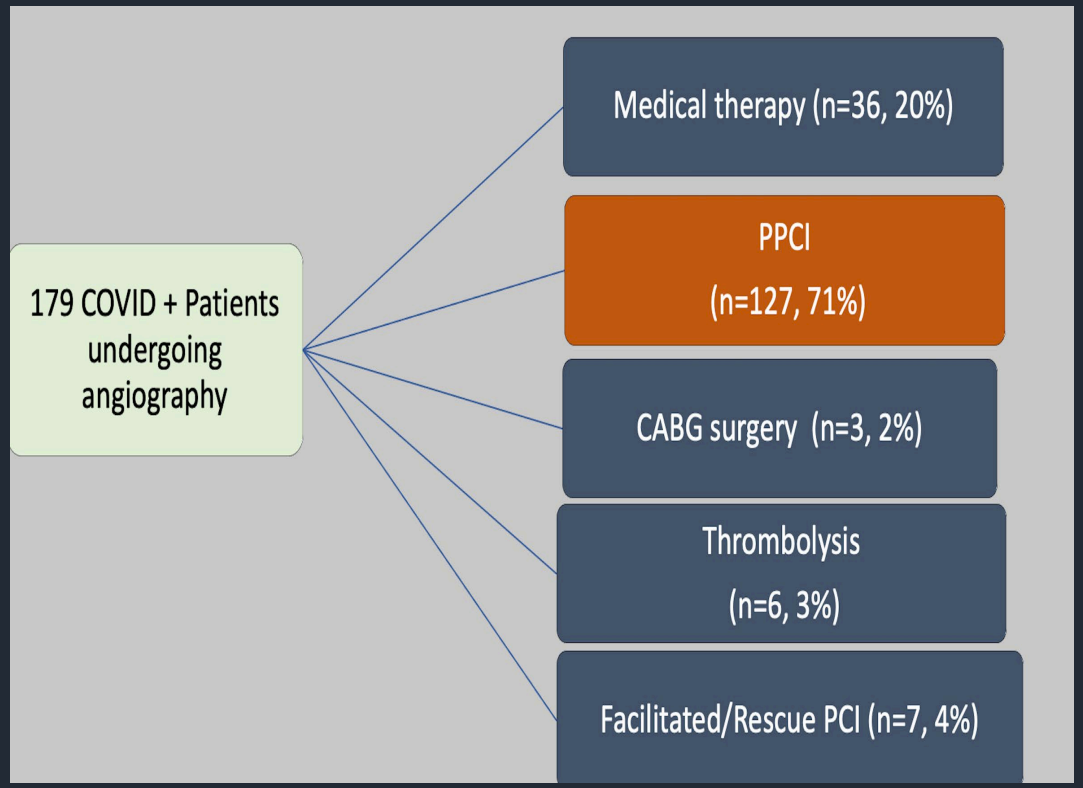
	COVID positive (n=331)	PUI (n=645)	P Value
Age >55	252 (76)	462 (72)	0.114
History of CAD	76 (26)	168 (27)	0.552
Non-Caucasian	186 (55)	180(25)	<0.001
Dyslipidemia	140 (47)	354 (59)	<0.001
Diabetes Mellitus	135 (44)	302 (33)	<0.001
BMI, mean ± SD	29.2±6.3	29.7±7.1	0.31
Arterial Hypertension	231 (73)	452 (72)	0.73
History of heart failure	49 (17)	64 (11)	0.009
Statin on Admission	128 (39)	225 (35)	0.244

Presentation COVID Positive and PUI

	COVID positive (n=331)	PUI (n=645)	P Value
Symptoms on presentation			
Dyspnea	169 (51)	228(35)	<0.001
Chest pain	175 (53)	514 (80)	<0.001
Syncope	10 (3)	33 (5)	0.131
Abnormal Chest X ray findings			
Infiltrates	149 (45)	101 (16)	<0.001
Pleural effusion	30 (9)	43 (7)	0.178
Cardiomegaly	27(8)	36 (6)	0.121
High-Risk Pre-PCI conditions			
Cardiac arrest pre-PCI	32 (11)	91 (15)	0.144
Shock pre-PCI	46 (16)	79 (13)	0.177
Ejection Fraction mean-SD	45 (33,55)	45 (35,53)	0.638
In-House presentation of MI	21 (7)	10 (2)	<0.001

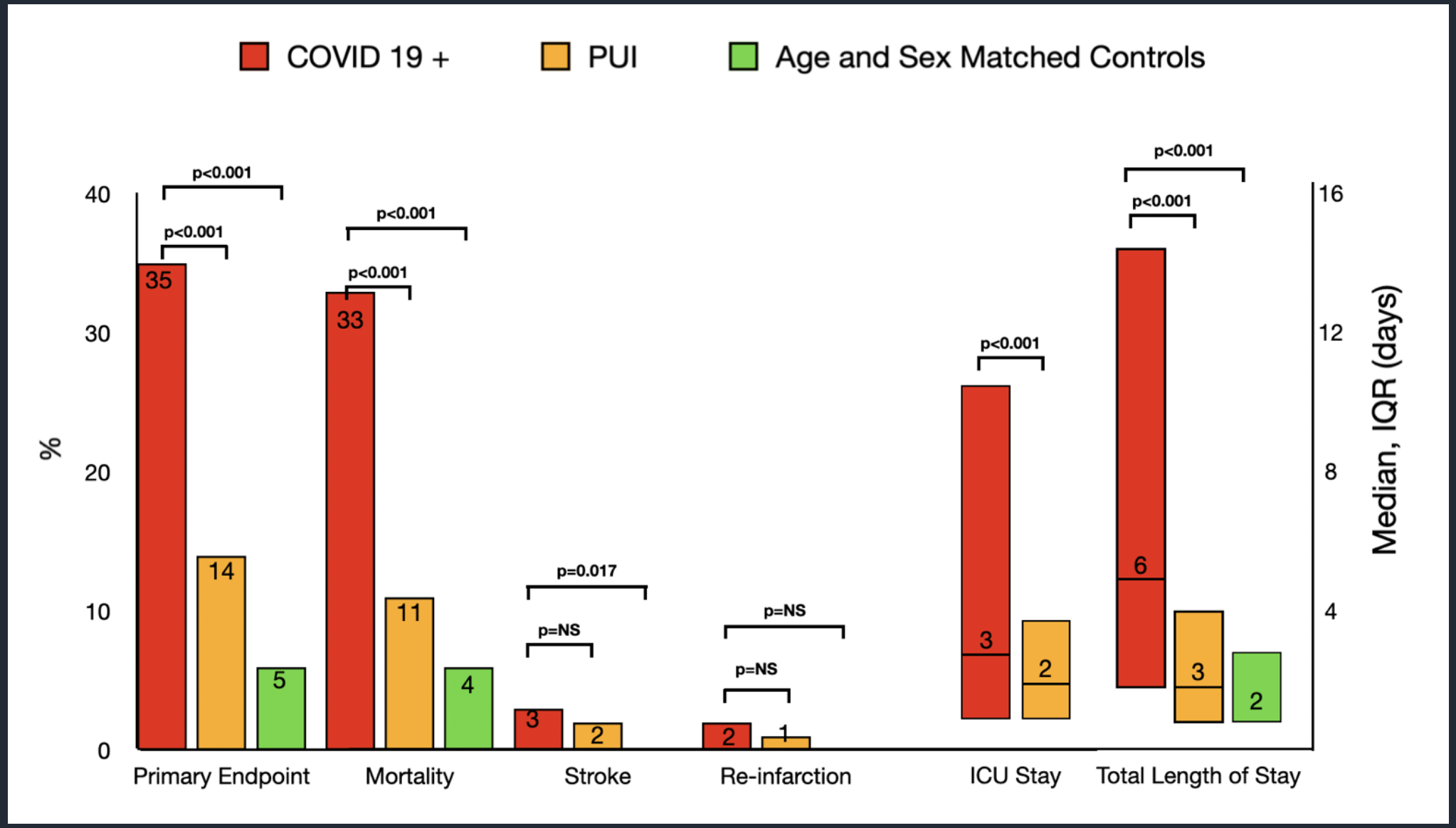
Reperfusion Strategies

- 80% underwent angiography
- PPCI (71% of patients referred for angio, 55% of overall group)

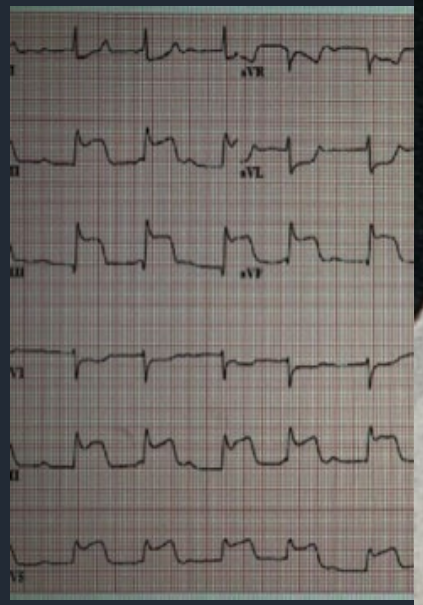


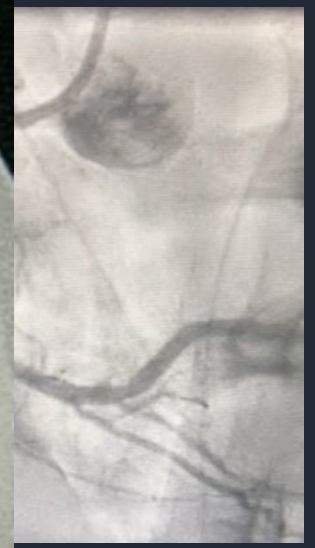
	COVID +	PUI	P-value	Historical Control	P-value
No Angio	22%	4%	<0.001	0	<0.001
D2B time, median (IQR)	79 (52,125)	77 (55,119)	0.989	66 (46,93)	0.008
D2B time < 90 minutes (%)	58%	63%	0.422	73%	0.006

Updated Clinical Outcomes in NACMI



NACMI Patient (MHI)



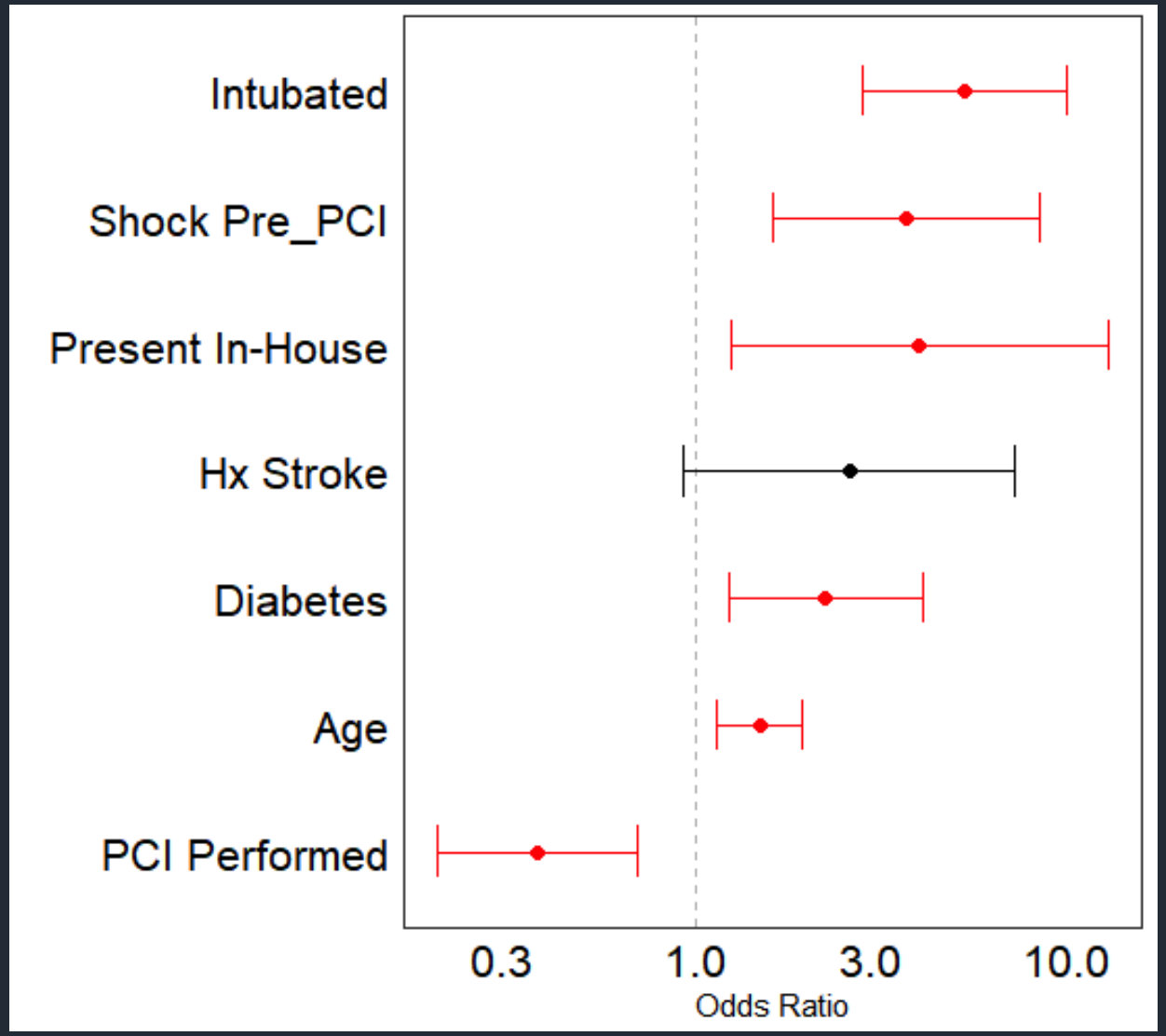


73-year-old man h COVID infection and ARDS.

He is taken to the (for cardiogenic shock and refracto

On day 5, a CT scan shows intracranial bleeding. Family withdrew support.

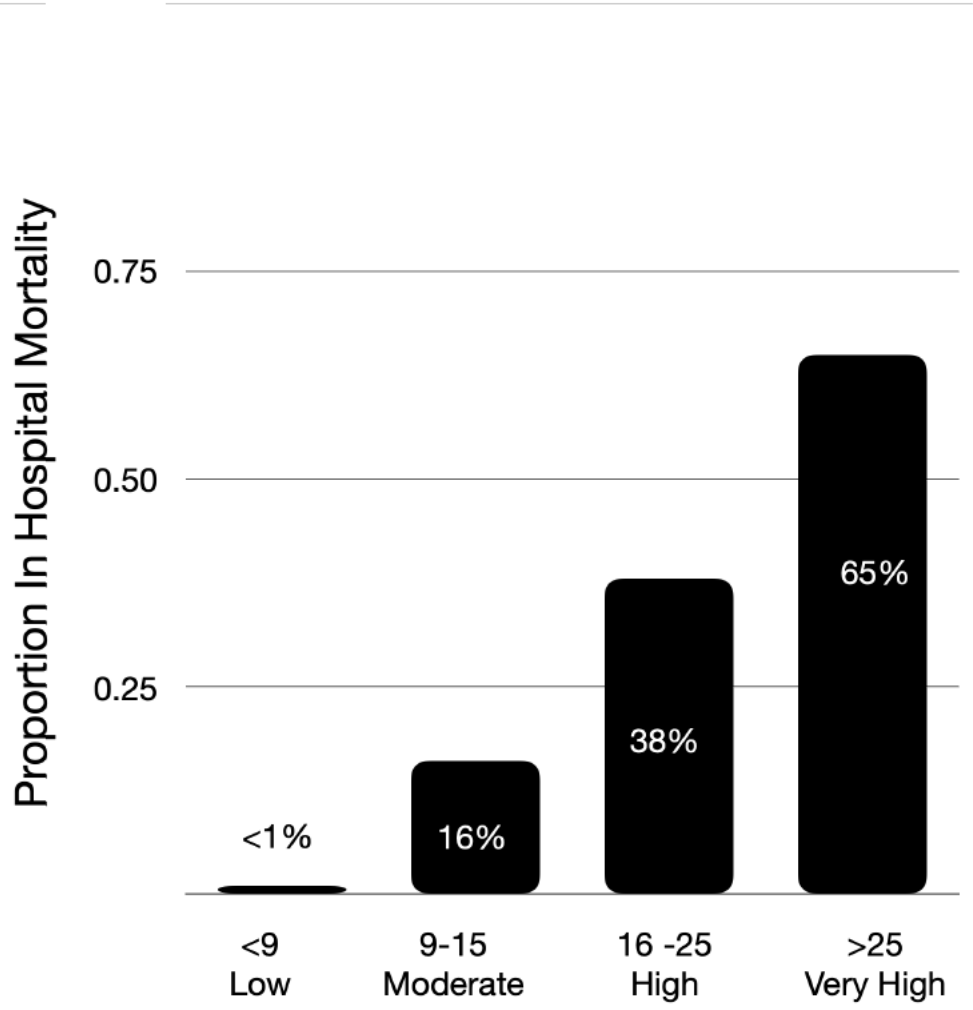
Multi-Variate Predictors of Death in COVID + STEMI (n=331)



NACMI Risk Score

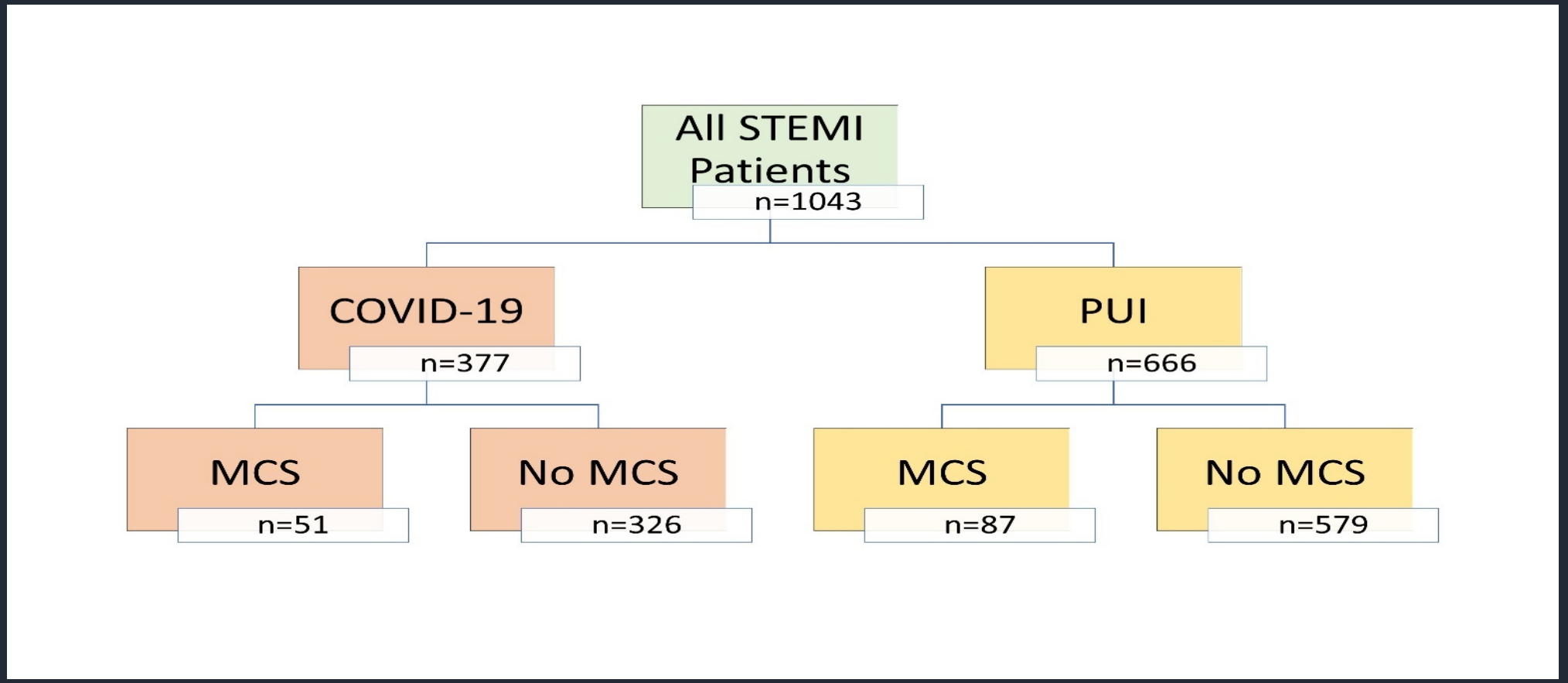
Risk Factors	Integer Score
Dyspnea on presentation	3
Infiltrates on Chest X-ray	4
Shock Pre-PCI	4
Diabetes	5
Age > 55	8
Any Mechanical Support	9
Mechanical Ventilation	13

Calculate Total Risk Score



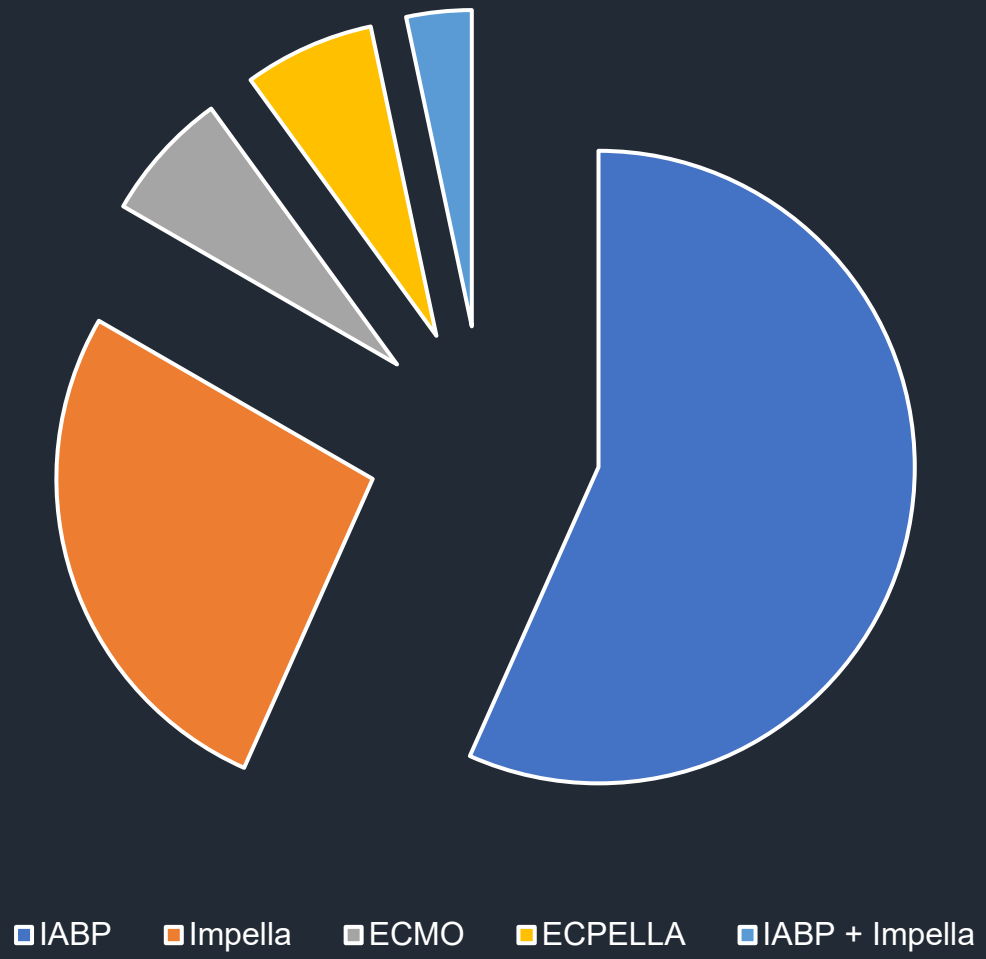
MCS in NACMI

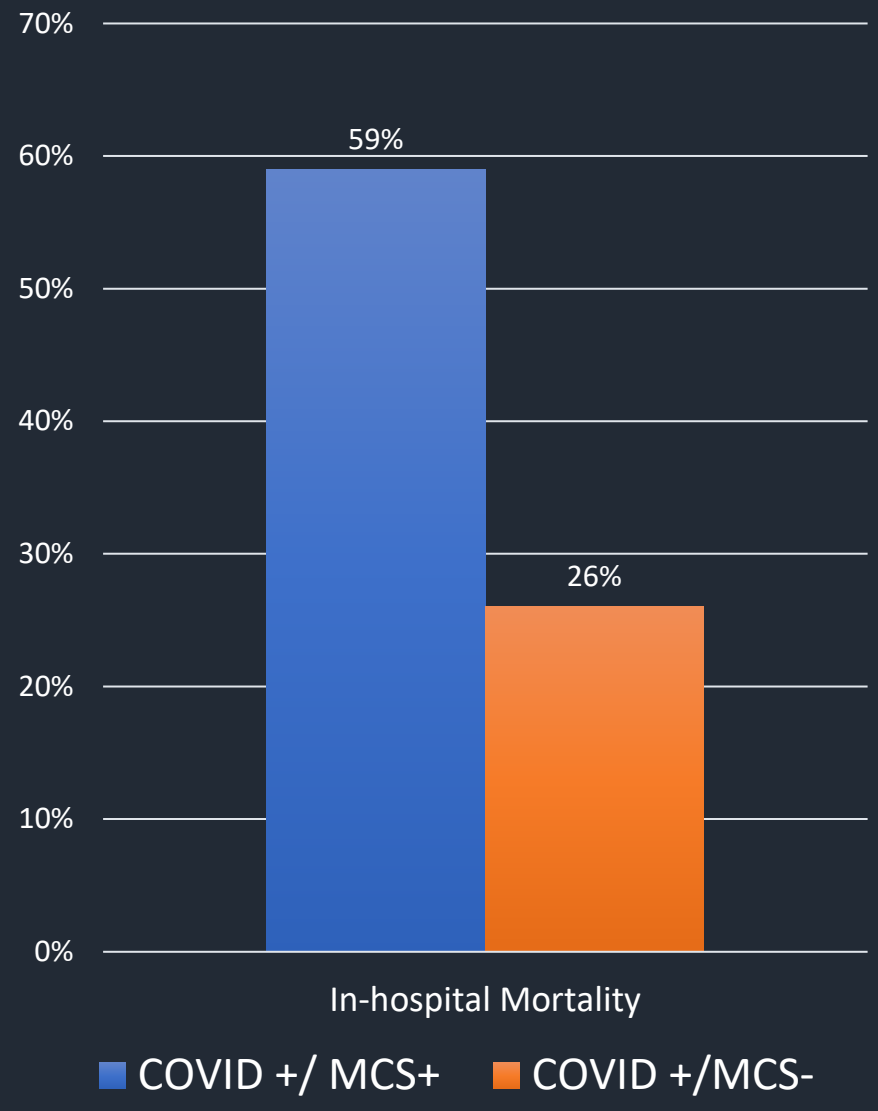
13 % of COVID + Patients

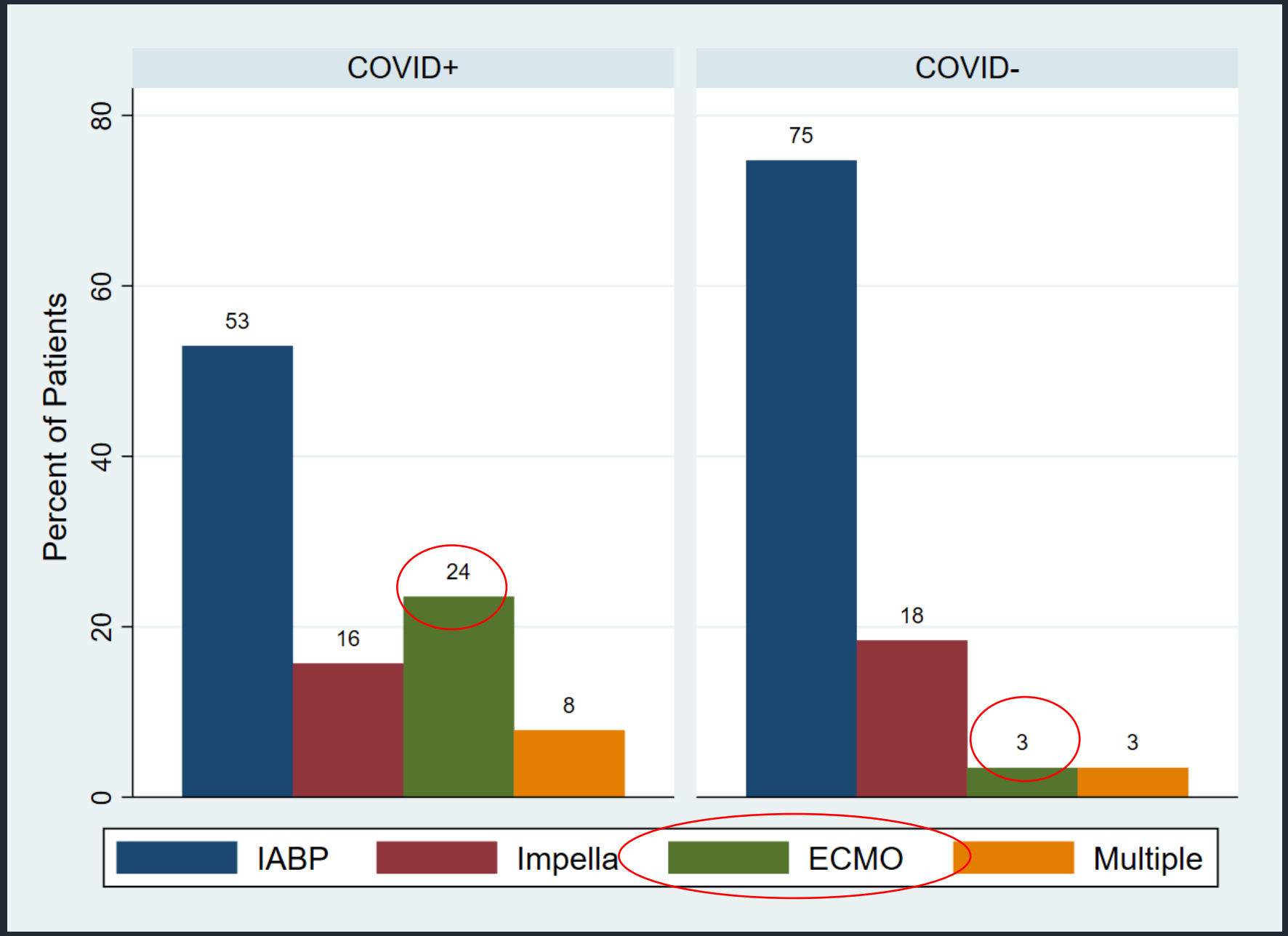


MCS Devices in NACMI

13 % of COVID + Patients






COVID+
COVID-
Percent of Patients
0
20
40
60
80
53
16
24
8
75
18
3
3
IABP
Impella
ECMO
Multiple

Ongoing Analyses

- 1-year Follow-up of survivors
- Angiographic core lab
- ECG core lab
- Gender and ethnic differences
- Canada vs. USA
- Risk score
- MCS

Acknowledgments

MHIF
ACC
SCAI

Industry sponsors
- Medtronic
- Abbott Vascular

The North American COVID-19 STEMI Registry

Santiago Garcia, MD

Back up slides

COVID-19 Hospitalization and Death by Race/Ethnicity

Updated Nov. 30, 2020 Print

Race and ethnicity are risk markers for other underlying conditions that affect health including socioeconomic status, access to health care, and exposure to the virus related to occupation, e.g., frontline, essential, and critical infrastructure workers.

Rate ratios compared to White, Non-Hispanic persons	American Indian or Alaska Native, Non-Hispanic persons	Asian, Non-Hispanic persons	Black or African American, Non-Hispanic persons	Hispanic or Latino persons
Cases[1]	1.8x	0.6x	1.4x	1.7x
Hospitalization[2]	4.0x	1.2x	3.7x	4.1x
Death[3]	2.6x	1.1x	2.8x	2.8x