MHIF Research Highlights: May 2020

Thanks to the physicians participating in the five-part, e-series connecting our physicians to the community!

Drs. Steven Bradley, Paul Sorajja, Retu Saxena, Peter Eckman, John Zakaib

mplsheart.org/on-the-pulse

Do you have a perspective about your world during the current pandemic you'd be willing to publish on the MHIF website?

Please let us know by connecting with Jesse Hicks – jhicks@mhif.org

Interested in MHIF Updates During COVID-19?

Visit mplsheart.org/coronavirus/

MHIF FEATURE:

HemoLung Emergency Use of ECCO2R
Dr. Saavedra-Romero

CONTACT:

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Carina Benson - carina.benson@allina.com

MHIF Research Tiger Team ready to support HemoLung with 24/7 onsite research coverage!

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American Heart Association COVID-19 CVD Registry

Steven M. Bradley, MD, MPH
Associate Medical Director, Healthcare Delivery Innovation Center
Minneapolis Heart Institute
Steering Committee Member, AHA COVID-19 CVD Registry

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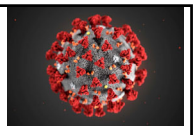
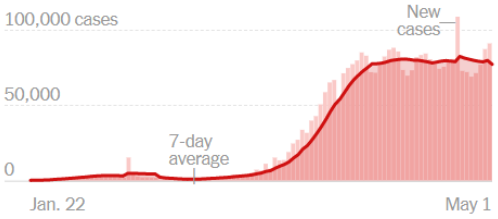
What is COVID-19?



- Disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
  - Emerged in Wuhan, China, in late 2019 with subsequent global spread
  - Common symptoms include fever, cough, and shortness of breath → can progress to severe illness.



TOTAL CASES
3.3 million+
DEATHS
241,677
UPDATE Includes confirmed and probable cases where available

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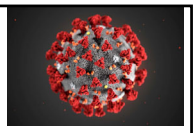
What is COVID-19?



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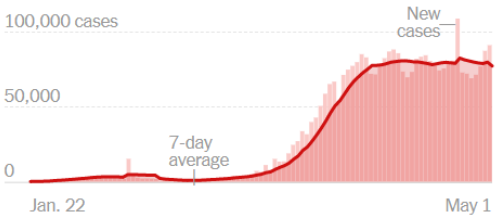

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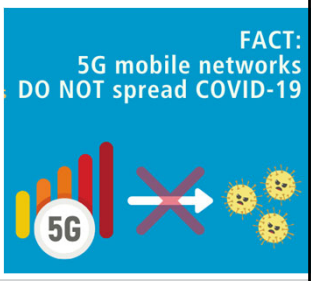

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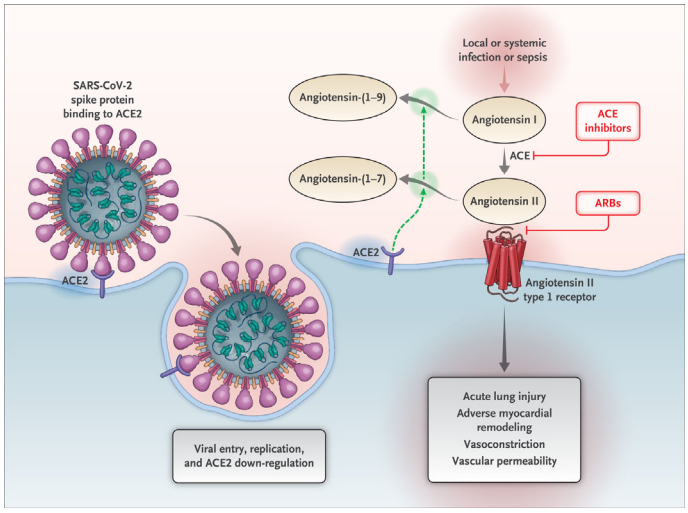
COVID-19 and Cardiovascular Disease



- SARS-CoV-2 invades the cell through ACE2
  - Enzyme involved blood pressure regulation
- Conflicting hypotheses that ACE/ARB or upregulation of RAAS could contribute to illness

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Association between CVD and COVID Outcomes

Mortality among 191 hospitalized patients with COVID-19

Characteristic	Non-survivor (n=54, 28%)	Survivor (n=137, 72%)
Age, med.	69 (63-76)	52 (45-58)
Male, %	70	59
HTN, %	48	23
CAD, %	24	1
Diabetes, %	31	14
COPD, %	7	1

Zhou F, et al. Lancet 2020;395:1054–62

ARDS among 201 hospitalized patients with COVID-19

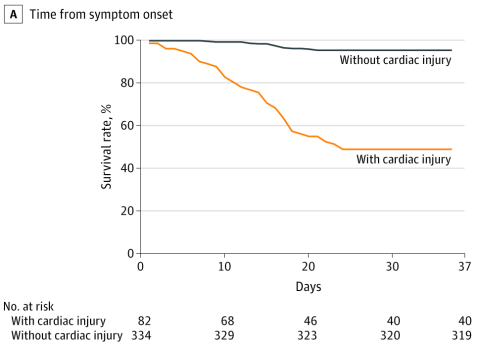
Characteristic	ARDS (n=84, 28%)	Without ARDS (n=117, 72%)
Age, med.	58.5 (50-69)	48 (40-54)
Sex, %	71	58
HTN	27	13
Cardiac dis.	6	3
Diabetes	19	5

Wu C, et al. JAMA Intern Med. 2020 (online).

Association between COVID and CV Events

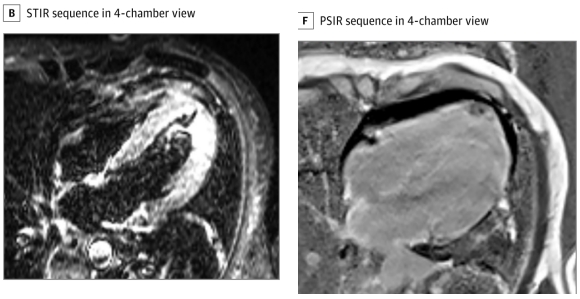
Among 416 hospitalized patients

- 19.7% with “cardiac injury”



Shi S, et al. JAMA Cardiol. March 25, 2020

Case Reports of Myopericarditis and Stress Cardiomyopathy



Inciardi R, et al. JAMA Cardiol. March 27, 2020

Association between COVID and Thrombotic Events

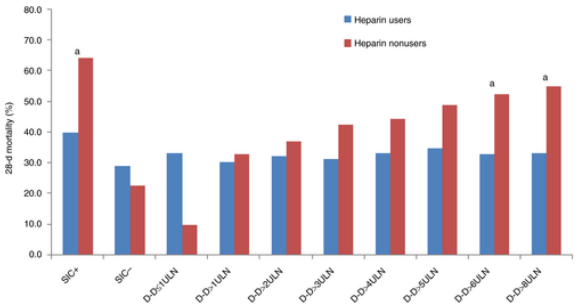
Case Series of Large Vessel Strokes in patients <50 years old

- ~5% of hospitalized patients in single site

Oxley TJ, et al. NEJM. April 28, 2020

High Prevalence of VTE among Critically Ill Patients

- Low quality evidence regarding full dose anticoagulation for prophylaxis

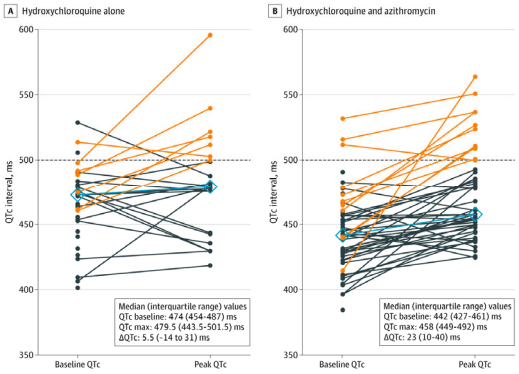


Tang N, et al. J Thromb Haemost. 2020;18:1094-1099.

Proposed COVID Management and CVD

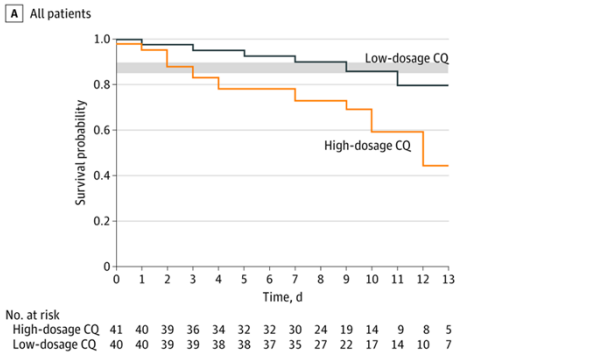
HCQ, AZM, QTc and Risk of Arrhythmia

- 90 patients treated with HCQ +/- AZM
- 20% with post-tx QTc >500 ms



Mercuro NJ, et al. JAMA Cardiol. May 1, 2020

Higher mortality with high dose CQ



Gabriela Silva Borba M, et al. JAMA Netw Open. 2020;3:e208857
Fihn SD, et al. JAMA Netw Open. 2020;3:e209035
JNOLive

CVD Management and COVID Outcomes

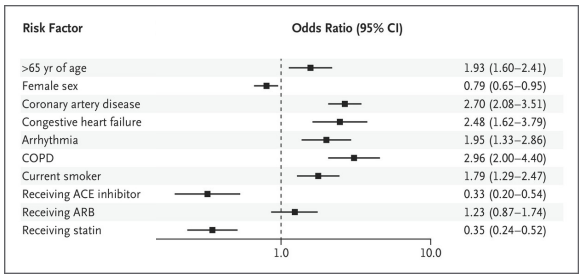
RAAS Inhibitors and COVID Outcomes in Patients with Hypertension

- No difference in illness severity or mortality by use of ACE-I/ARB

Characteristic	ACE-I/ARB (n=115)	No ACE/ARB (n=247)
Age, med.	65 (57-73)	67 (60-75)
Male, %	59	49
Prior CVA, %	24	17
CAD, %	24	14
Diabetes, %	36	34
Lung disease, %	7	4

ACE/ARB on Admission and COVID Outcomes

- No mortality signal (risk of indication bias)



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ACE/ARB on Admission and COVID Outcomes

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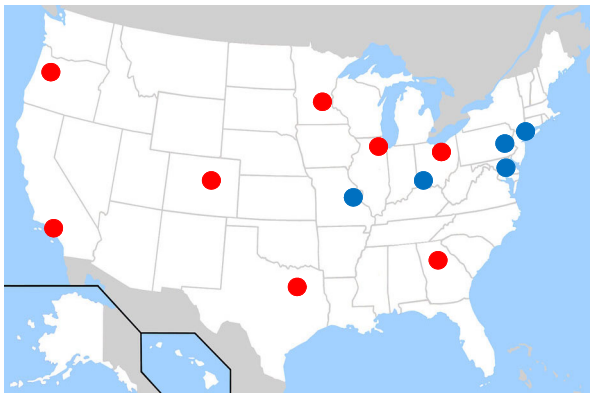
Table 2. Cardiovascular Drug Therapy at Hospitalization among Survivors and Nonsurvivors of Covid-19.*

Drug Class	Survivors (N=8395)	Nonsurvivors (N=515)	Difference (95% CI)
	number (percent)		*percentage points*
ACE inhibitor	754 (9.0)	16 (3.1)	5.9 (4.3 to 7.5)
ARB	518 (6.2)	38 (7.4)	−1.2 (−3.5 to 1.1)
Beta-blocker	497 (5.9)	28 (5.4)	0.5 (−1.6 to 2.6)

From CV-QuIC to AHA COVID-19 CVD Registry

CV Quality Improvement and Care Innovation Collaborative



March 20th: "Leveraging CV QUIC for COVID-19"

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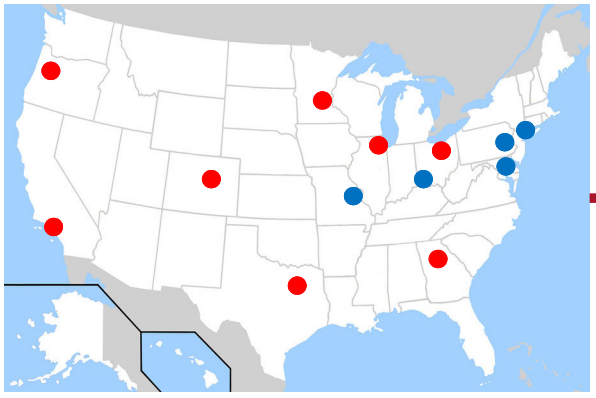
From CV-QuIC to AHA COVID-19 CVD Registry

CV Quality Improvement and Care Innovation Collaborative



March 20th: "Leveraging CV QUIC for COVID-19"

April 3: COVID-19 CVD Registry Announced

COVID-19 CVD Registry

To better understand the COVID-19 pandemic, the American Heart Association has developed a new registry for hospitals and health systems caring for COVID-19 patients.

"Having sufficient data is the first step to understanding the impact of COVID-19 on cardiovascular health"

-John Warner, M.D., FAHA

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AHA COVID-19 CVD Registry

All hospitalized patients with active COVID infection

Leverages Existing GWTG Program
- >1000 participating hospitals; no cost

Systematic capture of real-world practice patterns and outcomes
- Address clinical questions
  - Risk Prediction
  - Effectiveness vs Efficacy
- Inform Clinical Practice Guidelines
- Benchmark Practices and Outcomes

Registry Timeline

March 20	CV-QuIC Discussion
April 2	Steering Committee
April 9	CRF V1 Finalized
April 16	Operations Committee
April 23	R&P Formalized
April 24	First Cases Entered
April 28	CRF V2 Drafted

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Example Data Elements and Reporting Measures

Category	Examples
Demographics	Sex, race/ethnicity, age
Medical history	Cardiac risk factors, COPD, autoimmune disorders
Medical therapy (prior to admission)	HTN meds, lipid meds, DM meds, immunomodulators
Admission vital signs	Height, weight, BP, HR, O2 saturation
Laboratory values	Lymphocyte count, creatinine, d-dimer, BNP, troponin, ferritin, AST, ALT,
Covid Medical therapy (inpatient)	HCQ, lopinavir/ritonavir, Remdesivir, convalescent serum
Cardiovascular medical therapy	VTE prophylaxis, anticoagulants, ACE inhibitor/ARB, statin, diabetes therapies
Inpatient interventions	Mechanical ventilation, mechanical circulatory support
In-hospital outcomes	Mortality, stroke, heart attack, arrhythmia, DVT/PE

Patient outcomes
- In-hospital mortality
- ICU
- Mechanical ventilation
- LOS
- CV outcomes (MI, stroke, HF, arrhythmia)

Management
- Continuation of ACE-I/ARB
- VTE prophylaxis
- COVID specific therapies

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Summary

- The implications of COVID-19 for CVD (and CVD for COVID) are immense
- AHA COVID CVD Registry will provide high-quality multicenter real-world data to inform best practices

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Spotlight on National COVID-19 CV Registries:

North American COVID-19 ST-Segment Elevation Myocardial Infarction (NACMI) Registry

Santiago Garcia, MD
santiagogarcia@me.com
Cell:305-439-4083
Minneapolis Heart Institute

Why a STEMI Registry for a Viral Respiratory Illness?

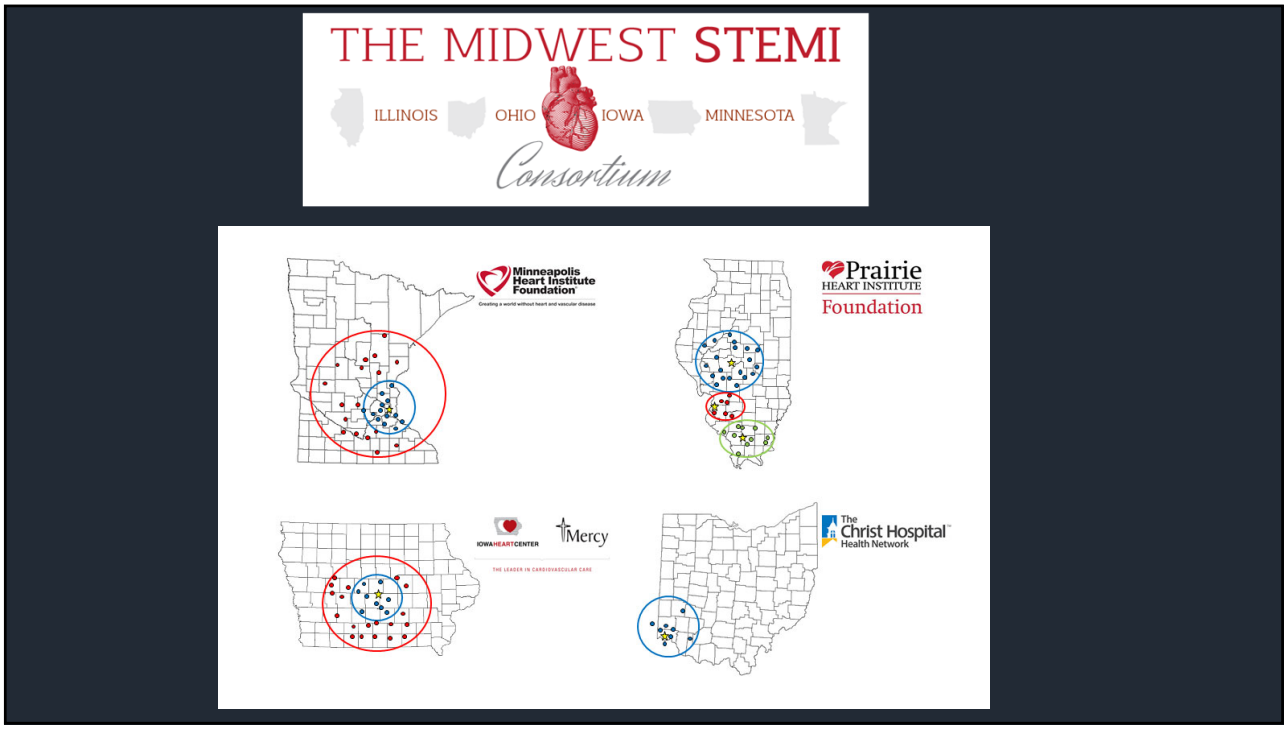
- Myocardial injury reported in 7-28% of hospitalized COVID-19 positive patients and is associated with higher mortality
- Early reports indicate that in COVID-19 patients with ST-elevation on electrocardiography (ECG), emergent angiography has revealed a variety of findings
- Patients with cardiovascular risk factors or established cardiovascular disease are more likely to experience severe or critical COVID-19 illness requiring intensive care unit (ICU) care for advanced therapies

NACMI: A Collaboration of 2 Interventional Societies (SCAI and CAIC) and ACC
In 2 weeks…..with no travel

1- Developed protocol after 2 conference call, multiple (21) Google docs
2- Methodology manuscript submitted for publication (American Heart Journal)
2- AHA Grant submitted for funding
3- Allina IRB approved protocol
4- 114 sites have been sent or requested information
5- Six sites are active and enrolling
6- Seven more sites have IRB approvals
7- Five sites have data use agreements completed

Goals

- To create a multi-center database of patients who present with ST segment elevation or new left bundle branch block (LBBB) on ECG and are COVID-19 positive or persons under investigation (PUI)
- To compare the demographics, clinical findings, outcomes and management strategies of patients identified in primary objective to a historical control of over 15,000 consecutive STEMI activation patients from the Midwest STEMI Consortium
- To develop data-driven treatment plans, guidelines and diagnostic acumen regarding these unique patients



Midwest STEMI Consortium (>15,000 patients) Standardized STEMI protocols

- The Midwest STEMI Consortium serves for **total of over 100 community hospitals without PCI capability** by using well-established **standardized STEMI protocols** with a similar pattern:
  - **Predetermined STEMI diagnosis criteria** per the guidelines.
  - **Activation of the STEMI alert system** by EMS or referral hospital with a single phone call or text.
  - **Pre-identified transport routes** to the centers.
  - **Bypassing the emergency department** in the centers to proceed directly to the catheterization laboratory.
- Comprehensive data including **demographics, clinical and angiographic characteristics, time data, and administered medications.**
- Follow-up data:
  - **Re-admission, major adverse cardiac events, mortality, and compliance to anti-platelet treatments** for the duration of **1-month, 1-year, and 5-year** post discharge either by phone calls or chart review.
  - **10-year mortality check** performed by checking national death index

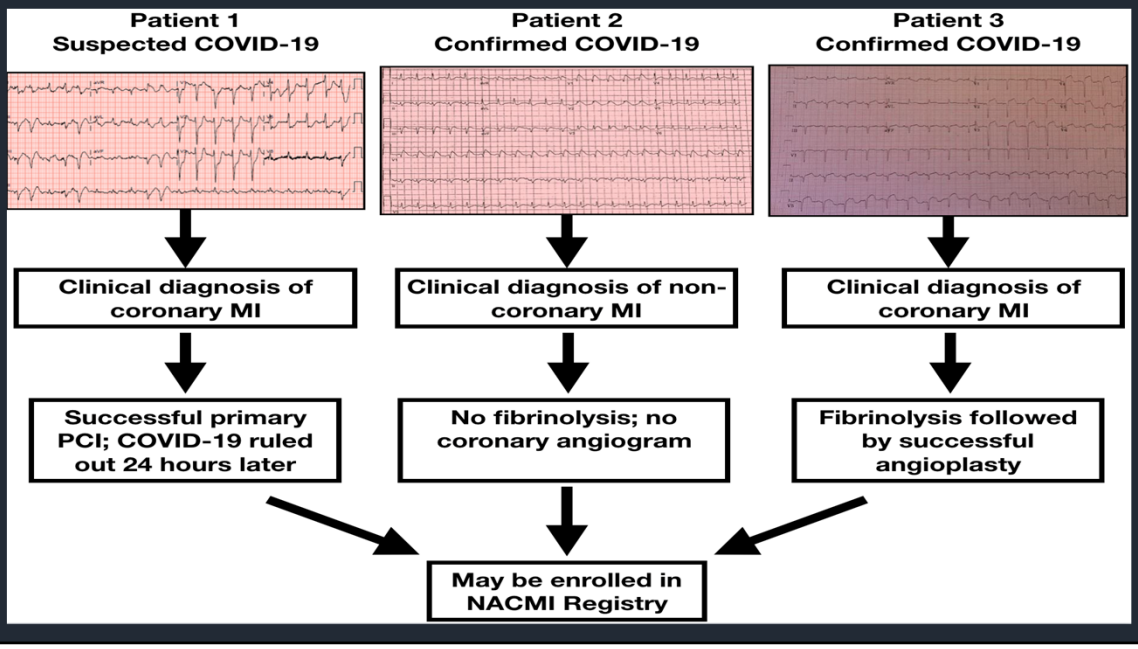
Inclusion and Exclusion Criteria

- 1) COVID-19 positive or PUI, 2) presents with ST-segment elevation or new-onset LBBB on 12-lead ECG, and 3) are ≥ 18 years of age
- Study inclusion will be restricted to those with an accompanying clinical correlate of myocardial ischemia (e.g., chest or abdominal discomfort, dyspnea, cardiac arrest, shock, mechanical ventilation)

- There are no exclusion criteria

PUI is currently defined as presence of fever or respiratory symptoms (cough, shortness of breath, sore throat), loss of smell, or mental status changes, either travel within 14 days or exposure to a confirmed case or cluster of suspected COVID-19 cases.

Pathways to Get Into NACMI



What we don't know about STEMI in COVID?

- Who needs to come the CV lab?
- What are the most common angiographic correlates?
- Are they similar to non-COVID patients?
- What treatment works best (PPCI, lytics, Conservative Rx)?
- Can me make data-driven management algorithms and recommendations?
- How is COVID-19 affecting care of non-COVID patients?

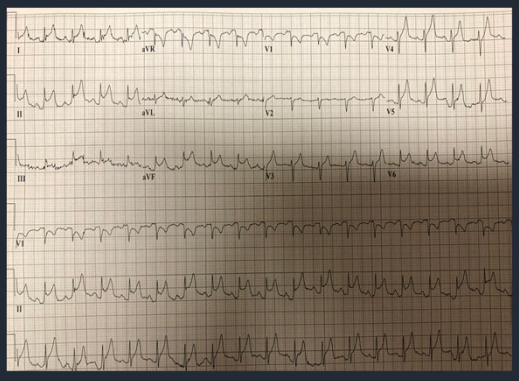
Who needs to come to the CV lab?

- Healthcare workers: 13% of COVID-19 cases in Spain
- Shortages of PPE widely reported
- Shortages in testing materials and long turnaround times: difficult to confirm cases, increases the # of patients under investigation (PUI)

Modified Reperfusion Strategies for STEMI during COVID-19 : Rationale

1- Currently in US practice, 13% of all STEMI patients receive pharmacoinvasive therapy, which includes a 'drip and ship' approach of fibrinolytic therapy (FT) followed by transfer to a PCI center for coronary angiography and PCI within 6-24 hours.
2- Given its established efficacy, some make a case for considering FT as primary therapy during the COVID-19 pandemic for STEMI patients presenting within 3 hours of symptoms and without any high-risk clinical findings.
3- FT potentially could mitigate delays in reperfusion related to increased overall time in the emergency room (establish history, sick contacts, and any additional testing to rule out COVID-19) and additional time needed for cath teams to be appropriately protected.
4- Door-to-needle time may be a quicker way to reperfusion even when primary PCI capabilities exist at the hospital.
5- FT may also be advantageous from the standpoint of resource utilization and protection of essential health care staff such as cath teams.
6-A proposed algorithm retains emergent PCI for patients who are 'high risk' and those who fail reperfusion therapy

Thrombolytics.....
Are you sure this is a good idea?



PUI
Normal EF
Normal Cors

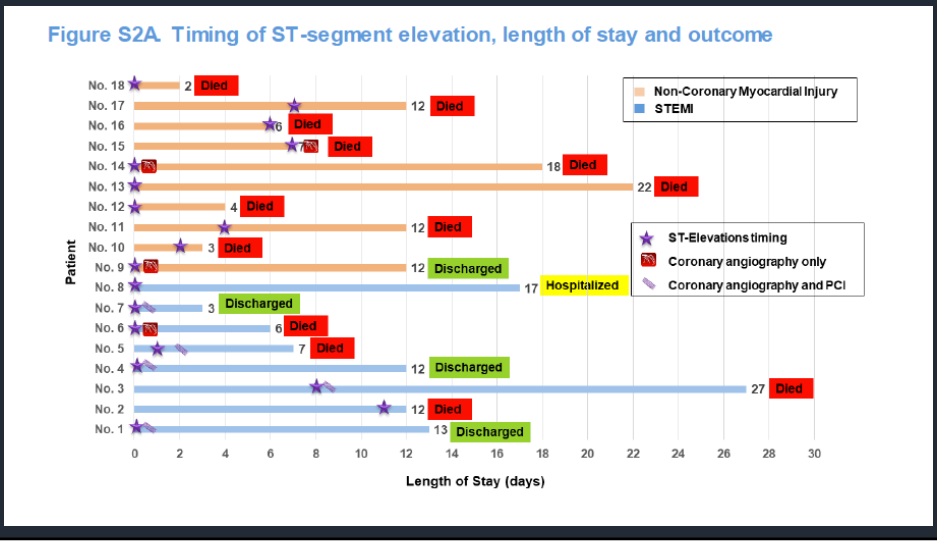
Early NYC experience (n=18)

Timing of ST-segment elevation: 10 (56%) at presentation, 8 during hospitalization (median 6 days)

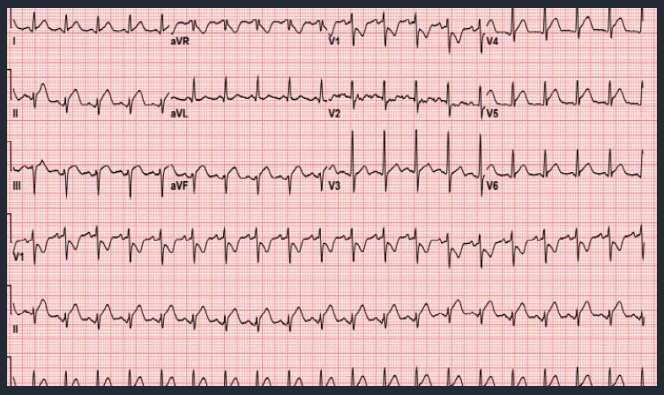
	Total (n=18)	*MI (n=8)*	*Noncoronary myocardial injury (n=10)*
Signs and symptoms around the time of ST-segment elevation — no. (%)			
Chest pain	6 (33)	5 (62)	1 (10)
Fever	13 (72)	6 (75)	7 (70)
Cough, shortness of breath, or respiratory distress	15 (83)	6 (75)	9 (90)
Intubation§	12 (67)	5 (62)	7 (70)
Shock	7 (39)	2 (25)	5 (50)
Cardiac arrest	2 (11)	1 (12)	1 (10)

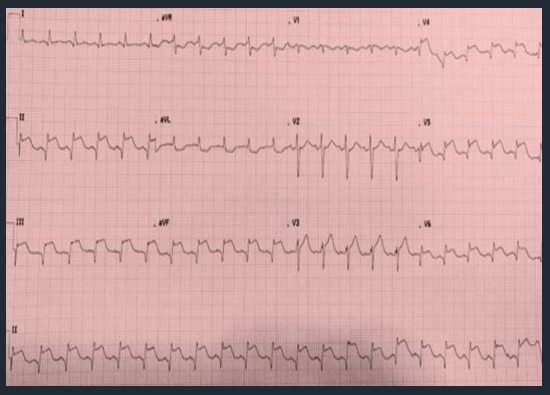
Bangalore et al. NEJM

50% (n=9) Underwent Angiography
6 had obstructive CAD (67%), 5 underwent PCI (56%)
Overall Mortality: 72 % *(13 patients: 4 MI, 9 non-coronary injury)*

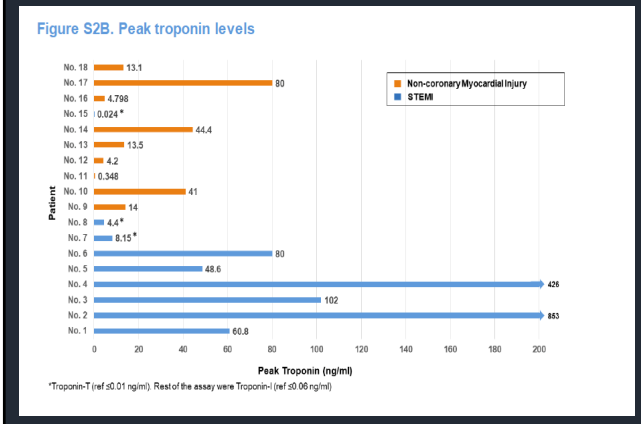


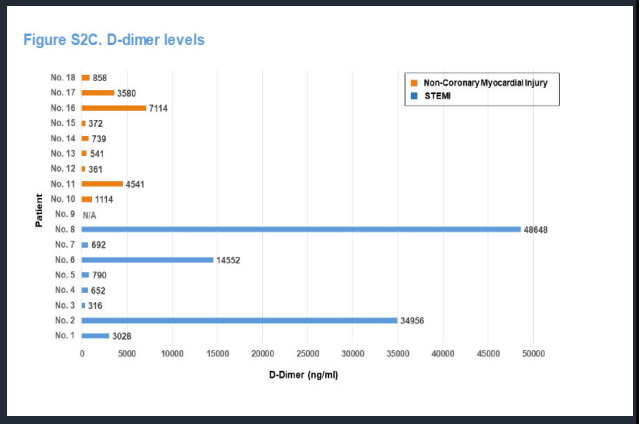
Who has MI versus non-coronary myocardial injury?

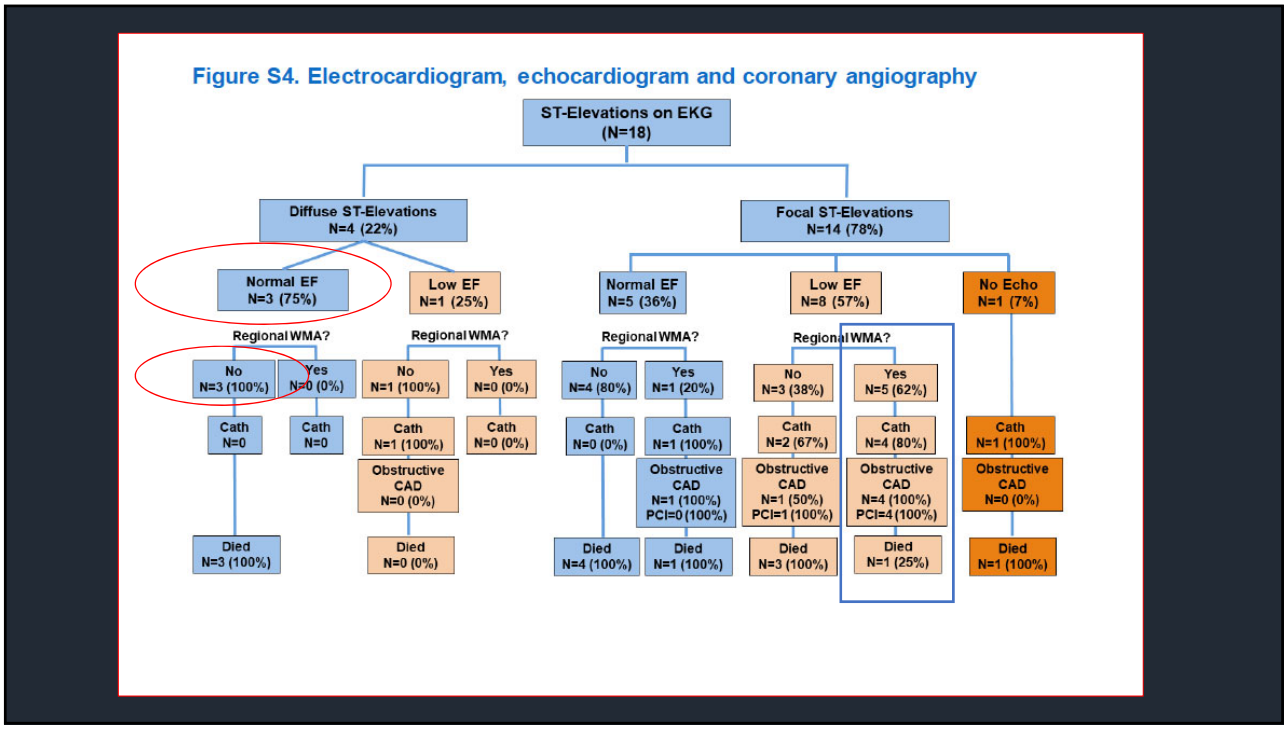




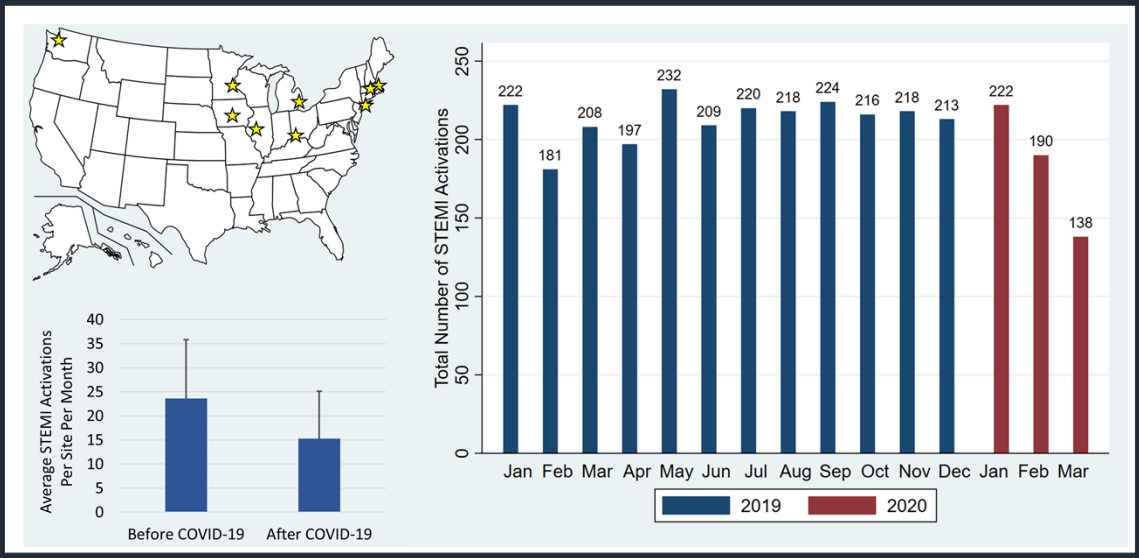
Biomarkers: Troponins and D-Dimer
Significant Overlap Between STEMI and Non-coronary etiologies







Is COVID-19 Affecting Care of non-COVID Patients?



Garcia et al. JACC 2020.

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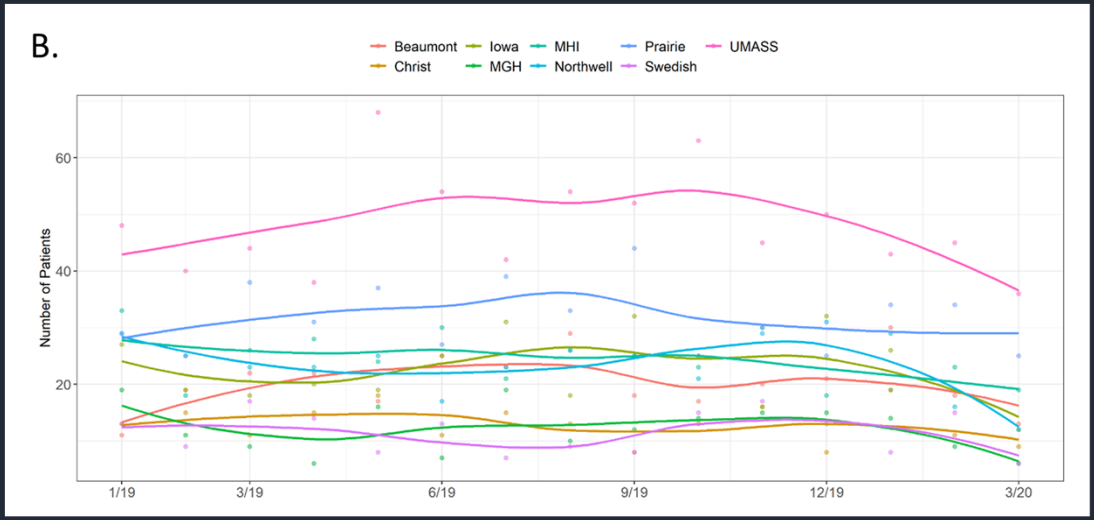
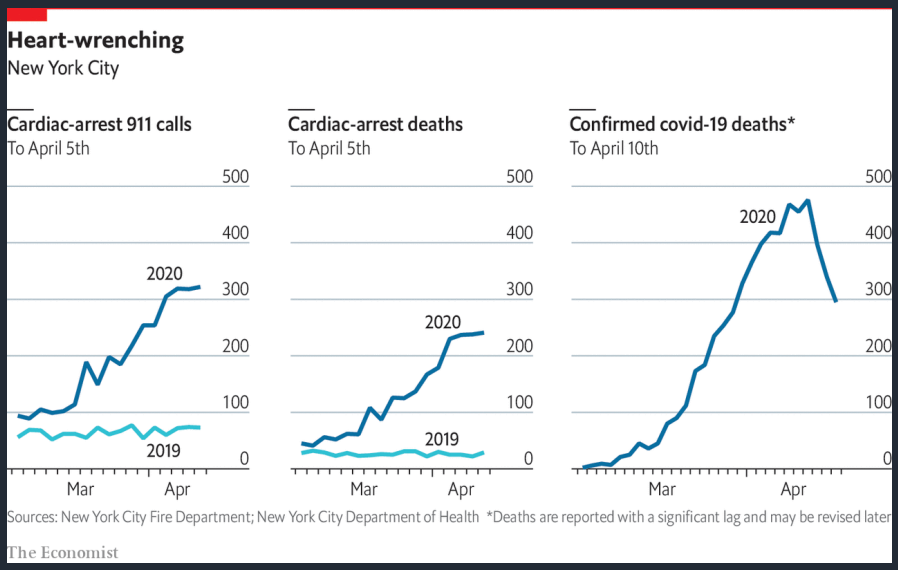


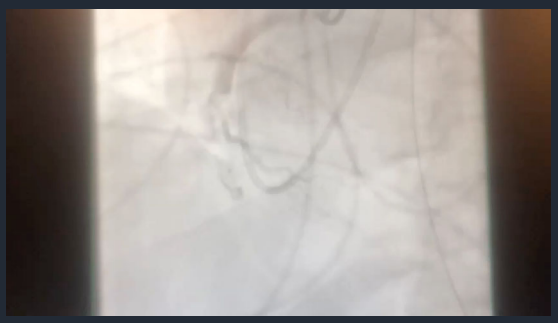
Cardiac Arrest 911 Calls Increasing in COVID-19 Hot-Spots

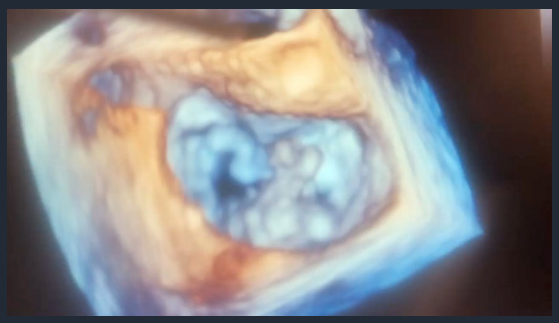


The Economist. graphic-detail/2020/04/13/

Are we seeing more Mechanical Complications post MI?

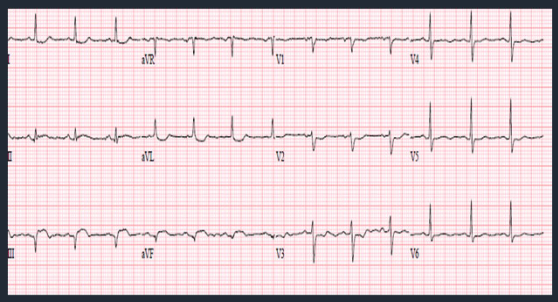
2-weeks of CP and SOB. Didn't want to come in because of COVID-19. Ruled out for COVID times 2. Needed emergency surgery

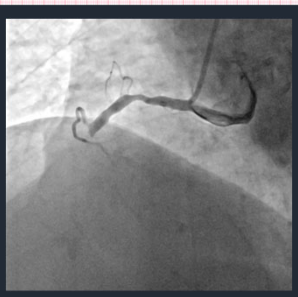


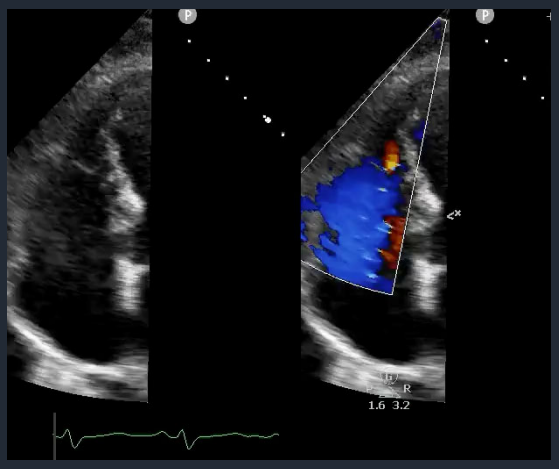


Courtesy of Saif Anwaruddin, MD

MHI Case I: Late presentation of Inferior MI

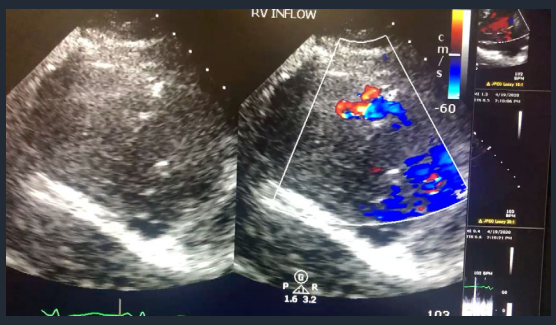


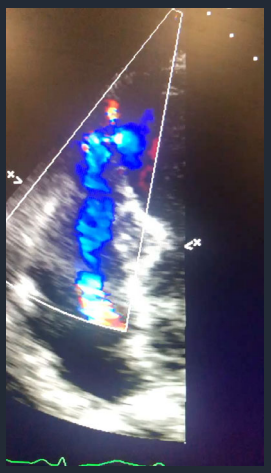




Courtesy of S. Alsidawi MD

MHI Case II: Late presentation of Anterior MI





Courtesy of S. Alsidawi MD

Summary

- COVID-19 pandemic seems to be affecting multiple aspects of STEMI care
- Observational registries have gained traction in cardiovascular medicine as they provide important information, including benefits and potential complications of different treatments or procedures.
- Immediate access to actionable data is particularly relevant to the current expanding COVID-19 pandemic which is disproportionally affecting cardiovascular patients and healthcare workers.
- The NACMI registry will be beneficial in identifying etiology, patterns of myocardial injury, developing a risk model for cardiac complications, understanding short and long-term major adverse cardiac events, and designing clinical trials testing different treatment modalities including MCS devices.

North American COVID-19 ST-Segment Elevation Myocardial Infarction (NACMI) Registry

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