# Evolving Role in Echo in Bedside Critical Care: Lessons from COVID

**Sharon L. McCartney, MD, FASE**
**Assistant Professor of Anesthesiology**
**Duke University**
**Divisions of Cardiothoracic and Critical Care Anesthesiology**

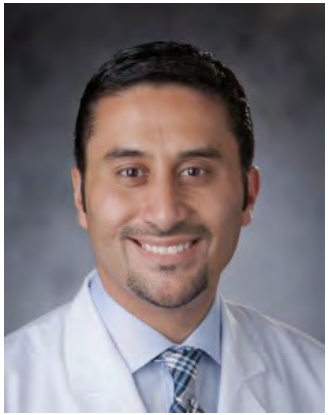
# Outline

**Evolving Role of Bedside Ultrasound in COVID**

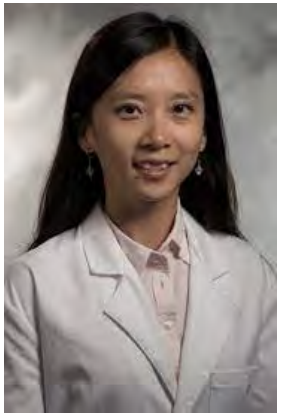
- **Similarities with COVID and other forms of sepsis**
- **Differences with COVID**
- **Key Points**

# Thank you to all of the frontline workers during this pandemic

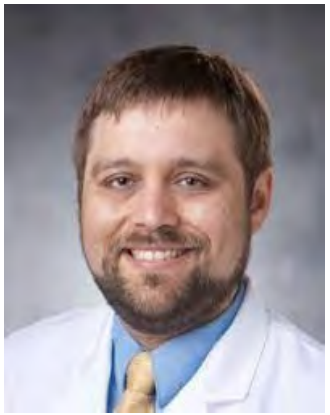
Chris Cox, MD



Talal Dahhan, MD



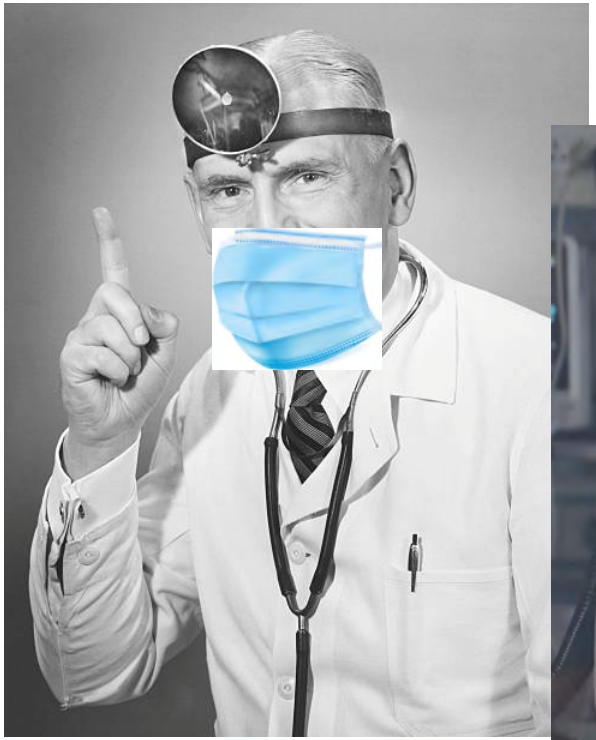
Nina Chen, MD



Daniel Gilstrap MD

# Evolving Role of Bedside Echo in COVID

**April 2020**



www.theatlantic.com

# Evolving Role of Bedside Echo in COVID

Evolving Role | Similarities | Differences | Key Points

www.butterflynetwork.com

# Bedside Ultrasound Use in COVID

**Lungs:**

- **Consolidation**
- **Pulmonary Edema**
- **Pneumothorax**

**Heart:**

- **Myocardial Function**
- **Volume Status**

**Extremities:**

- **DVTs**

# Bedside Ultrasound Use in COVID

https://www.cbc.ca

Evolving Role | Similarities | Differences | Key Points

# Evolving Role of Bedside Echo in COVID

Mitchell et al. ASE 2020

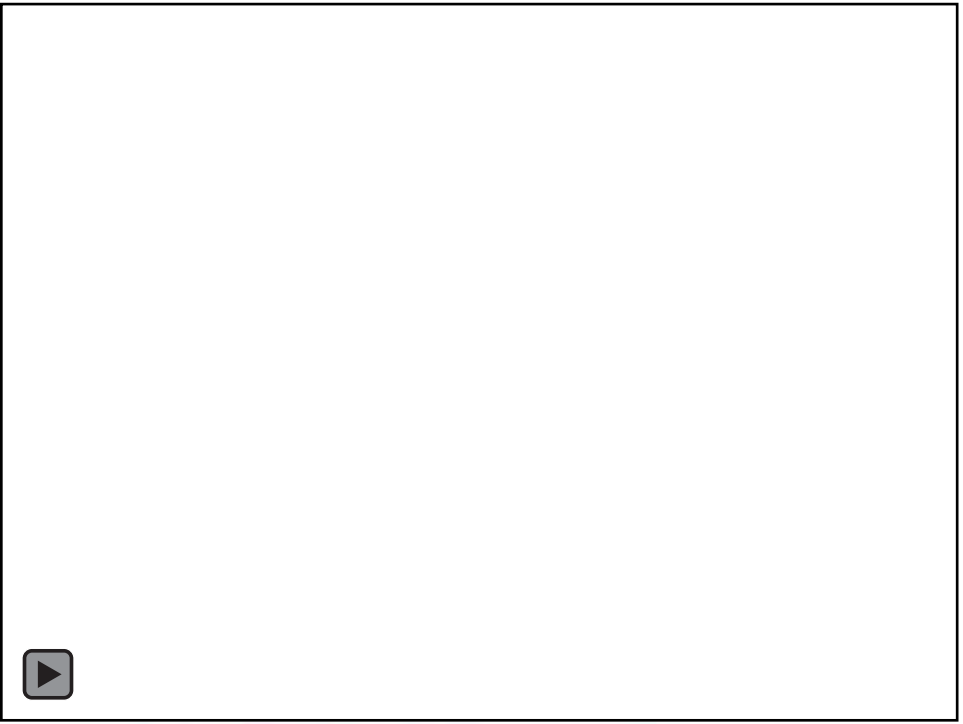
# Evolving Role of Bedside Echo in COVID

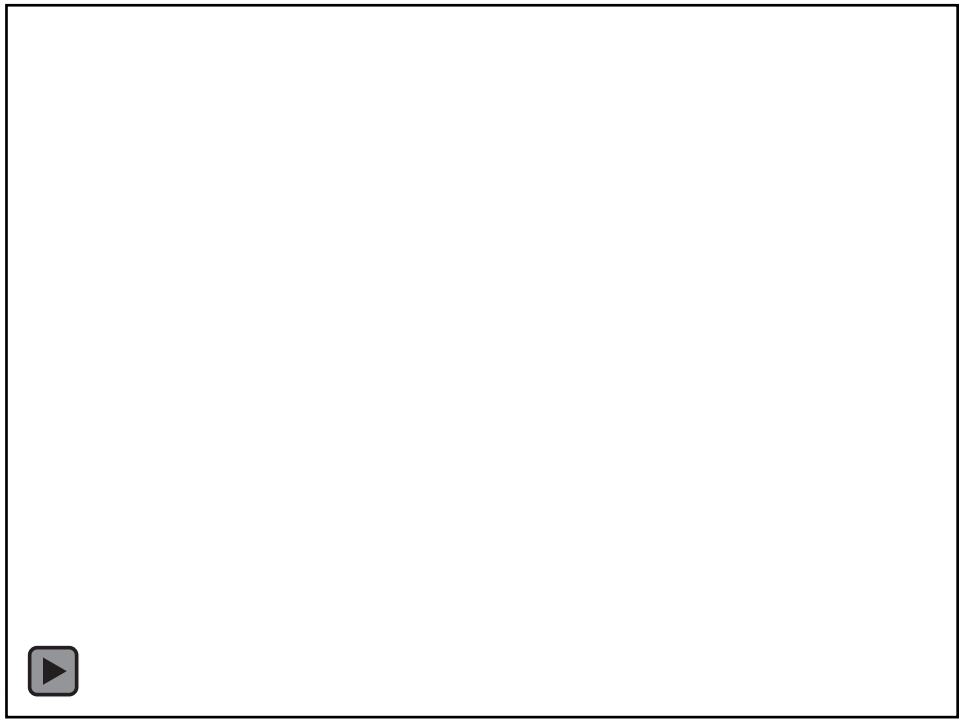
Horowitz et al. CASE 4(4). Aug 2020

# Outline

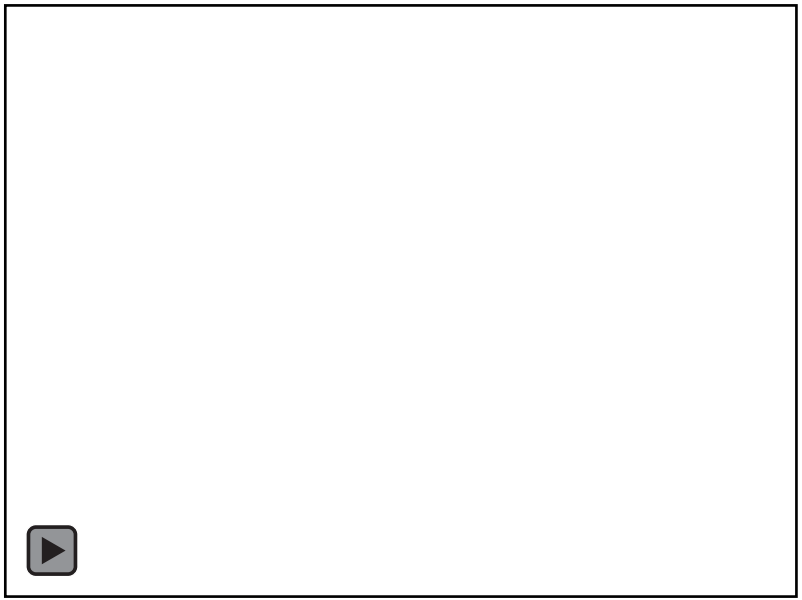
- Evolving Role of Bedside Ultrasound in COVID
- Similarities with COVID and other forms of sepsis
- Differences with COVID
- Key Points

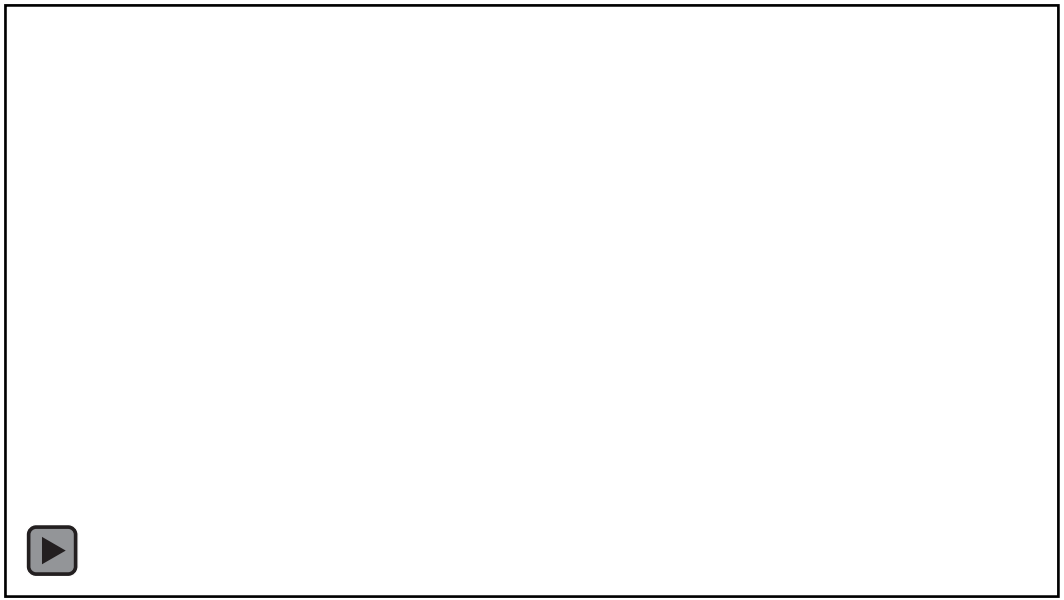
# Similarities between COVID and Other Causes of Sepsis





# Similarities between COVID and Sepsis





# Outline

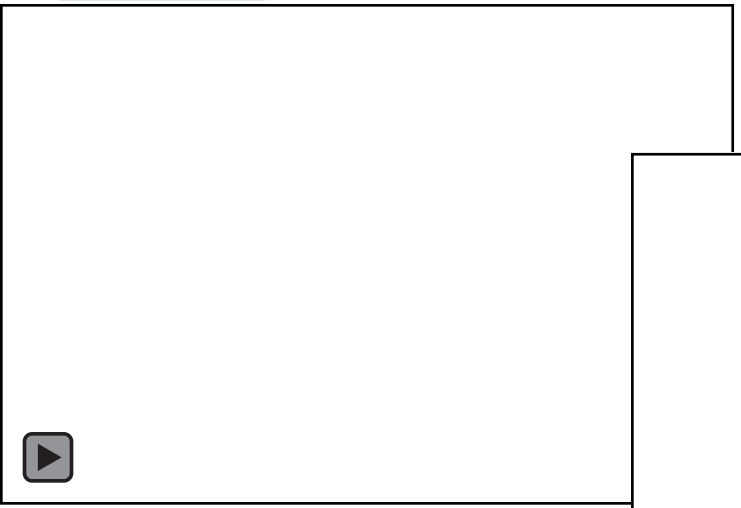
- Evolving Role of Bedside Ultrasound in COVID
- Similarities with COVID and other forms of sepsis
- Differences with COVID
- Key Points

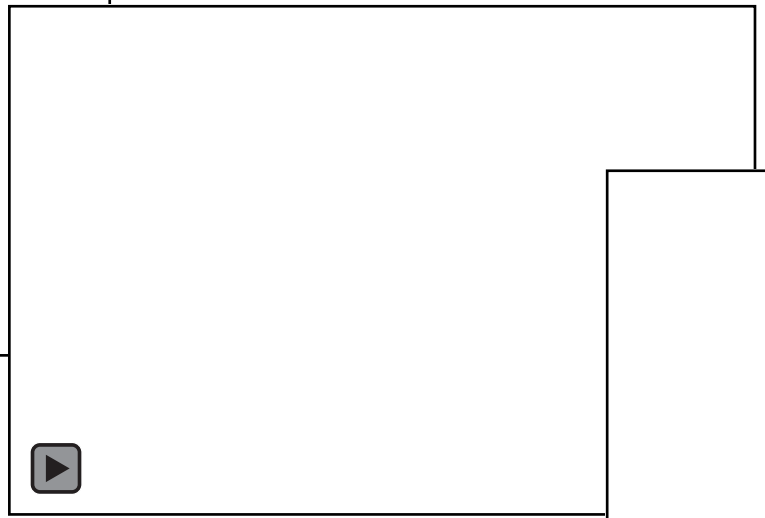
# Case 1

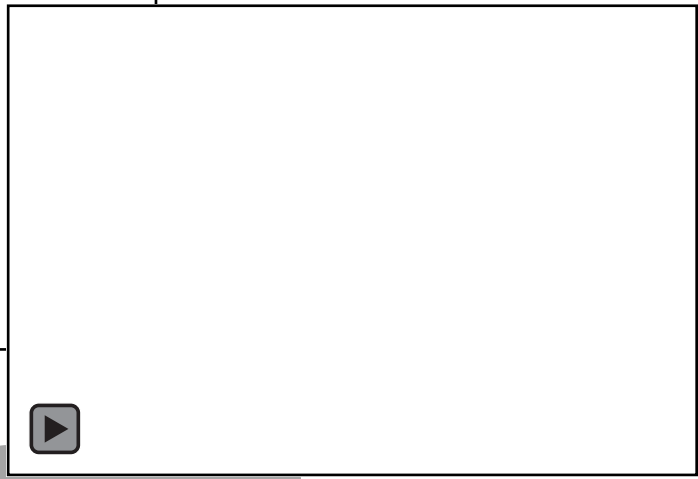
**43 yo male with COVID ARDS s/p proning, paralytics, and now on VV ECMO. Transferred from OSH after ECMO cannulation. Still with hypoxic respiratory failure despite adequate flows on VV-ECMO. FiO2 100% on ventilator.**

**Pressor requirement: Norepinephrine**

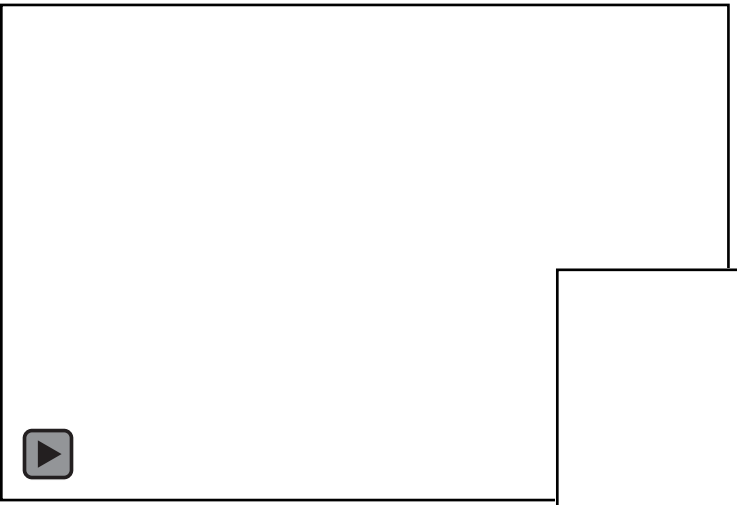
# Case 1

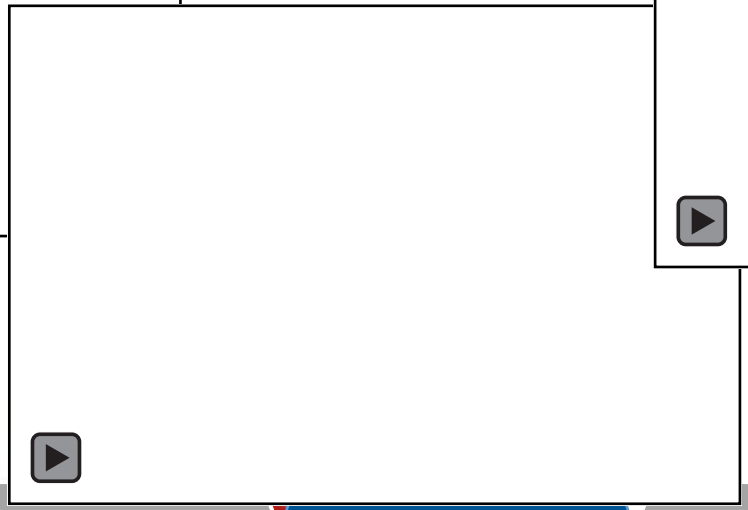


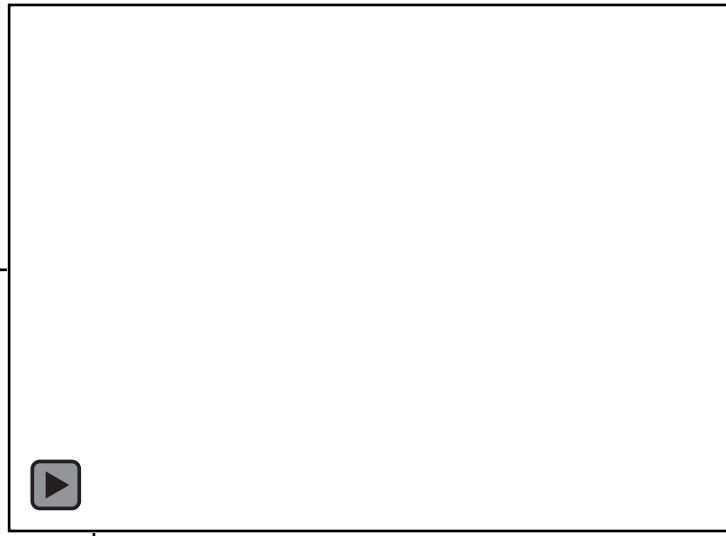




Case

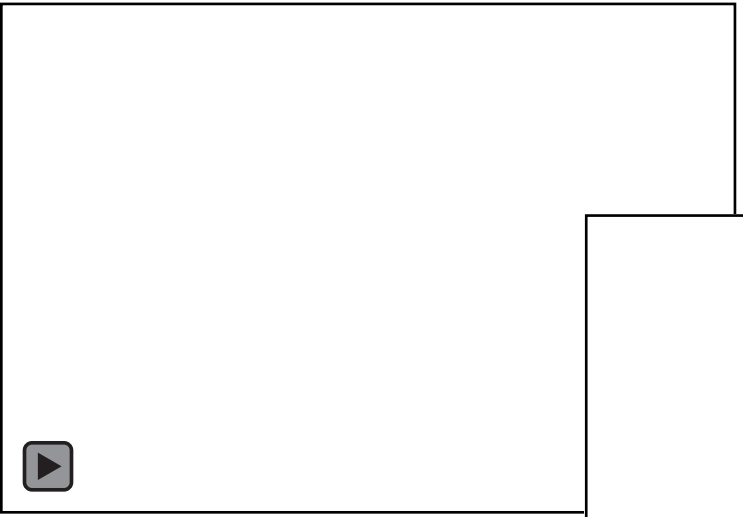


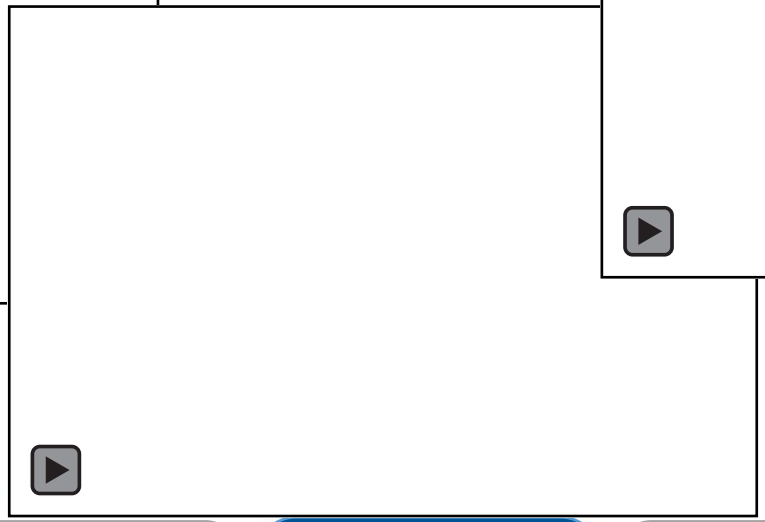


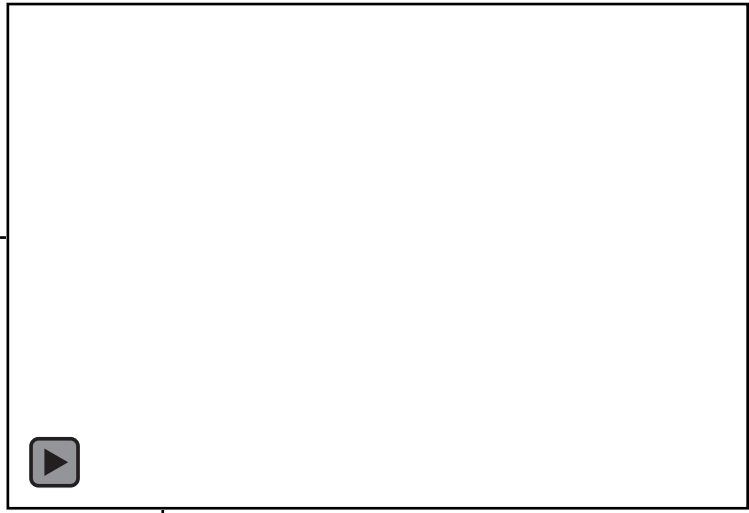


Evolving Role | Similarities | Differences | Key Points

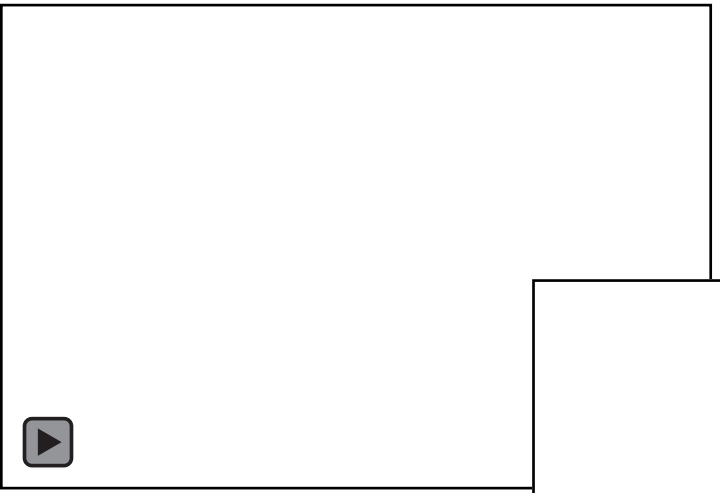
# Case 1

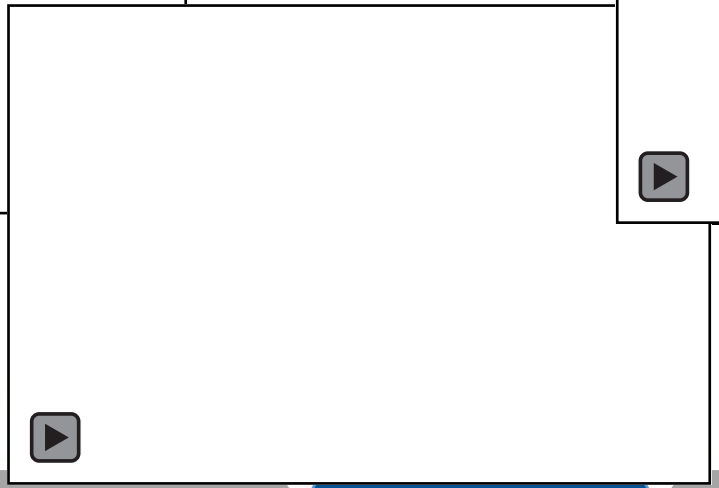


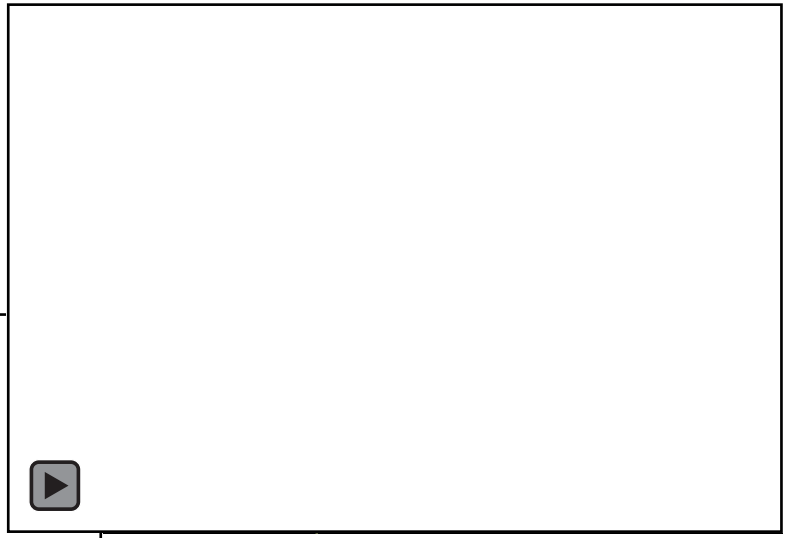




# Case 1







# Case 1

**On hospital day 4, both iNO and Epinephrine were added to help RV function.**

**On hospital day 11, the patient developed new onset lactic acidosis, refractory shock, and died.**

Circulation

ASE American Society of Echocardiography Sound Saves Lives

ORIGINAL RESEARCH ARTICLE

# Spectrum of Cardiac Manifestations in COVID-19

## A Systematic Echocardiographic Study

- **39% of patients developed RV dilatation and dysfunction**
- **RV dysfunction was more common in patients with elevated troponin and poor clinical status**

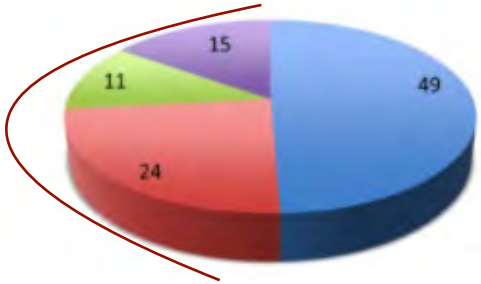
Szekely et al. Circulation. 142(4). July 2020

| Non-COVID Sepsis | COVID Sepsis |
| --- | --- |
| 50% have myocardial dysfunction | 55-66% have myocardial dysfunction |
| **Predominantly LV dysfunction**<br>Typically reversible within **7-10 days** | Isolated LV dysfunction less common (10-35%) |
| Isolated RV dysfunction less common<br>Typically portends worsened prognosis | Isolated **RV dysfunction** in up to 39% of patients |

Curr Cardiol Rev. 2011. Aug 7(3): 163-183
Szekely et al. Circulation. 142(4). July 2020
Dweck et al. Euro Heart J. 21(9). June 2020

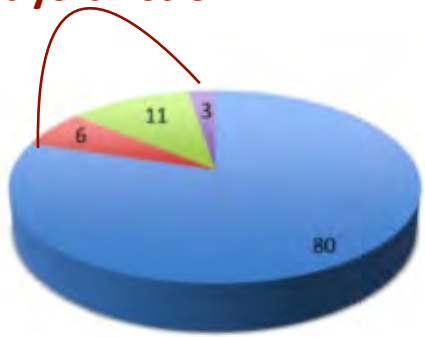
# What happens to the RV post-COVID?

RV dysfunction




During Acute COVID

RV dysfunction




3 Months Later

Normal RV size, normal RV systolic function
Dilated RV, normal RV systolic function
Normal RV size, RV systolic dysfunction
Dilated RV, RV systolic dysfunction

Moody et al. JASE. 34(5). May 2021

# Case 2

- 69 year old male with HLD, HTN, and DM2
- Started having cough, SOB, chest pressure, and symptoms of upper respiratory infection
- Started taking NyQuil and getting very confused
- Found to be COVID +
- Received Monoclonal Antibody infusion
- Drastic improvement in symptomatology - appetite back, SOB better, less confused

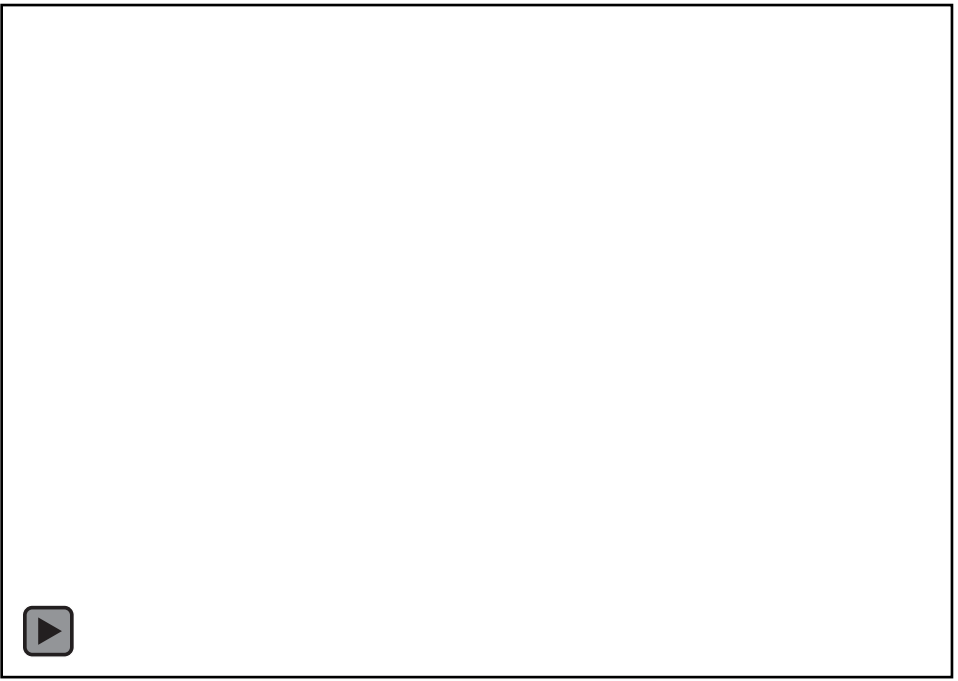
# Case 2

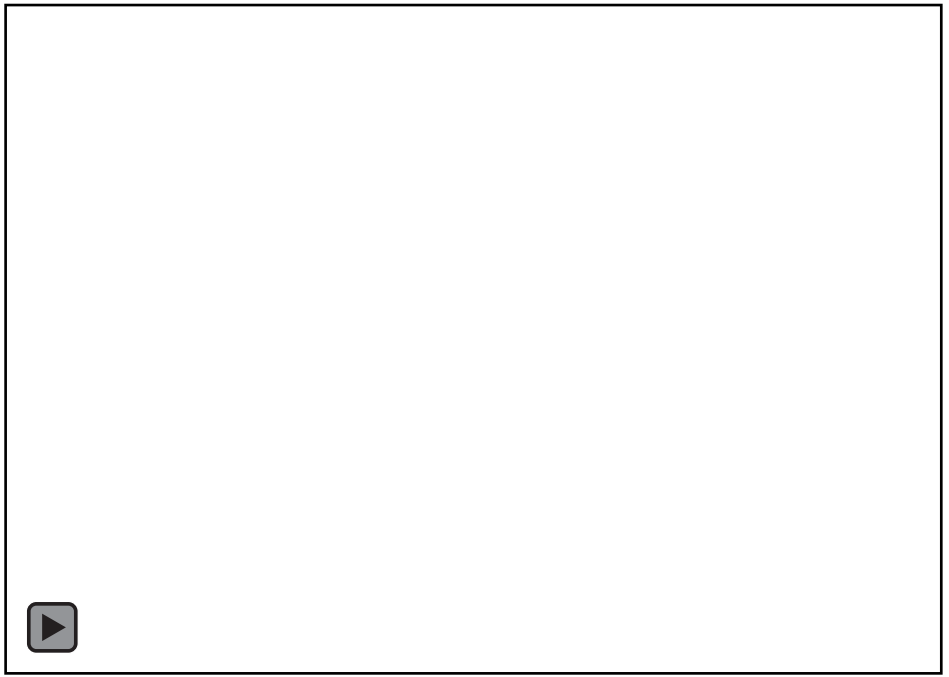
- 2 days after monoclonal antibody treatment - fell at home.
- Family checked O2 sat - was 75% on home pulse oximetry

- Called EMS
- EMS Pulse oximetry - O2 sat 60% on room air

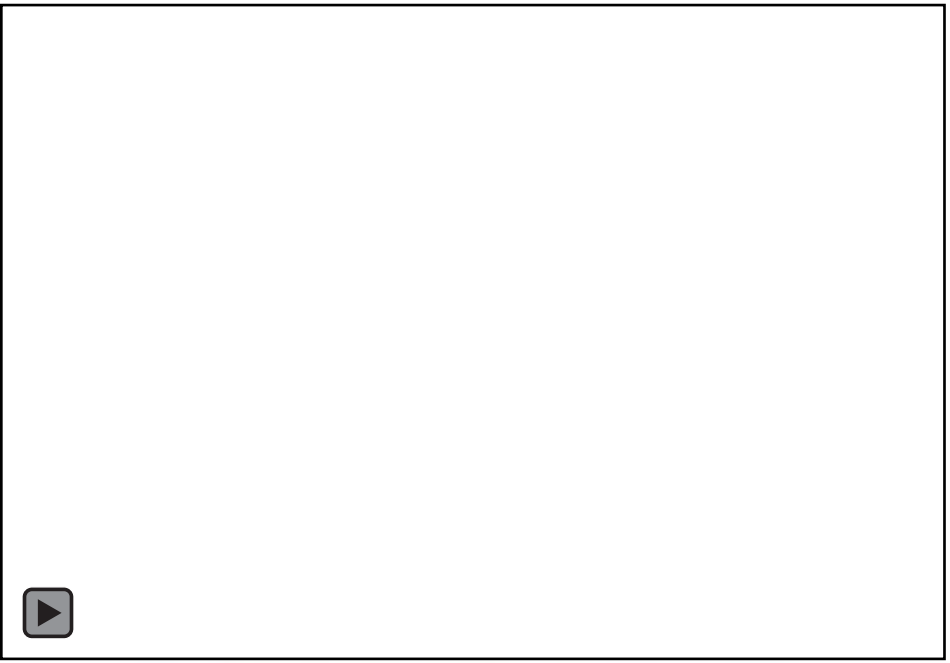
- Admitted to hospital and went to ICU for high FiO2 requirements:
  - High Flow Nasal Cannula - 100% FiO2, 50L flow
  - O2 Sat: 92%

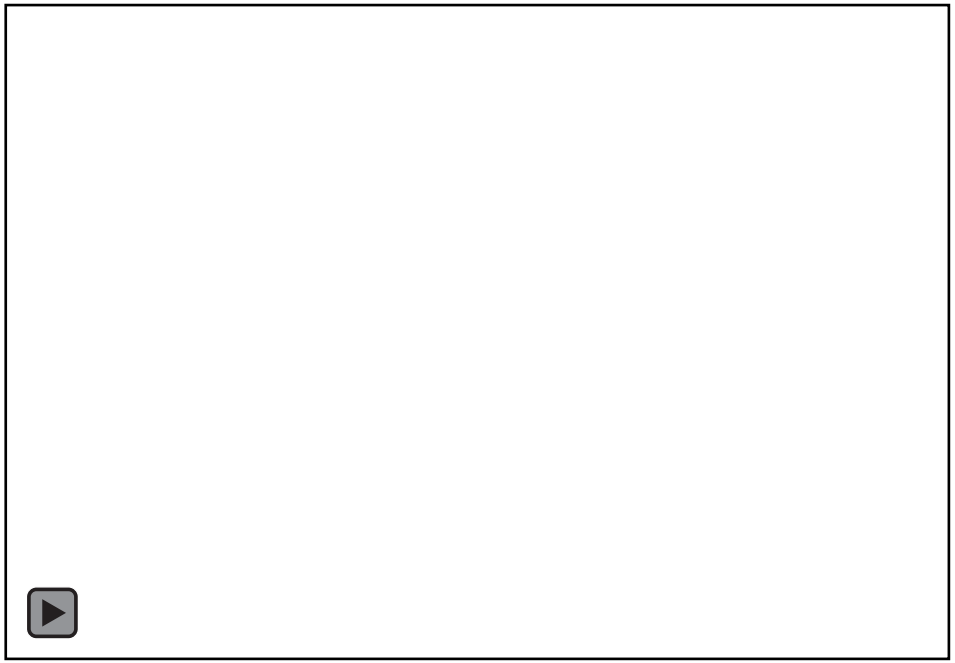
# Case 2



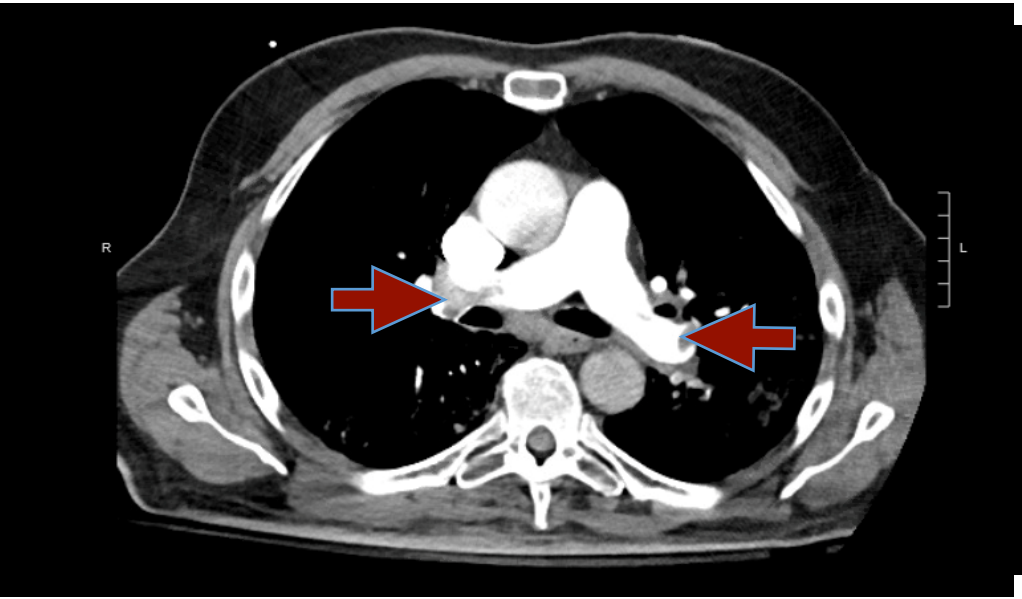


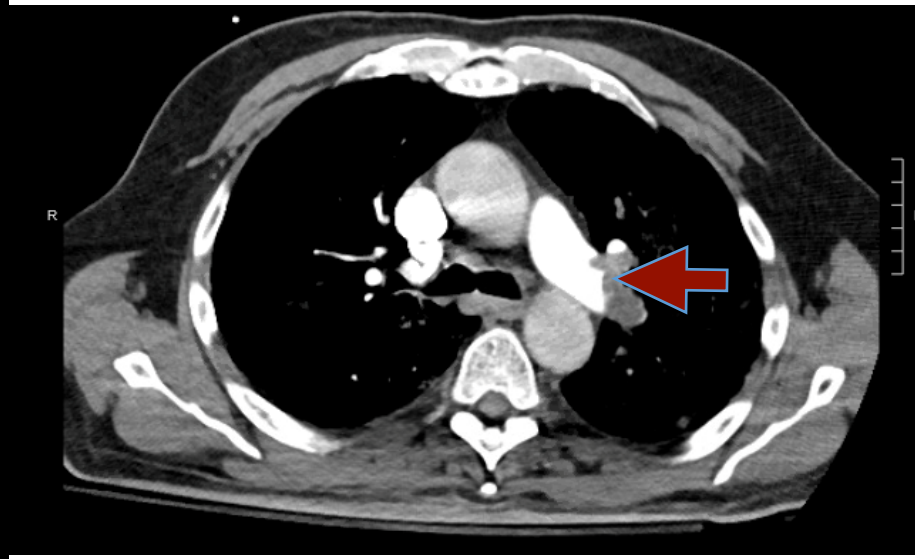
# Case 2





# Case 2



# Case 2

- **Treated with:**
  - **IV Heparin**
  - **Remdesivir**

- **Weaned to 2L Nasal Cannula within 48 hours**
- **Discharged Hospital day 4**

# Case 2

- **Pulmonary Embolisms diagnosed in 25% (102 of 413 patients) of hospitalized patients with COVID**
  - **29% of patients in the ICU with COVID had PE**
  - **24% of patients hospitalized but not ICU, with COVID, had PE**

Riyahi et al. Radiology. 301(3). July 2021

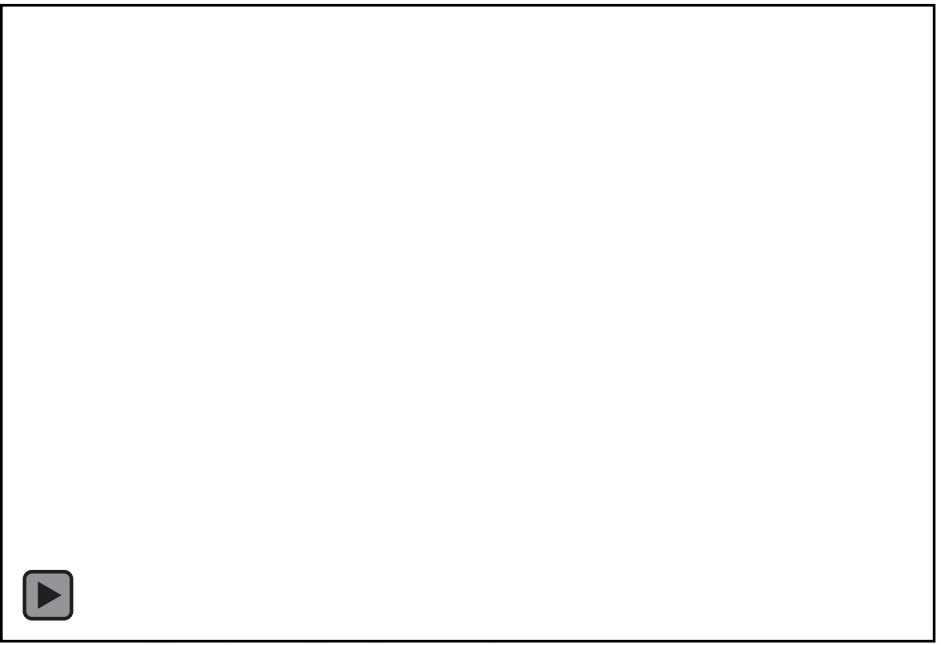
# Case 3

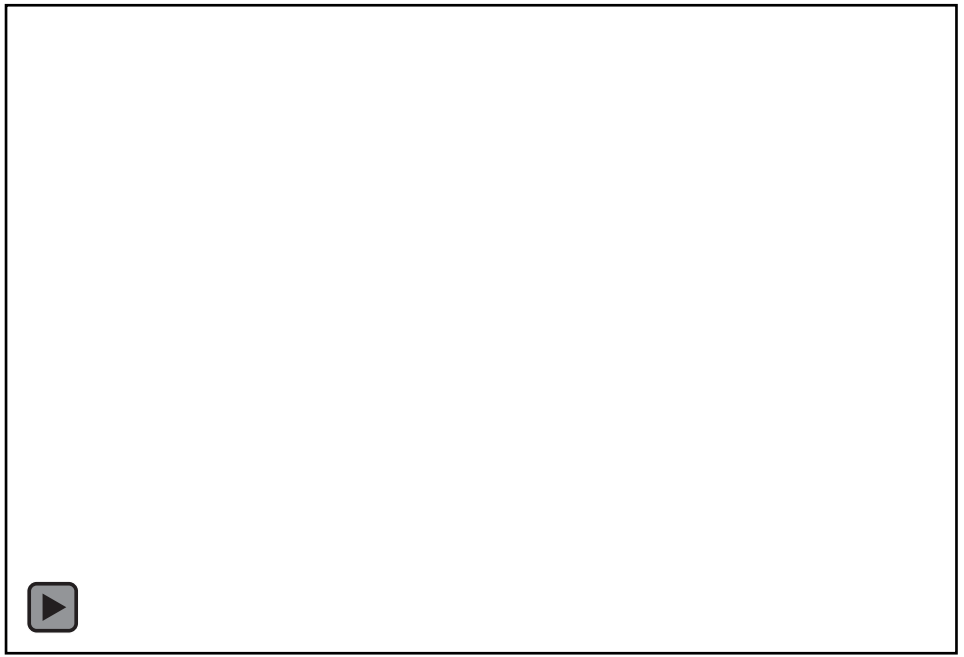
**42 yo female with COVID**

- **Presented to ED on COVID day 5 - received IV Fluids, Regeneron, and discharged home.**
- **Re-presented on COVID day 7 with diarrhea and syncope**

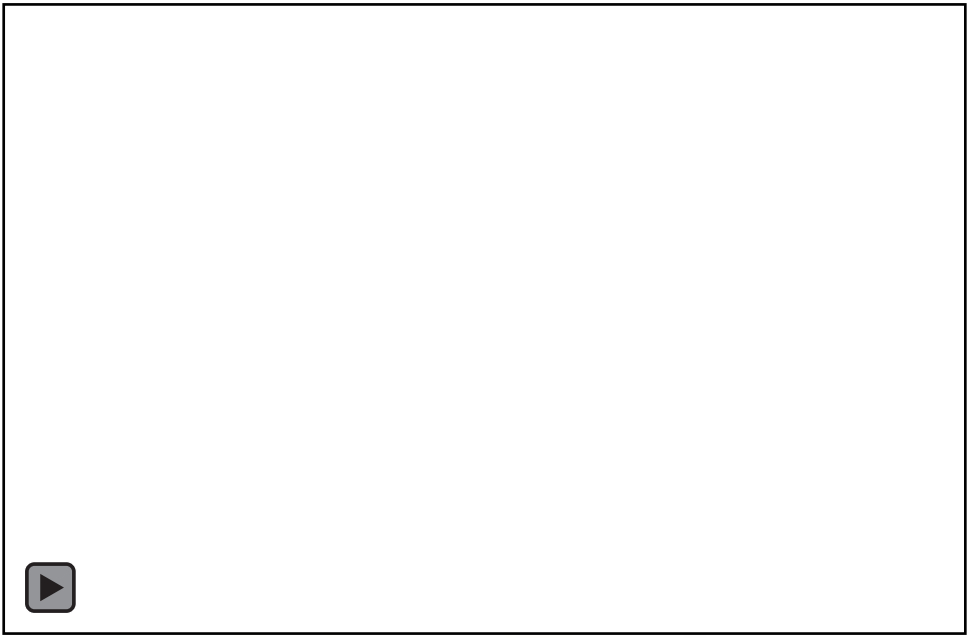
- **Arterial blood gas: 6.93/46/89/10/-20, Lactate >17**

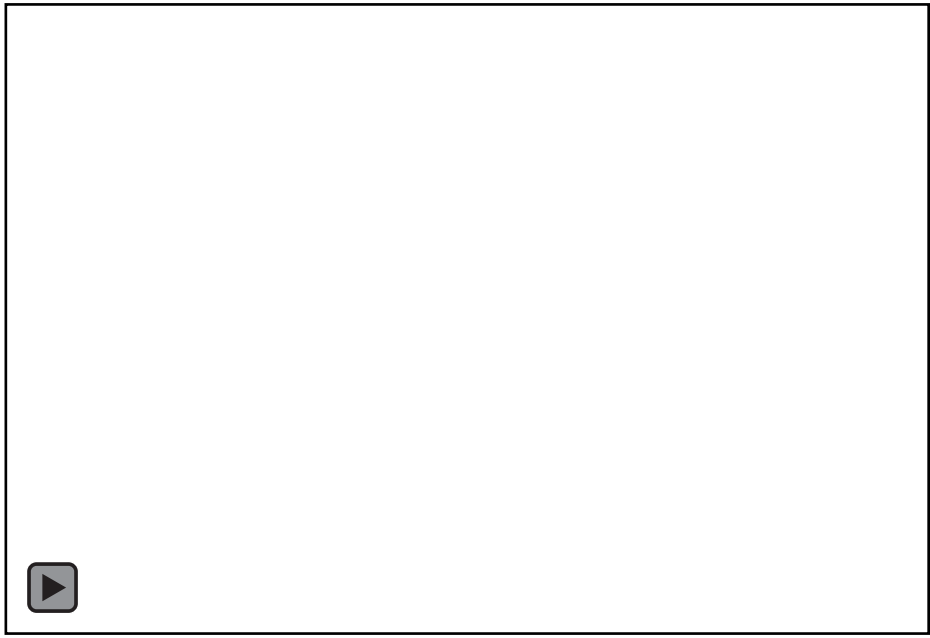
# Case 3



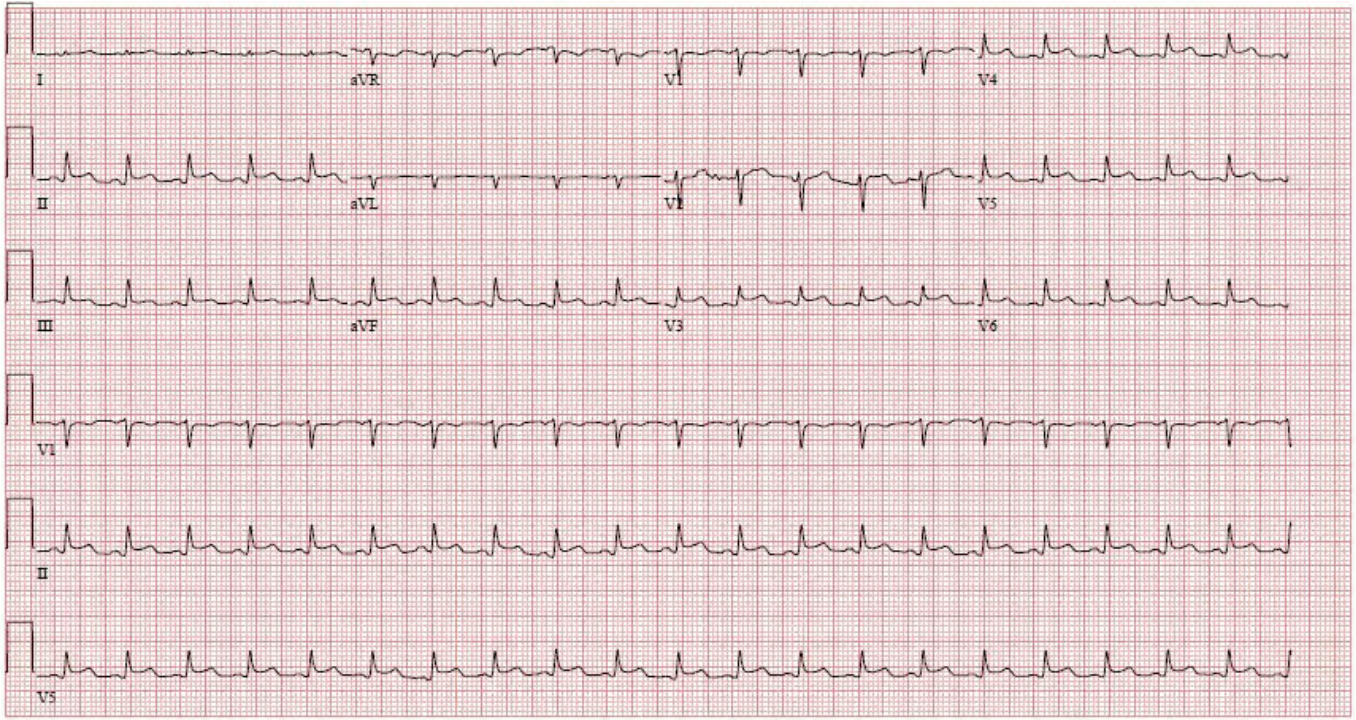


# Case 3

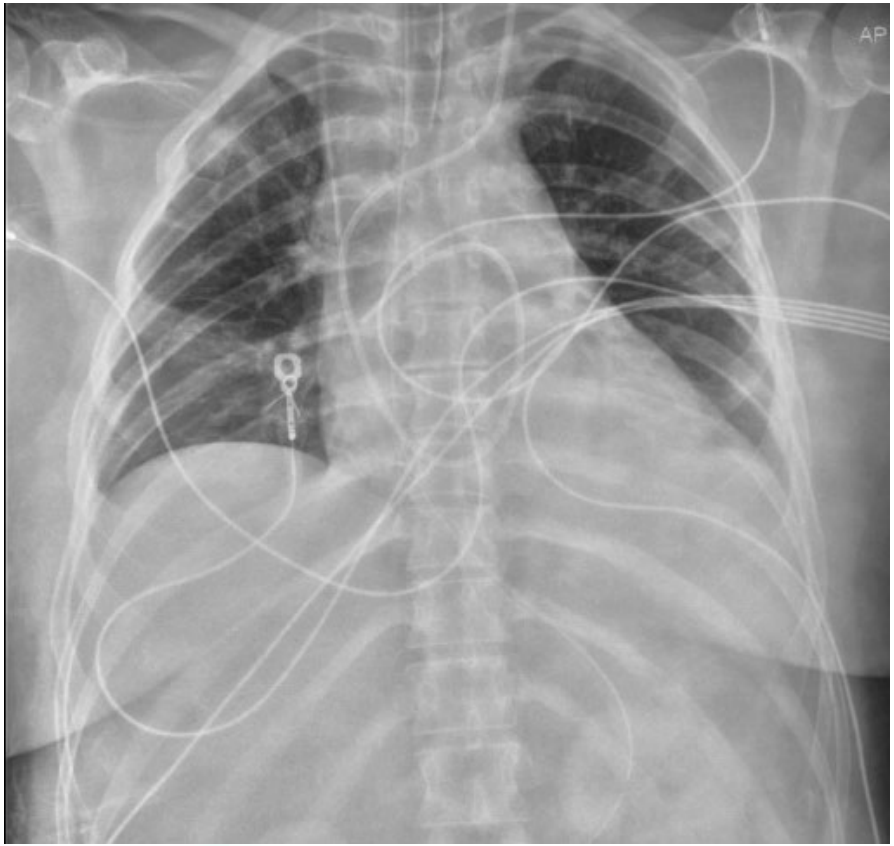




# Case 3



# Case 3



# Case 3

**42 yo female with COVID (diagnosed 8 days prior).**

- **Received IV fluids**
- **Started on dexamethasone, antibiotics, Norepinephrine, Dobutamine**
- **Became more hypotensive, altered mental status progressed, and emergently intubated**

- **Developed AKI, Shock Liver, Thrombocytopenia**
- **Shock refractory to 3 pressors**

- **Patient died within 12 hours of admission**

# Clinical Manifestations in MIS-A

- Typically presents within 4-6 weeks of COVID infection
- 96% of patients present with fever
- 60% present with hypotension
- 52% present with diarrhea
- 54% present with cardiac dysfunction
- 52% present with shortness of breath

Patel et al. JAMA Network Open. 4(9). Sept 2021

# Cardiac Manifestations in MIS-A

- **Pericarditis**
- **Myocarditis**
- **Coronary ectasia and coronary aneurysms**
- **Heart block**

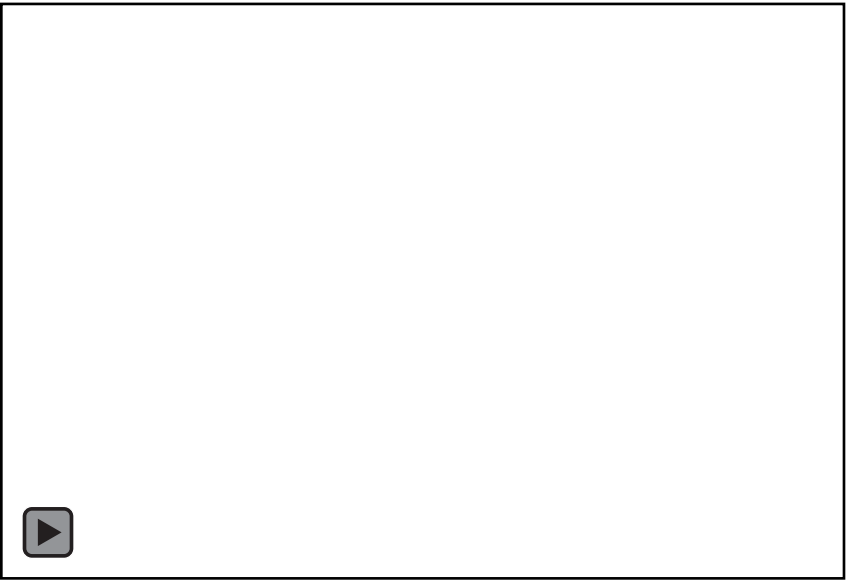
# Outline

- Evolving Role of Bedside Ultrasound in COVID
- Similarities with COVID and other forms of sepsis
- Differences with COVID
- Key Points

# Key Points

- **There are key echocardiographic differences in patients with COVID versus non-COVID sepsis**
- **Bedside echocardiography can be beneficial in patients with hemodynamic instability and sometimes in patients with worsening hypoxemia.**
- **Bedside echocardiography in COVID patients has changed management in 30-40% of patients**

# Thank you!




Sharon.McCartney@duke.edu

@smccartney31