Outcomes of Extracorporeal Membrane Oxygenation (ECMO) in Acute Respiratory Distress Syndrome (ARDS) due to COVID-19: Comparison of the First and the Second Wave

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Introduction

Background on COVID-19

ARDS is a major complication of COVID-19.

COVID-19-induced ARDS is more severe than ARDS due to other causes.

Extracorporeal membrane oxygenation (ECMO)

Has been used in select COVID-19 patients that develop refractory ARDS.

Evidence for the overall efficacy of ECMO for COVID-19-induced ARDS remains limited.

In-hospital mortality rate of 48% as of September 2021

Unclear how evolution of disease and pharmacologic therapies during the second wave has affected the clinical utility of ECMO.

Objectives

To compare characteristics and outcomes of ECMO in treating first wave COVID-19 patients and second wave COVID-19 patients with refractory ARDS.

To compare incidence of complications related to ECMO between first wave and second wave patients.

To observe causes of death in patients who died on ECMO.

Definition of Second Wave

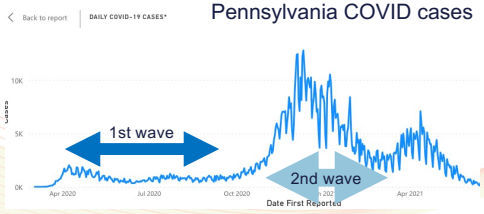
First wave: April 2020-September 2020

Second wave: November 2020-March 2021

(No ECMO for COVID in October 2020)

3rd wave (Delta pandemic) is not included

Pennsylvania COVID cases



Methods

ECMO Placement

All cannulation was performed VV-ECMO

Typical cannulation was using femoral and internal jugular veins

Small number of patients underwent VV-ECMO via single double-lumen cannula

General management of ECMO

Ventilator set to ultra-lung protective setting

Typical setting for pressure-controlled ventilation

Rate 15 per minute
PEEP 15 cm H_2O
delta P 15 cm H_2O
Inspiratory time 1.5 sec

Paralytics were discontinued within 24 hours of ECMO initiation

Blood pressure maintained ≥ 60 mm Hg with vasopressors and/or fluid

Anticoagulation with heparin infusion started if PTT < 50 sec

Maintained at anti-Xa goal of 0.3-0.5 IU/mL

Study period: April 2020-March 2021

Total number of ECMO cases: 41

28 patients stratified to first wave

13 patients stratified to second wave

Demographics of patients

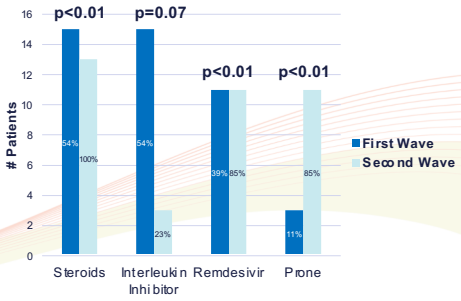
41 patients: 28M; 13F

51 ± 11 y/o

Median duration of ECMO: 16 (8, 30) days

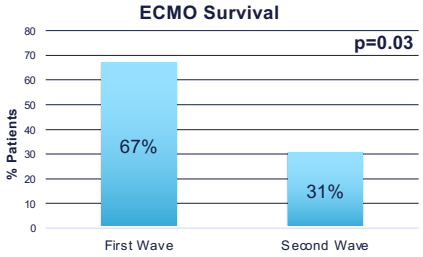
Retrospective analysis with IRB approval.

Pre-ECMO Treatments

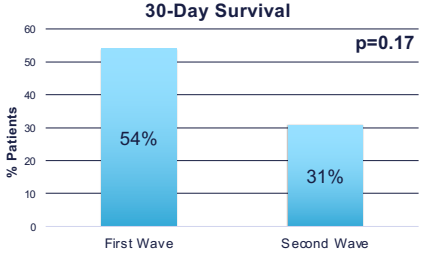


Results

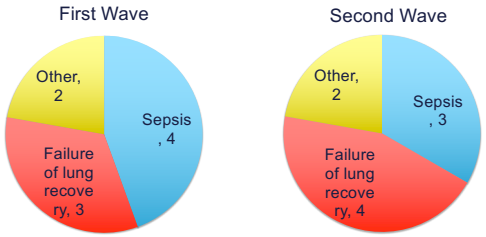
ECMO Survival



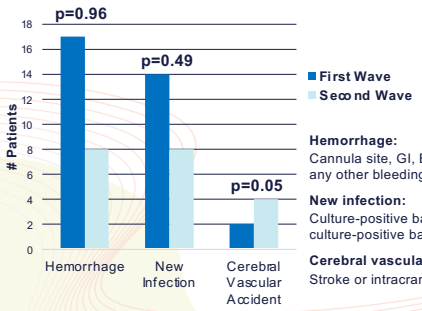
30-Day Survival



Causes of Death on ECMO



Other Significant Complications



Hemorrhage:
Cannula site, GI, ENT, or any other bleeding

New infection:
Culture-positive bacterial pneumonia, culture-positive bacteremia

Cerebral vascular accident:
Stroke or intracranial bleed

Results

No significant difference between groups in pre-ECMO vital signs or comorbidities

Second wave patients were more likely to receive steroids and remdesivir and more likely to be proned prior to ECMO initiation

ECMO survival rate of 67% in first wave patients vs. 31% in second wave patients (p = 0.03)

Sepsis (7/18) and failure of lung recovery (7/18) were the most common causes of death on ECMO

No significant difference in cause of death between first and second wave patients

Hemorrhage (n = 25) and new infection (n = 22) were most commonly observed complications

No centrifugal pump thrombosis was noted

Conclusion

Second wave COVID-19 patients experienced significantly higher ECMO mortality than first wave patients.

Control of infection for the patient with COVID-19 on immunomodulation therapy is challenging.

Stricter inclusion/exclusion criteria and improved pre-ECMO management may be required to improve outcomes.

Contact Information

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