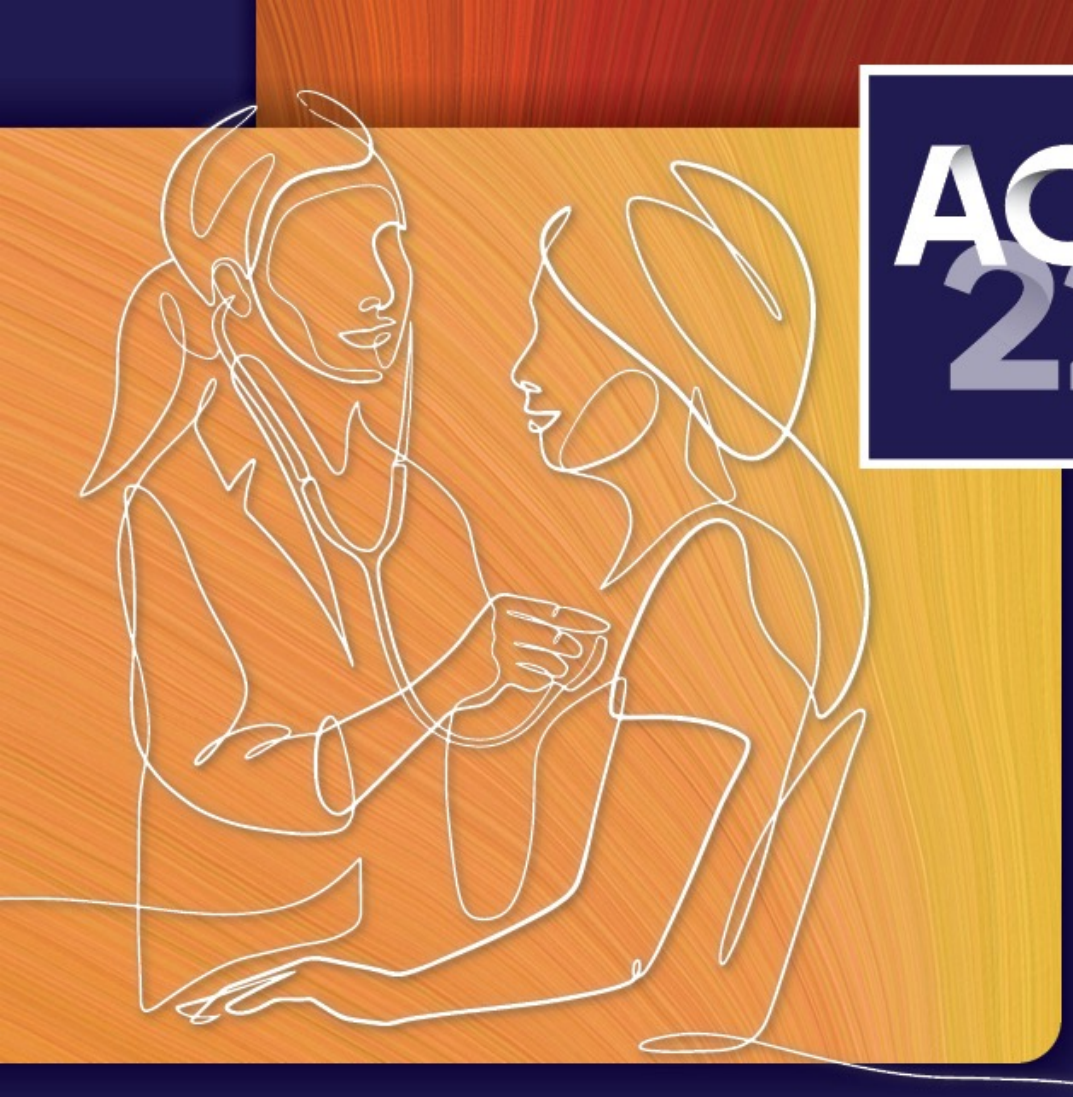

ACC 22

TRANSFORMING CARDIOVASCULAR CARE FOR YOU. FOR YOUR TEAM. FOR YOUR PATIENTS.

AMERICAN COLLEGE of CARDIOLOGY

NACMI: Trends in Clinical Characteristics, Management Strategies and Outcomes of STEMI Patients with COVID-19

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On Behalf of NACMI Investigators

COVID-19 and STEMI Care:
Direct and Indirect Effects

The Direct Effects

History of Cardiovascular Disease and Risk Factors Associated With Mortality

STEMI With COVID-19 Infection

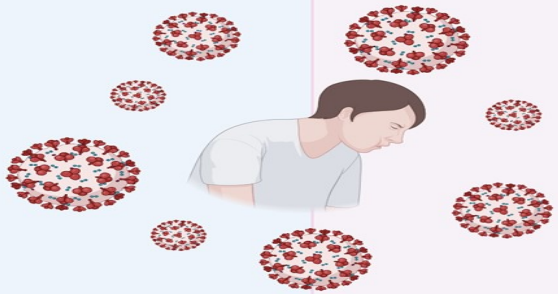
- *20-30% with no culprit lesion*
- *Increase in cardiogenic shock*
- *Increased mortality*

Troponin Elevation Associated With Mechanical Ventilation and Mortality

Up to ~40% elevated troponin

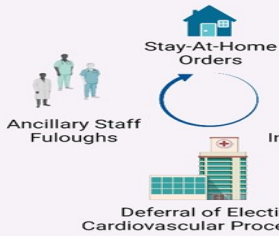
Cardiovascular Complications of COVID-19 Prothrombotic & Proinflammatory

Cardiovascular Effects of COVID-19 Pandemic



The Indirect Effects

Public Health Restrictions



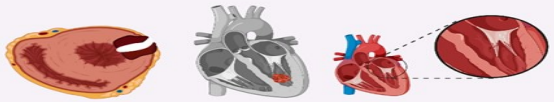
- *Reduction in diagnostic procedures*
- *Decrease in cardiovascular hospitalizations*
- *Increase in cardiovascular mortality*

Out-of-Hospital Cardiac Arrest

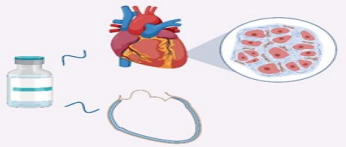
STEMI Without COVID-19 Infection

- *Delay to reperfusion*
- *Increase in infarct size and microvascular obstruction*
- *Increase in cardiogenic shock*

Late Mechanical Complications



Vaccine Related Myocarditis and Pericarditis

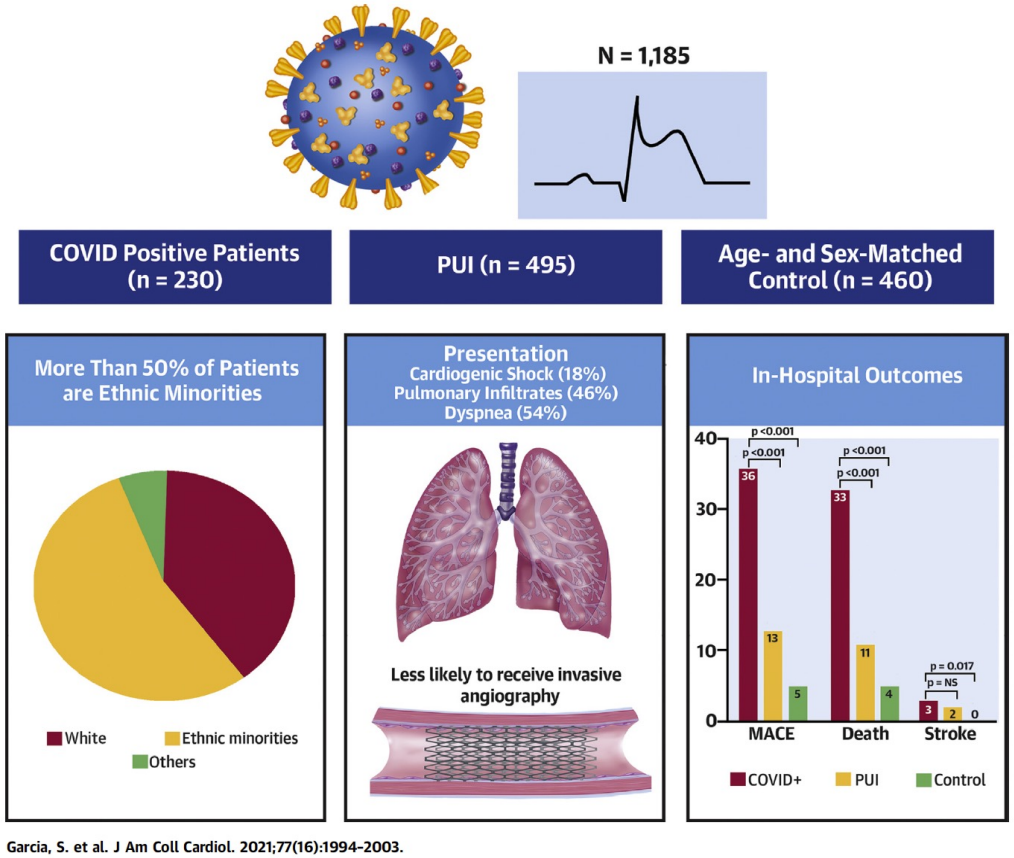


Psychological and Economic Impact

1- *Henry, T. Eur Heart J*, ehab782

Direct Effects of COVID:
STEMI in Patients with COVID-19 Infection

- The risk of myocardial infarction (MI) doubles within 1-2 weeks of receiving a COVID-19 diagnosis
- High-risk subset with distinct clinical features
- Calls to deviate from the standard of care (PPCI) during the pandemic



Garcia, S. et al. J Am Coll Cardiol. 2021;77(16):1994-2003.

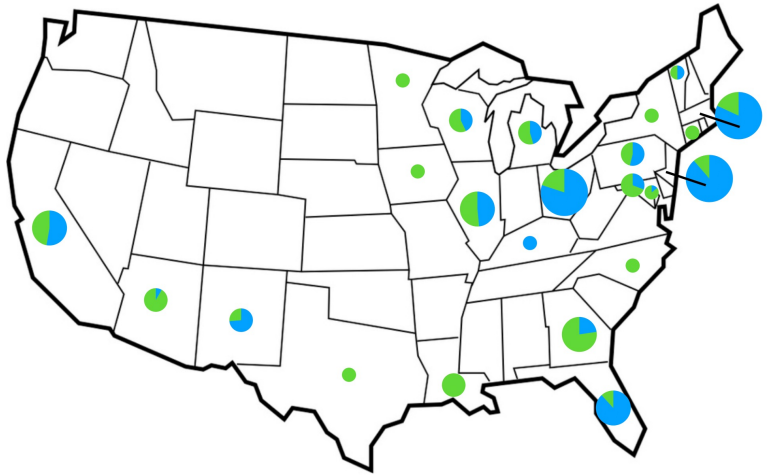
1- Mayo Clin Proc 2021;96:2587-2597

2- Garcia S. JACC 2021; 77 916):1994-2003

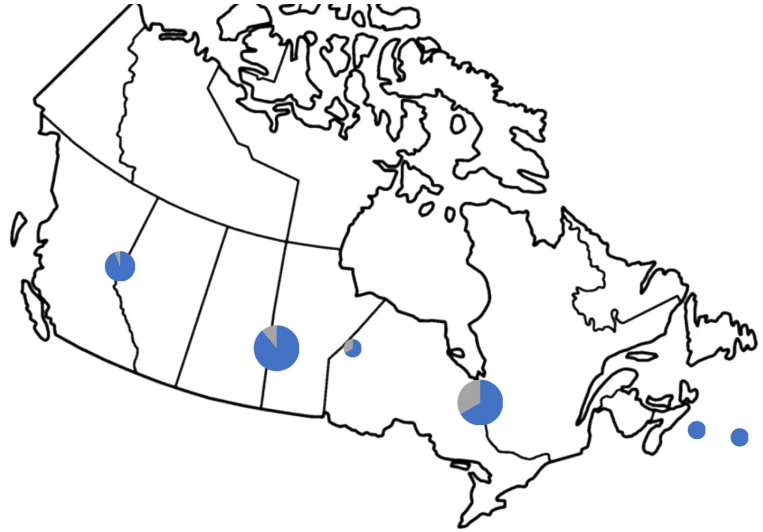
Background

- Despite increased number of COVID-19 cases worldwide, **significant progress has been made** in both disease prevention and management during the course of the pandemic, which has contributed to a **marked reduction in mortality in selected countries**
- Goal: To describe trends in the baseline characteristics, management strategies and outcomes of COVID-19 patients with STEMI during the course of the pandemic

1- Lancet Respir Med 2021;9:397-406.
2- J Hosp Med 2021;16:90-92.
3- Lancet Respir Med 2021;9:322-324.



Methods



- NACMI is a prospective, investigator-initiated, multi-center, observational registry of hospitalized STEMI patients with confirmed or suspected COVID-19 infection in North America
- Broad enrollment criteria without exclusions

Dehghani P et al. Am Heart J 2020;227:11-18.

Methods

Inclusion Criteria

- ***COVID +:*** *A*dult patients (≥18 years) with 1) *ST-segment elevation* in at least 2 contiguous leads (or new-onset left bundle branch block), 2) a *clinical correlate of myocardial ischemia* (e.g., chest pain, dyspnea, cardiac arrest, shock, mechanical ventilation) and 3) *confirmed COVID +* by any commercially available test during, or 4 weeks before, the index STEMI hospitalization.
- ***PUIs:*** *A*dult patients with STEMI who were suspected positive on presentation but subsequently *tested negative for COVID-19 infection* (person under investigation or PUI). The definition of PUI was left to the discretion of local hospitals but in general included a combination of possible COVID signs and symptoms (fever or respiratory symptoms such as cough, shortness of breath, sore throat), or exposure to a confirmed case or cluster of suspected COVID-19 cases.

Methods

Outcomes

- **Primary:** In-hospital mortality
- Secondary: stroke, composite of death, stroke or reinfarction

Comparison

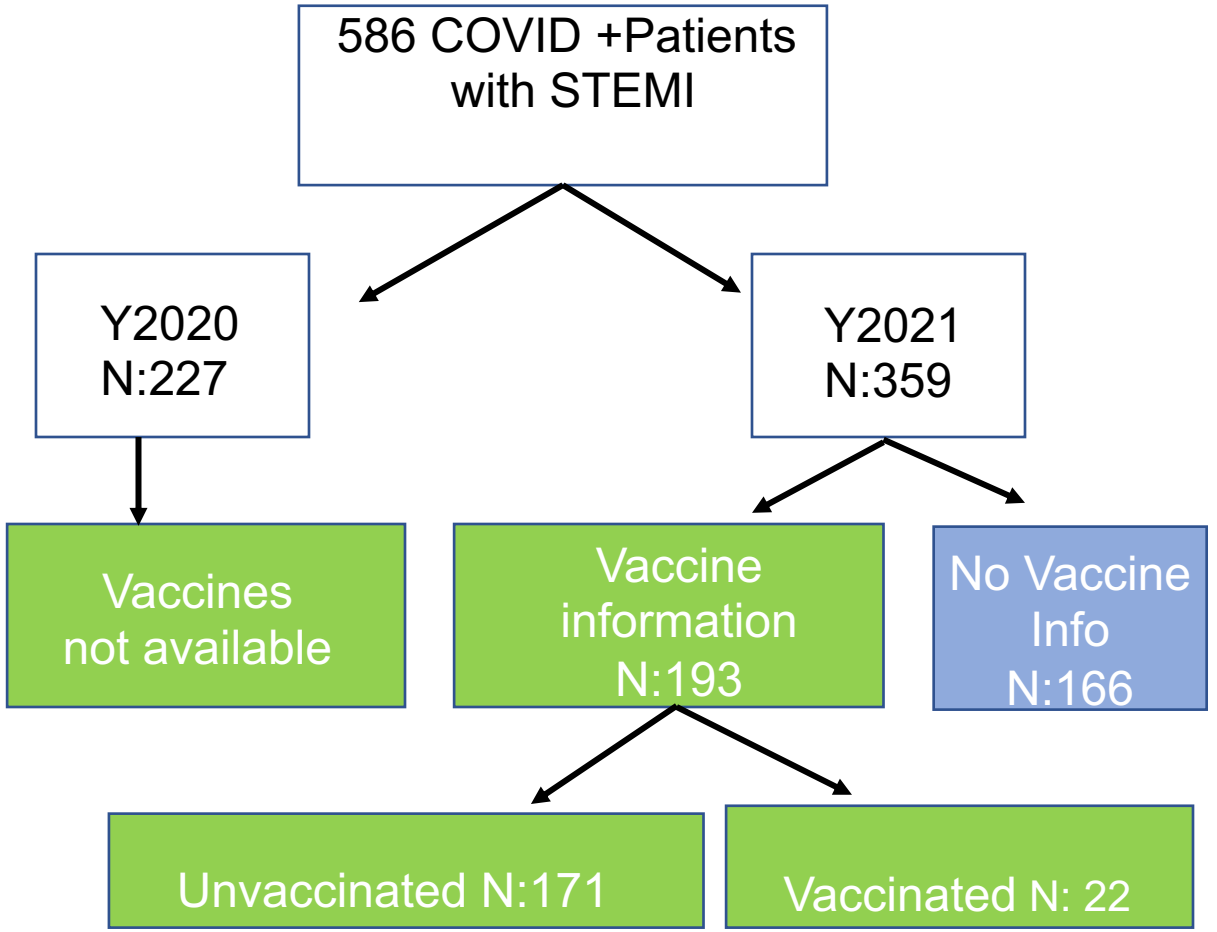
- COVID+ patients were divided into two groups according to the year of the STEMI presentation during the pandemic, i.e. **Y2020** group (3/1/2020 - 12/31/2020) and **Y2021** group (1/1/2021 - 12/31/2021)
- These periods coincided with the ***commercial introduction of vaccines against COVID-19 in North America.***

Statistics

- Demographic, clinical, and outcome variables were compared between the groups using Pearson's chi-squared or Fisher's exact test for categorical data and Student's t-test or Wilcoxon rank-sum test for continuous variables, as appropriate.
- The relative risk of death for Y2021 vs Y2020 group is estimated from a multivariate robust Poisson regression analysis with a canonical log-link and robust sandwich estimator of variance to allow for overdispersion in the data.
- Model covariates include age, BMI, gender, race, diabetes, abnormal chest X-ray findings, and shock pre-PCI.
- Age originally collected as a five-category variable is dichotomized as < 66 or ≥ 66 years; and BMI categories are defined overweight/obese or not per CDC definition.
- A proxy comorbidity index is defined to capture the pre-existing cardiovascular diseases/conditions as follows: a sum of indicators of hypertension and history of PCI, MI, CABG, stroke, or CHF for each patient is dichotomized to index those with three or more pre-existing conditions

Vaccines: 74% overall, 54% of Y2021patients with vaccine information

- NACMI was designed in early 2020 prior to the commercialization of vaccines against COVID-19
- Vaccine status was not routinely captured in the registry
- However, once vaccines became commercially available in North America in 2021 the original protocol was amended to include immunization status including timing and type
- The protocol amendment was approved by 20 enrolling sites at the time of this publication



Results

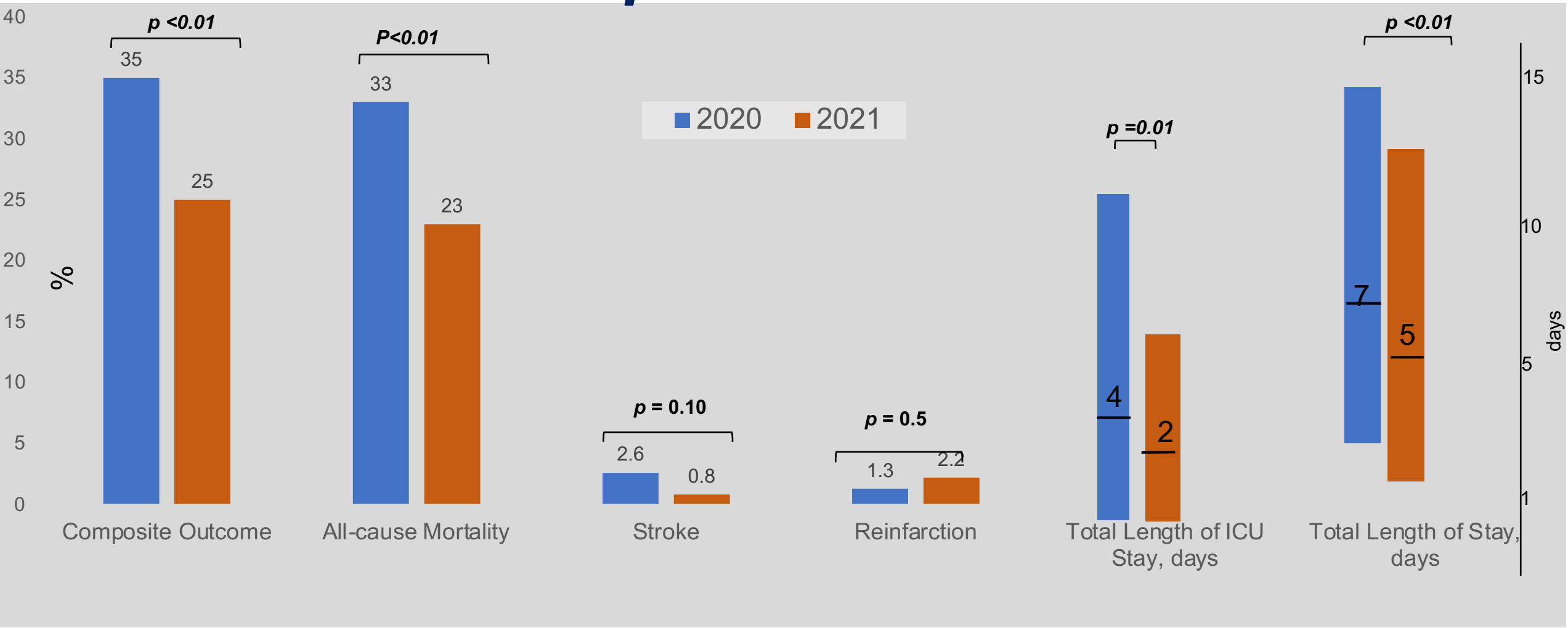
Baseline Characteristics	Y2020 n = 227	Y2021 n = 359	p-value
Age > 55 years	175 (77)	261 (73)	0.3
Male	163 (72)	268 (75)	0.4
History of CAD	51 (24)	88 (28)	0.3
Non-Caucasian	137 (61)	142 (42)	<0.001
Dyslipidemia	98 (45)	145 (46)	0.9
Diabetes Mellitus	102 (46)	135 (42)	0.4
BMI (Kg/m^2) - mean ± SD	29 ± 8	27 ± 10	0.5
Hypertension	165 (74)	223 (65)	0.025
History of Heart Failure	33 (16)	51 (16)	0.9
Symptoms at Presentation			
Dyspnea	126 (56)	152 (42)	0.002
Chest pain	115 (51)	212 (59)	0.046
Syncope	6 (2.6)	16 (4.5)	0.3
Infiltrates on Chest X-ray	106 (47)	120 (33)	0.001
Cardiac arrest pre-PCI	23 (11)	24 (7.9)	0.2
Shock pre-PCI	37 (18)	38 (13)	0.079
Ejection Fraction	43 (35, 55)	45 (34, 55)	0.5
In-House presentation of MI	13 (5.7)	26 (7.4)	0.4

Utilization of Invasive Angiography and Coronary Revascularization

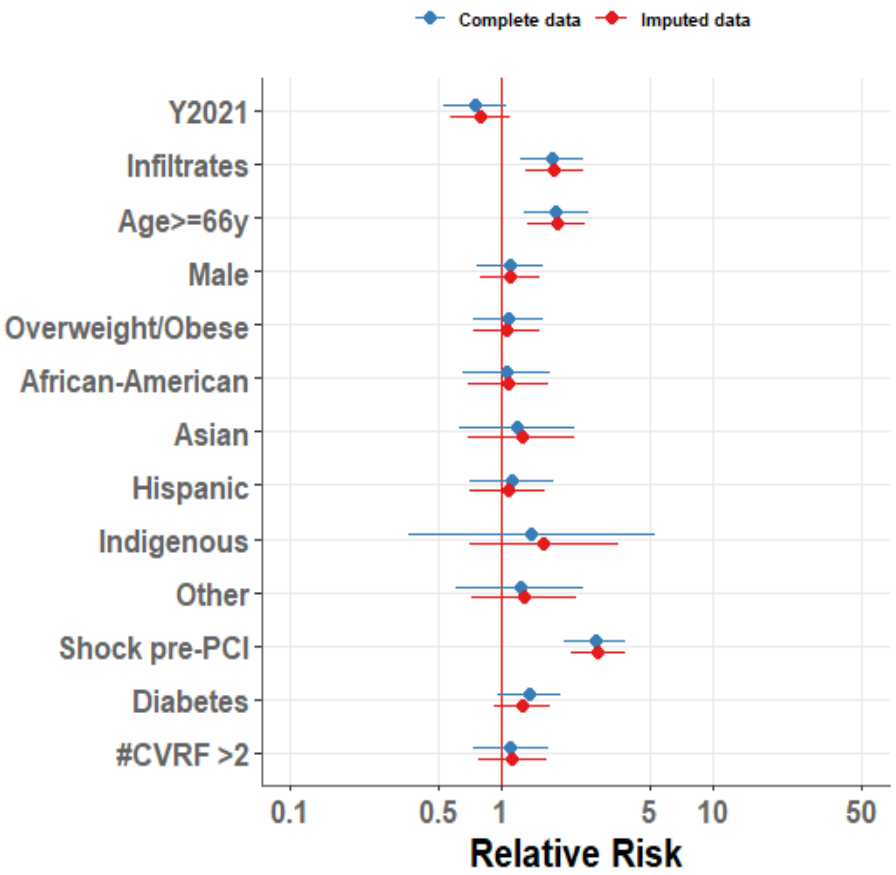
Variable	Y2020 n = 227	Y2021 n = 359	p-value[1]
No angiogram	52 (23)	49 (14)	0.004
Patients undergoing invasive angiography, n = 485			
Reperfusion strategy	n = 175	n =310	0.7
CABG	3 (1.7)	5 (1.6)	
Facilitated/Rescue PCI	7 (4.0)	11 (3.5)	
Medical therapy	34 (19)	78 (25)	
Primary PCI	125 (71)	206 (66)	
Thrombolytics	6 (3.4)	10 (3.2)	

Results

In-Hospital Outcomes



Results (Cont'd)

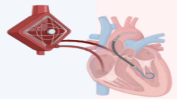
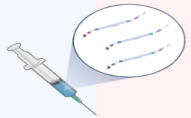


- Risk of in-hospital mortality 25% lower (95% CI: -47-5, p=0.01) in Y2021 relative to Y2020
- Risk 1.7 (95% CI:1.2, 2.4, p=0.002) times higher if infiltrates were observed on X-Ray and nearly three times higher (95% CI:1.9-3.9, p<0.001) if cardiogenic shock was present
- Risk also higher for patients ≥66 years of age

Vaccine Effect (Y2021)

	Unvaccinated, n = 171	Vaccinated, n = 22	p-value[1]
Age < 66y	104 (61)	12 (55)	0.572
Overweight / Obese	128 (78)	16 (89)	0.372
CVRF <3	137 (80)	19 (86)	0.579
Dyspnea	79 (46)	6 (27)	0.092
Chest Pain	107 (63)	15 (68)	0.608
Syncope	6(3.5)	1 (4.5)	0.577
Infiltrates on Chest X-Ray	64 (37)	4 (18)	0.075
Cardiac arrest pre-PCI	8 (5.4)	1 (5.0)	1.0
Shock pre-PCI	20 (14)	2 (10)	1.0
Ejection Fraction	45 (34, 55)	45 (44, 54)	0.404
In-House presentation of MI	19 (11)	0	0.137
Clinical Outcomes			
Mortality	37 (22)	0 (0)	0.009
Stroke	1 (0.6)	0 (0)	1.0
Reinfarction	3 (1.8)	1. (4.5)	0.386
Composite end-point	38 (22)	1 (4.5)	0.052

Trends In STEMI Patients With Infection

	2020		2021
Non-Caucasian	61%		42%
Symptom/Dyspnea	56%		42%
Infiltrates On Chest X-Ray	47%		33%
Cardiogenic Shock	18%		13%
Covid-19 Vaccination	0%		11%
In-Hospital Mortality	33%		23%

Simultaneous Publication in JACC

Acknowledgements

- NACMI received financial support from ACC, Saskatchewan Health Research Foundation (SHRF), Medtronic and Abbott Vascular
- Minneapolis Heart Institute Foundation (MHIF) data coordinating site
- 64 enrolling sites without compensation and in the midst of a pandemic that significantly affected biomedical research

Conclusions

- In-hospital mortality decreased 25% in Y2021
- Possible mediators: lower risk profile of patients, more typical ischemic symptoms, less cardiogenic shock and pulmonary involvement
- Vaccinated patients less likely to develop respiratory complications, none of them expired
- In contrast, mortality remains high (22%) for unvaccinated patients
- Despite logistical challenges, PCI remains dominant revascularization modality, 2/3 D2B time ≤ 90 minutes
- **In summary, the clinical profile, management and outcomes of STEMI patients with COVID-19 infection is evolving towards that of STEMI patients prior to the pandemic although mortality remains high for unvaccinated patients**