



# HAS COVID-19 TAUGHT US ANYTHING ABOUT HF?

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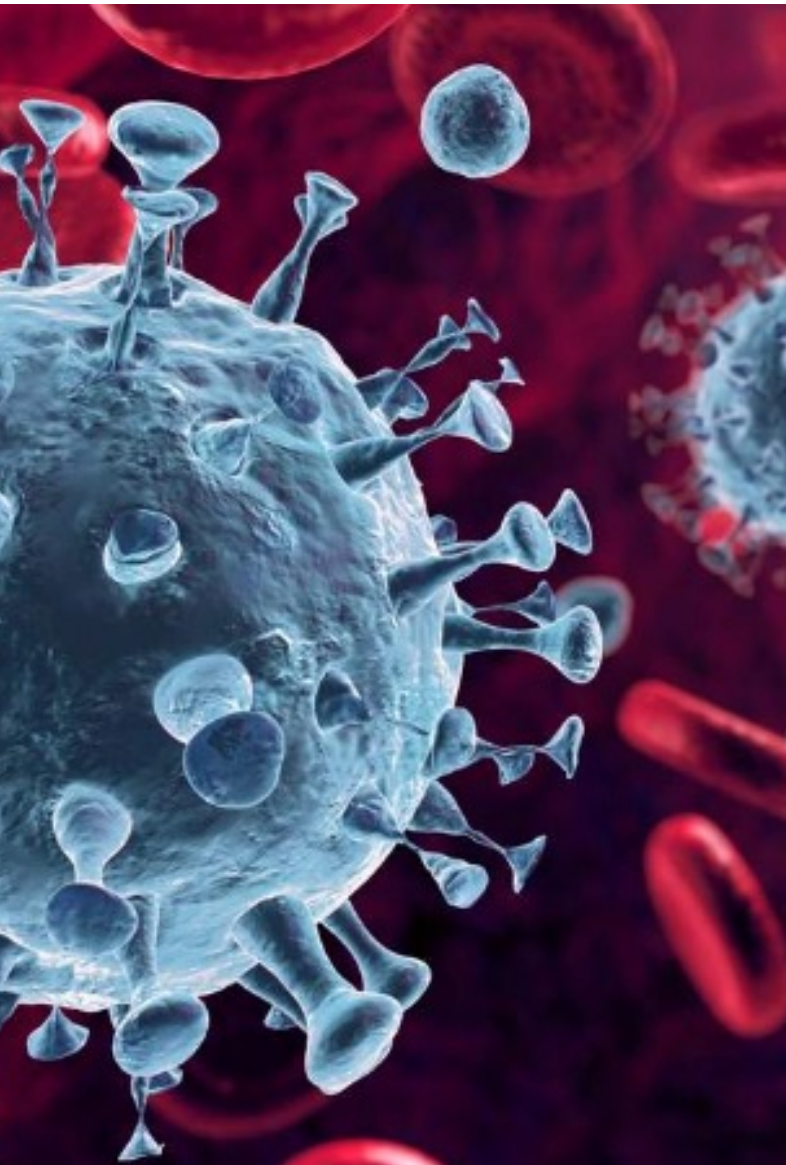


@DRANULALA

# DISCLOSURES

- Editorial Board
  - Journal of Cardiac Failure
- Advisory Board
  - BioVentrrix
  - Merck
- DSMB
  - Sequana Medical
- Speaker Honoraria
  - Zoll Fellows' Symposia
  - Abbott

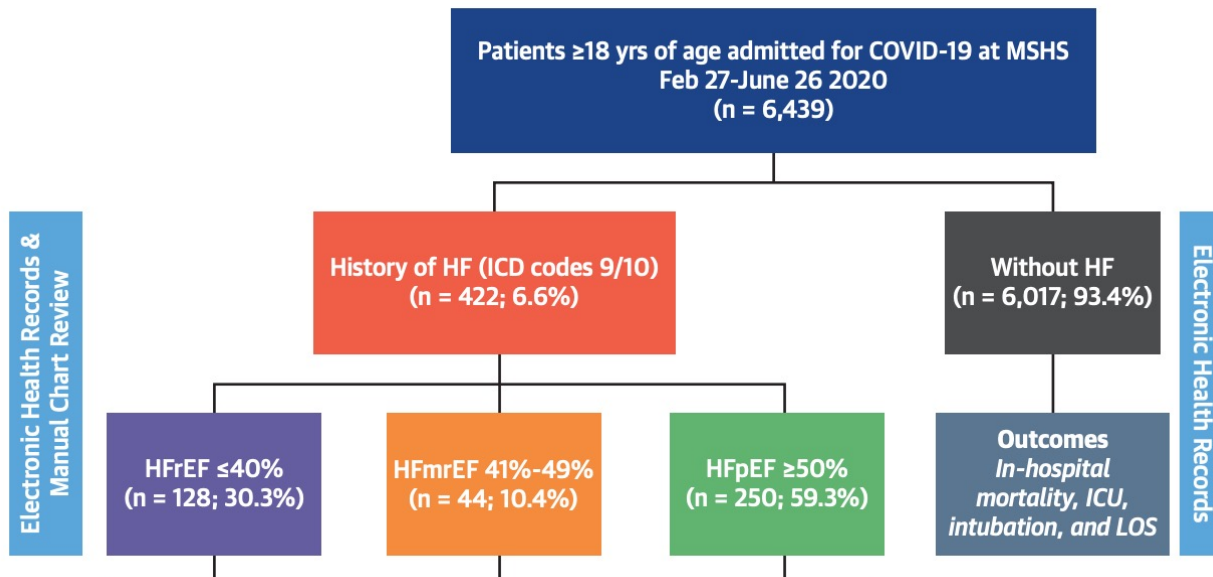




# OUTLINE

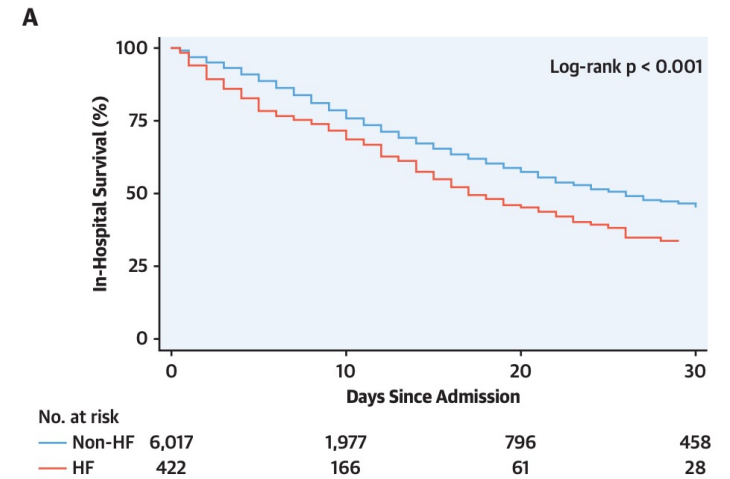
- Impact of HF history on COVID-19 outcomes?
- Does COVID-19 cause heart failure?
- Impact of HF history on vaccine safety/efficacy?
- History of COVID-19: risk of future HF?
- Silver linings COVID-19 provided for HF care?

# PATIENTS WITH A HISTORY OF HEART FAILURE...

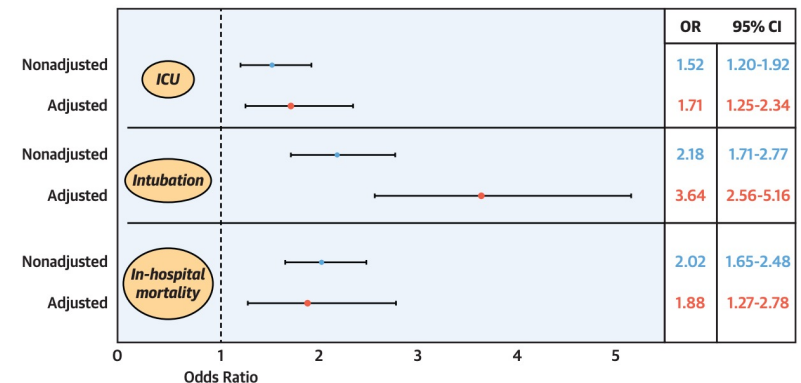


## ARE AT HIGHER RISK FOR ADVERSE EVENTS WITH COVID-19

Alvarez-Garcia/Lala 2020



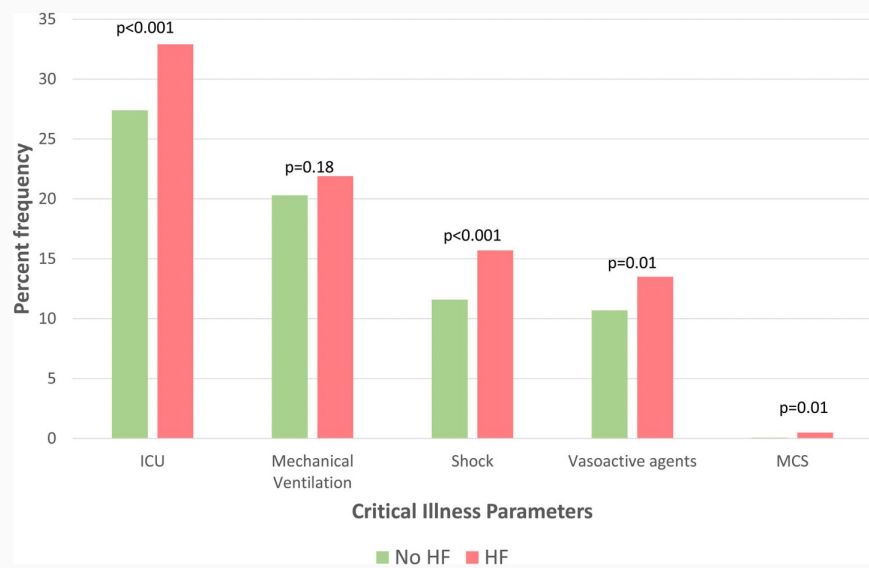
**FIGURE 3** Forest Plot of the Effect of a History of HF on Outcomes in Patients Admitted for COVID-19



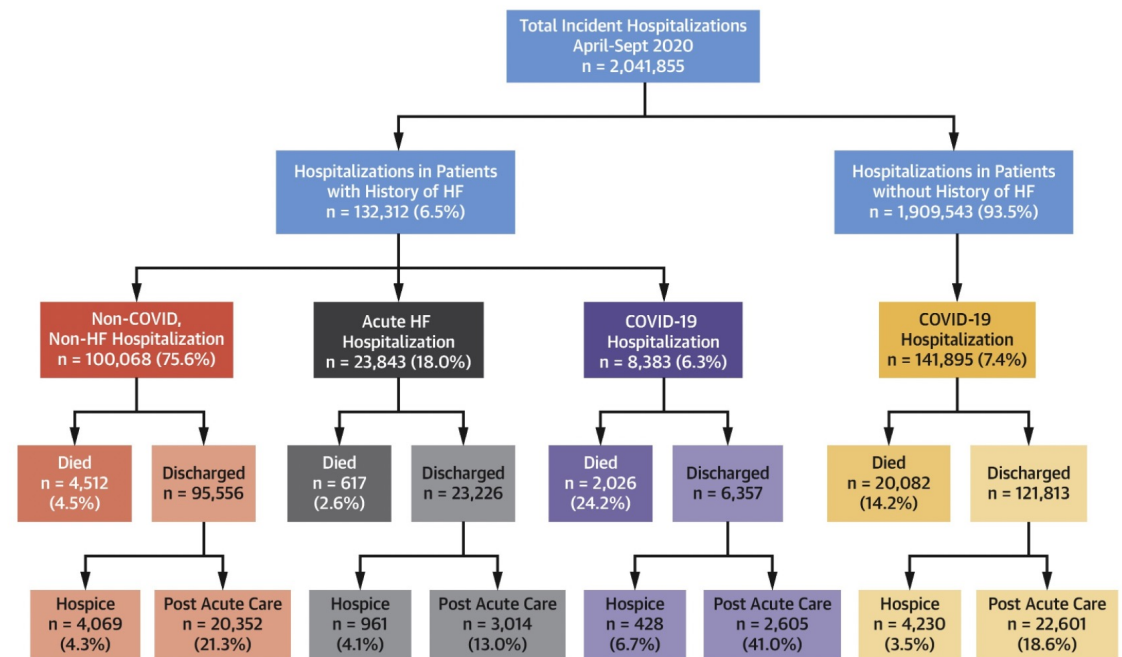
# HISTORY OF HF = WORSE COVID-19 OUTCOMES

AHA COVID-19 REGISTRY: >8000pts

All-PAYER database > 120,000 hospitalizations

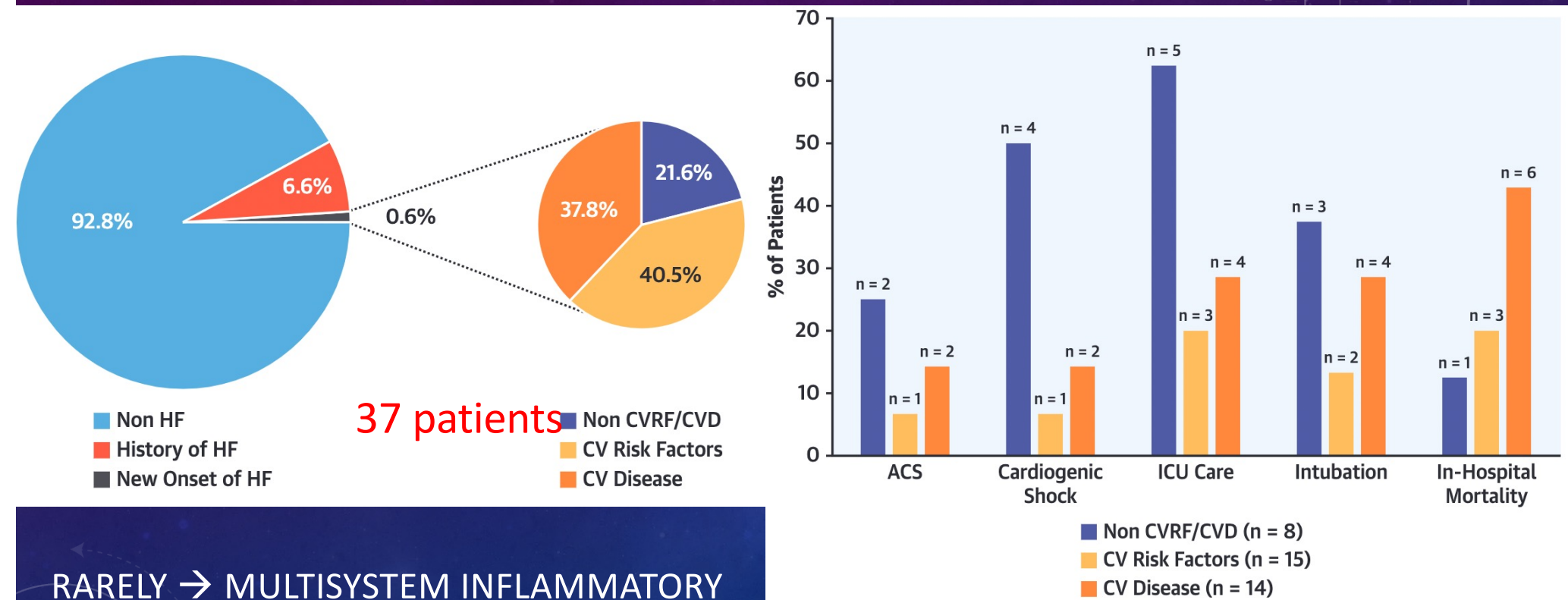


## CENTRAL ILLUSTRATION: Breakdown of Hospitalizations in Patients With HF During the COVID-19 Pandemic





# DOES COVID-19 CAUSE ACUTE HEART FAILURE?



RARELY → MULTISYSTEM INFLAMMATORY SYNDROME (MIS), & MYOCARDITIS

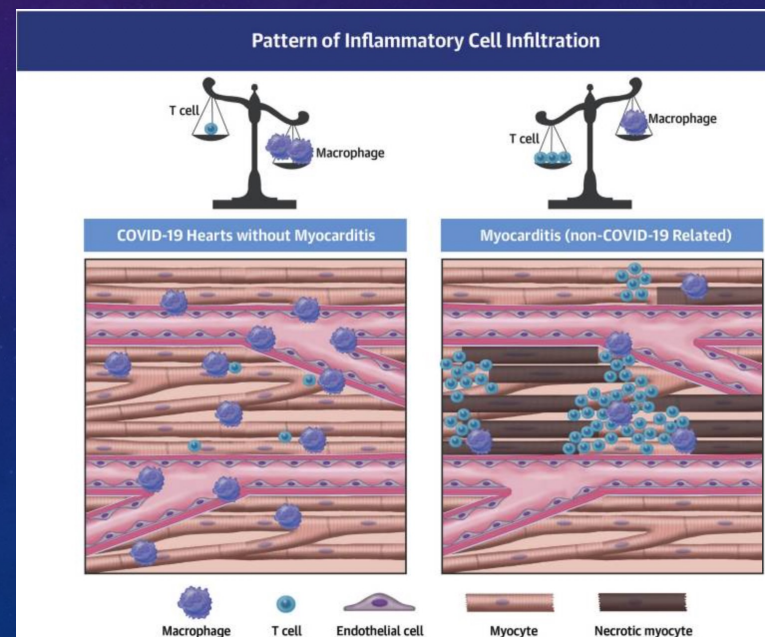
Alvarez-Garcia/Lala JACC 2021; Chau/Mancini Circ HF 2020

# WHAT ABOUT MYOCARDITIS?

	Troponin	Imaging ECG	Symptoms
Myocardial Injury	+		
Myocardial Involvement	+/-	+	-
Myocarditis	+	+	+

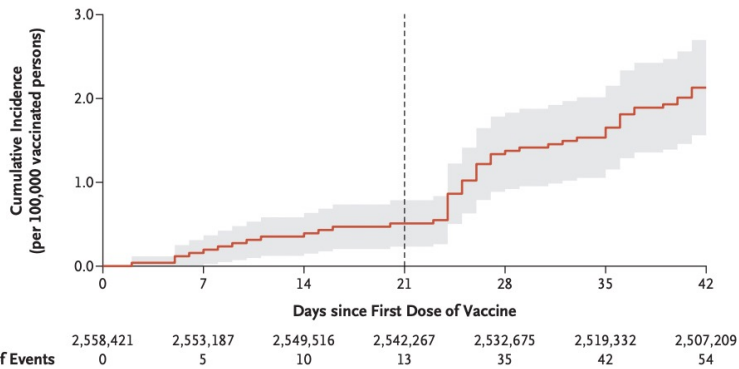
- **Incidence 0.24%**
- 39% fulminant presentation = MCS/inotropes
- Mortality 6.6% at 120 days
- Concomitant PNA major factor

- Possible Myocarditis
- Probable Myocarditis
- Definite Myocarditis

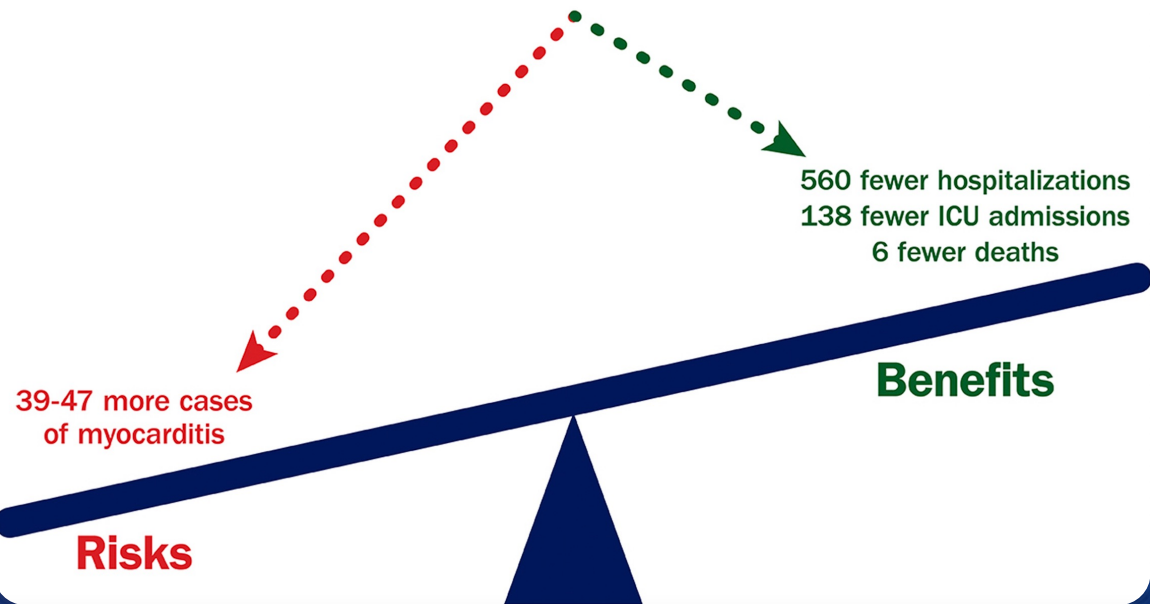


# VACCINE RELATED MYOCARDITIS = FAR MORE RARE!

54/2.5 million cases



**1,000,000 male individuals 12-29 years of age**  
receiving a second dose of the COVID-19 mRNA vaccine  
(estimates as of the week of May 22, 2021\*)





# DOES HF HISTORY IMPACT VACCINE EFFICACY?

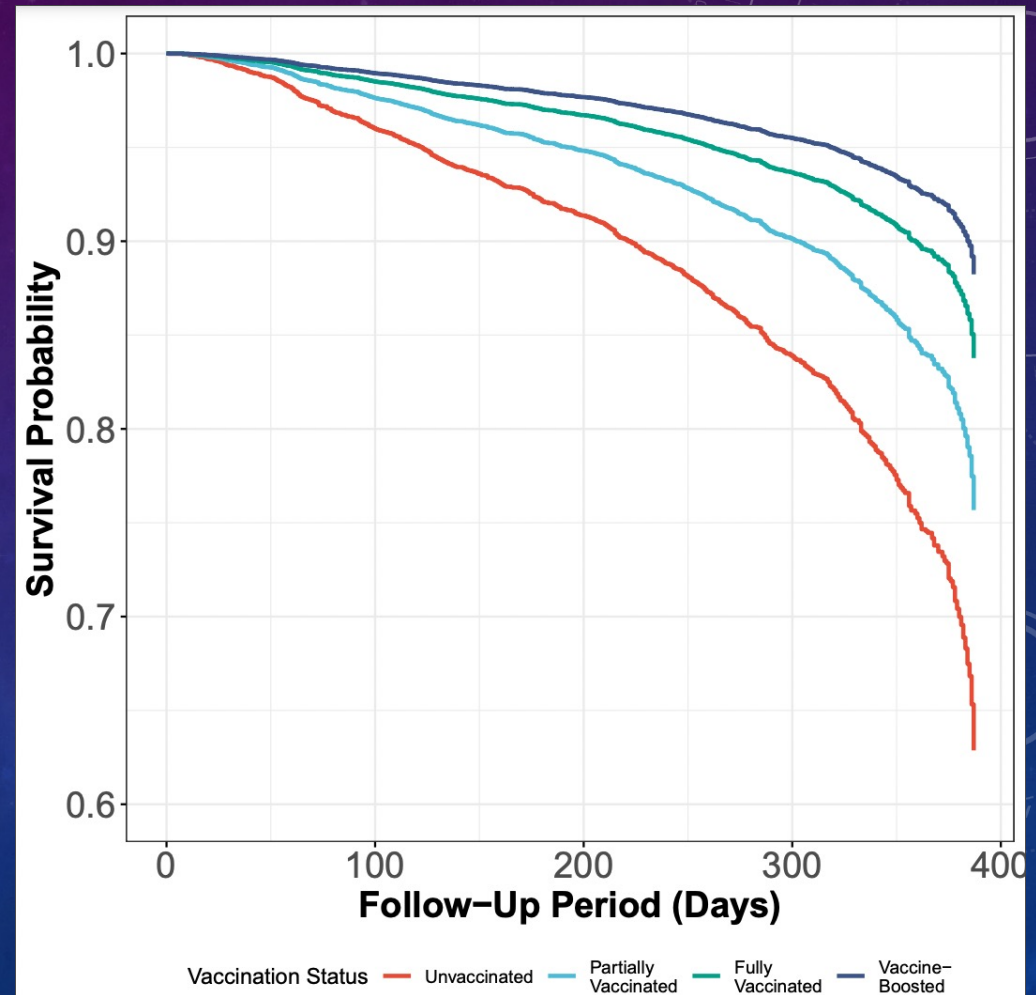
> 7000 patients with HF  
January 2021-January 2022

↓ *mortality*  
↓ *hospitalization*  
↓ *ICU admissions*

Vaccinated +  
Boosted

Vaccinated

Partially/  
Unvaccinated



# FOR HEART TRANSPLANT PATIENTS, YES BUT STILL PROTECTIVE!

April 27, 2022

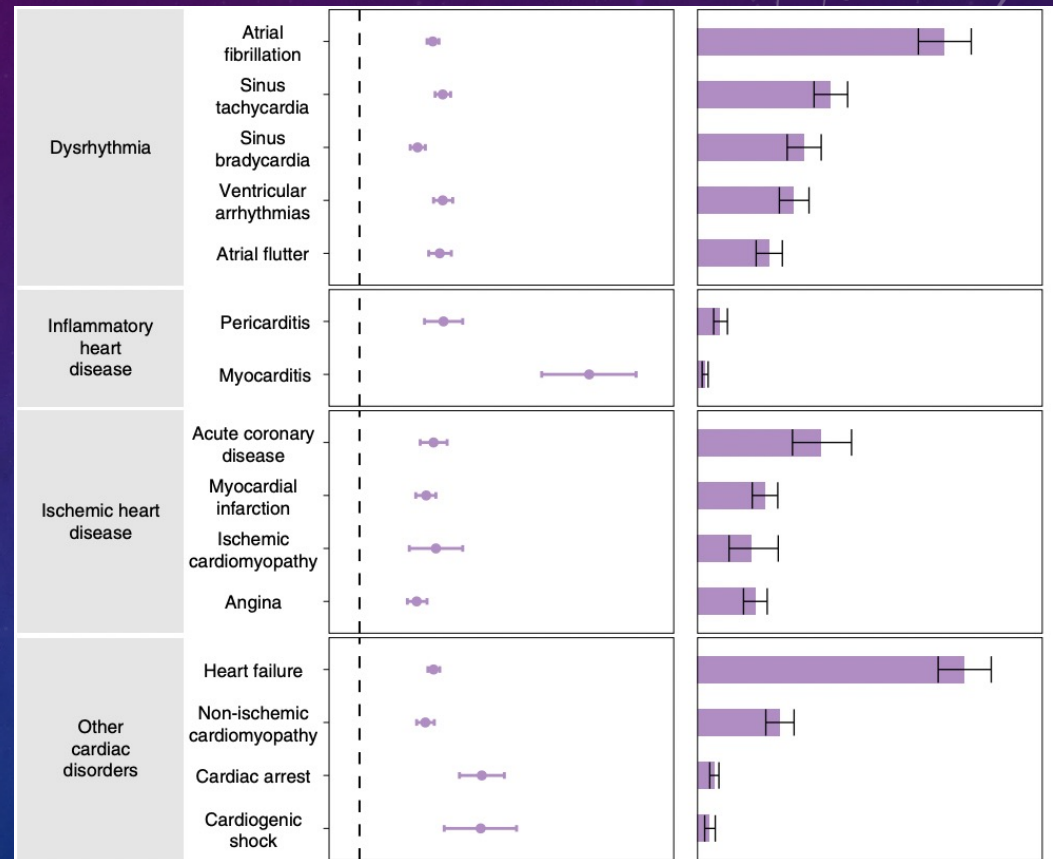
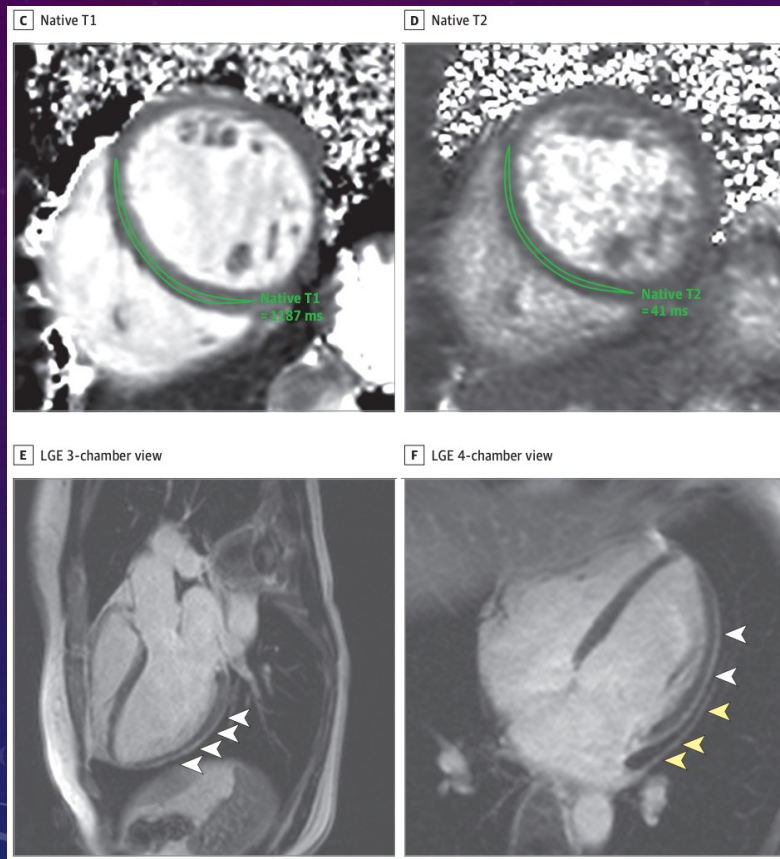
## Association of COVID-19 Vaccination With Risk of

COVID-19 Infection, Hospitalization, and Death in

**He** **Meaning** Even though the immunogenic response to COVID-19 vaccination is lower in patients who receive a heart transplant, the vaccine appears to be safe and is associated with a lower risk of COVID-19 infection, hospitalization, and death, suggesting it is imperative that all heart transplant recipients obtain the COVID-19 vaccine.

Variable	Unvaccinated	Vaccinated	Relative Risk (95% CI)
COVID-19 infections	72 (19.7)	34 (48.6)	0.41 (0.30-0.56) <sup>a</sup>
COVID-19 hospitalizations	15 (4.1)	10 (14.3)	0.29 (0.14-0.61) <sup>a</sup>
ICU admissions	4 (1.1)	3 (4.3)	0.26 (0.07-1.01)
Deaths	3 (0.8)	3 (4.3)	0.19 (0.05-0.82) <sup>b</sup>

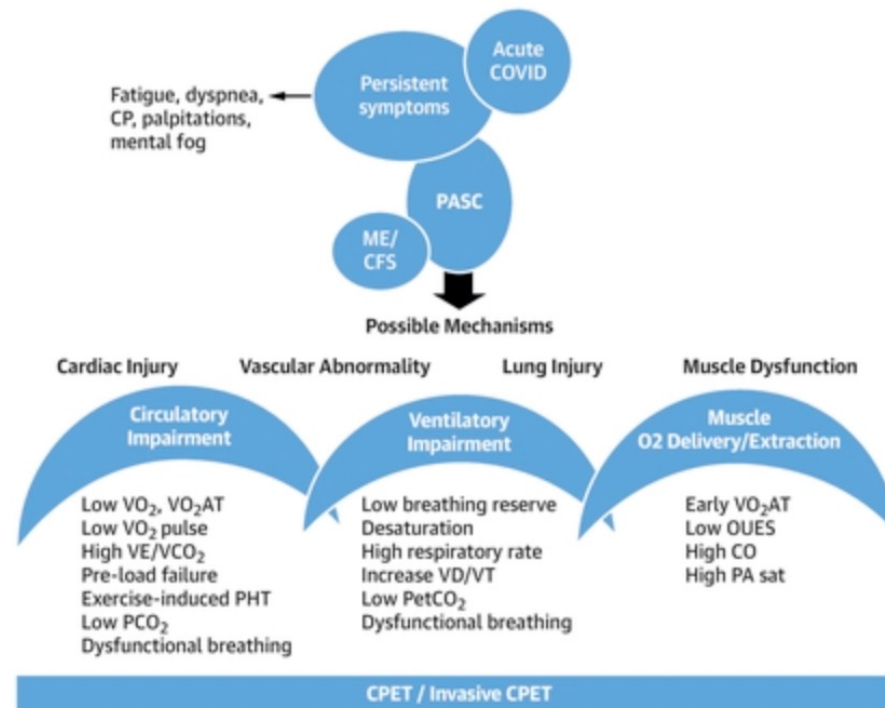
# DOES COVID-19 INCREASE RISK OF HF?





# PASC – LONG HAULER SYNDROME & HEART FAILURE

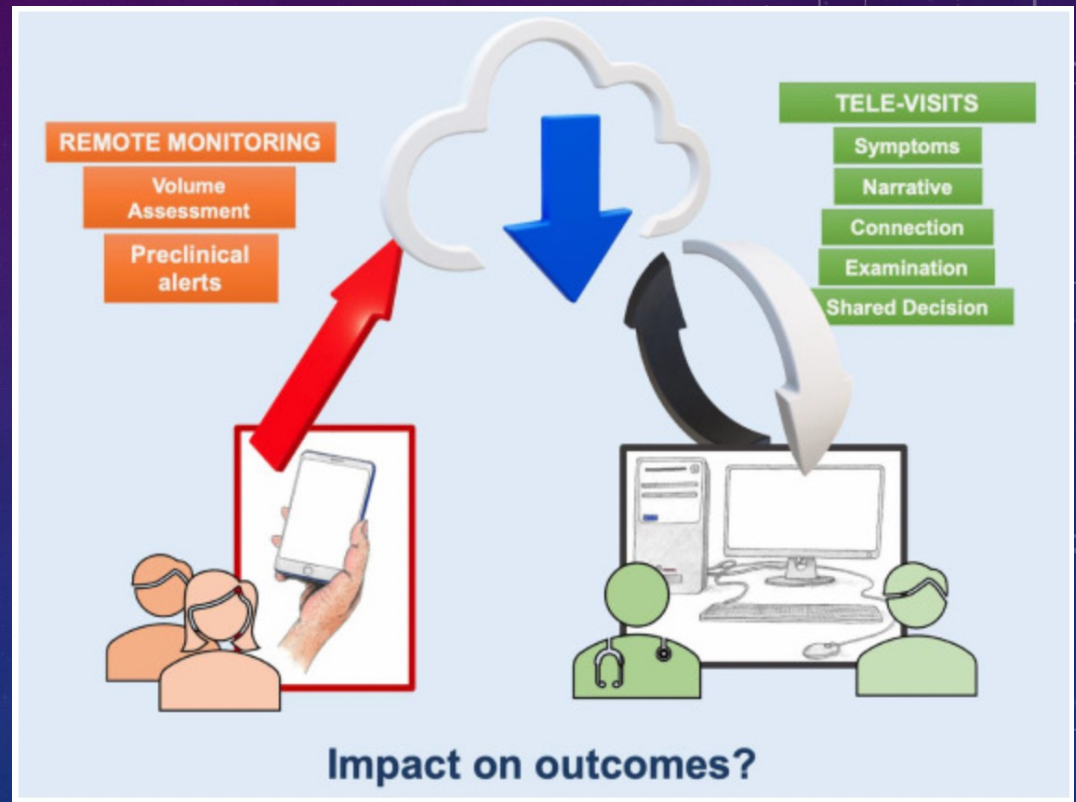
## CENTRAL ILLUSTRATION: Development of PASC With Possible Causes and How These can Be Classified Using CPET



Mancini, D.M. et al. J Am Coll Cardiol HF. 2021;9(12):927-937.

# SILVER LININGS

- Virtual visits
- Remote monitoring





## IN-HOSPITAL OUTCOMES



Intubation  
ICU Admission  
Mortality

Regardless of EF

## PREVENTION

### Vaccination

- Implementation gap
- Efficacy in OHT?



## MANAGEMENT

- RAASi maintenance
- Optimal anticoagulation? (eg: LVAD)
- OHT immunosuppression modification?

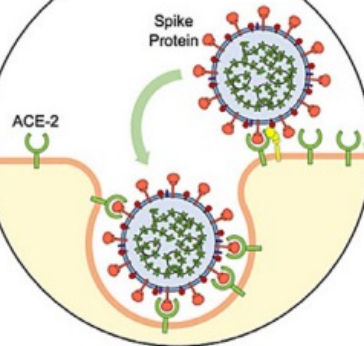
## ADAPTATION

- Pre-procedural COVID-19 testing
- Non-invasive surveillance (eg: cell-free DNA)
- ↑ Remote monitoring
- ↑ Tele-visits



## The COVID-19 – HF Nexus

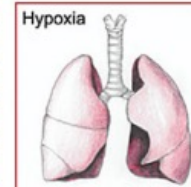
### SARS-CoV-2



### Heart Failure



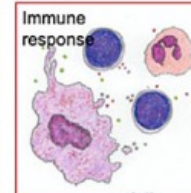
## MECHANISMS OF MYOCARDIAL INJURY



Hypoxia



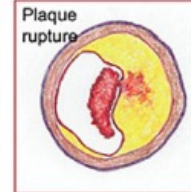
Shock



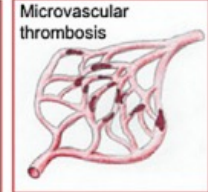
Immune response



Direct cellular injury



Plaque rupture



Microvascular thrombosis

Antibody-mediated  
MIS-C

Subclinical  
myocardial  
injury/fibrosis

PASC?





# WE HAVE LEARNED A LOT!

- HF history associated with ↑ COVID-19 morbidity & mortality
- Acute HF attributed to COVID-19 is rare
- Vaccines are efficacious & safe in HF; including Heart transplant patients
- History of COVID-19(even mild) ↑ risk of future HF
- Silver linings = reliance on Remote monitoring, creative clinical trial design





# Thank you!

