# HEMOLUNG®

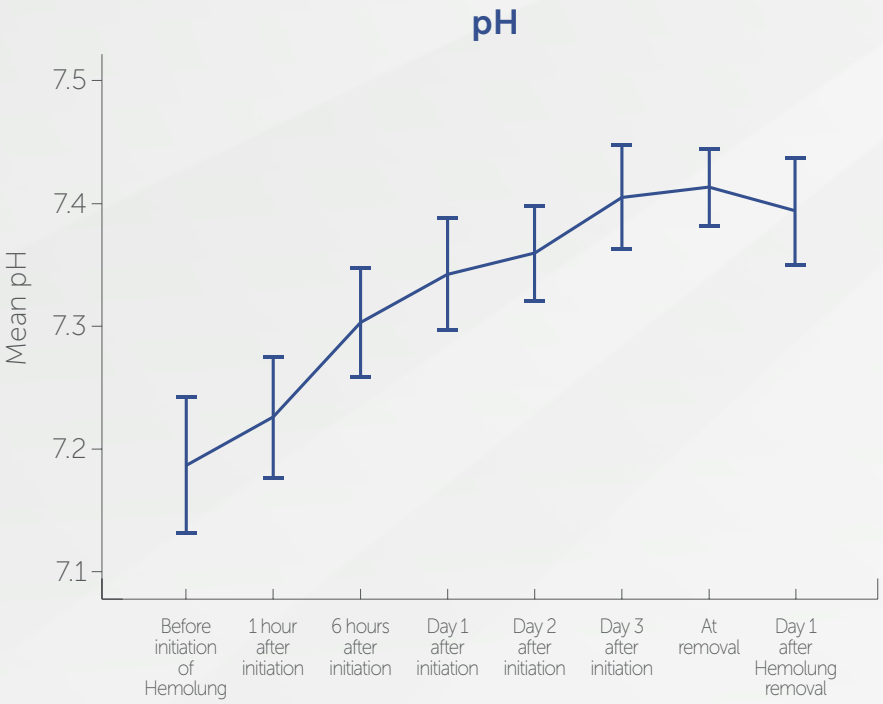
The First and Only FDA Cleared ECCO$_2$R Device

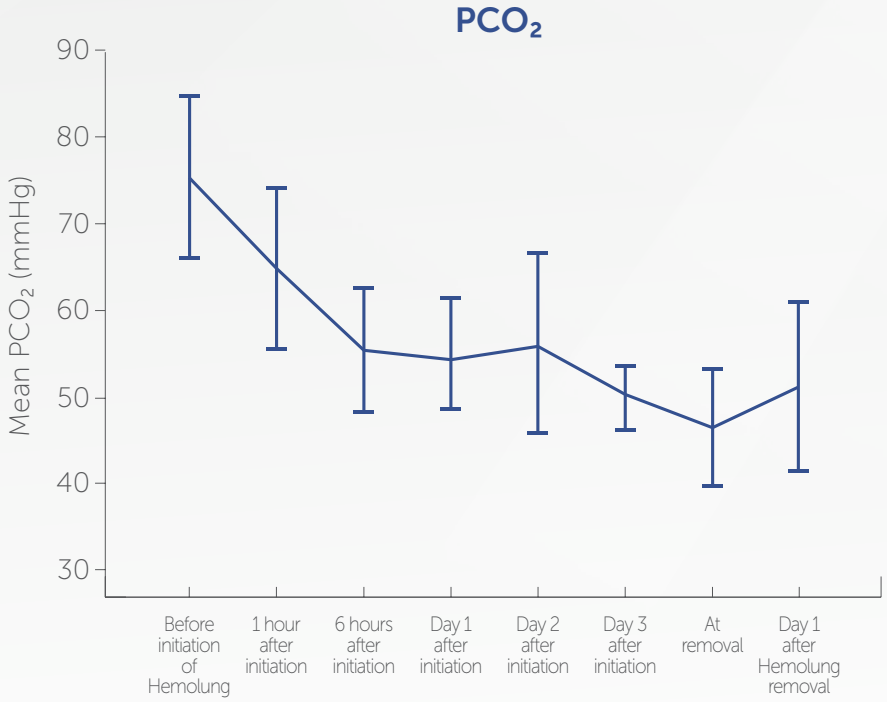

# SUMMARY OF **HEMOLUNG® PUBLICATIONS** 2022

ALUNG®

# Early Experience of a New Extracorporeal Carbon Dioxide Removal Device for Acute Hypercapnic Respiratory Failure

Tiruvoipati, et al. (2016) Critical Care and Resuscitation.[2]




**Primary Diagnosis:** Acute or acute-on-chronic hypercapnic respiratory failure

**Number of Patients:** 15

**Indication:** Failing NIV (n= 5) or Facilitate Lung Protective Ventilation (n= 10)

**Location:** Australia

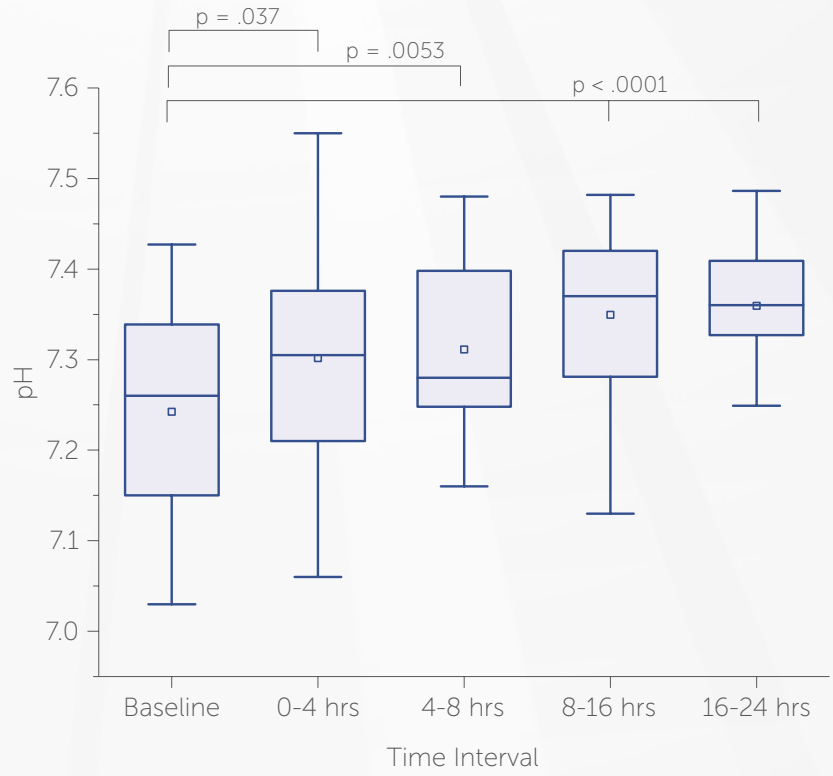
**Study Type:** Multicenter retrospective case series

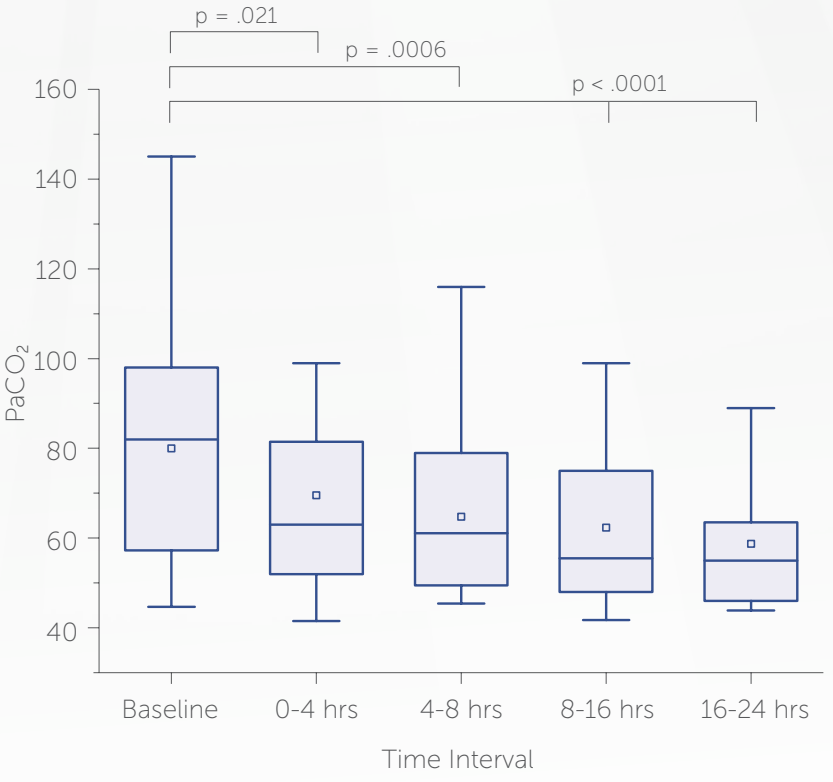
**Key Results:**

- pH and $PaCO_2$ improved significantly after 6 hrs of Hemolung therapy
- 4/5 NIV patients avoided intubation
- Lung protective ventilation was successfully instituted in all of the intubated patients
- 93% survived to $ECCO_2R$ weaning, 73% survived ICU discharge and 67% survived to hospital discharge
- "Most complications... were minor and did not require withdrawal from the Hemolung"
- "$ECCO_2R$ was safe and effective"

# Physiologic Improvement in Respiratory Acidosis Using Extracorporeal $CO_2$ Removal With Hemolung Respiratory Assist System in the Management of Severe Respiratory Failure from Coronavirus Disease 2019

Akkanti, et al. (2021) Critical Care Explorations.[3]




**Primary Diagnosis:** COVID-19 ARDS

**Number of Patients:** 31

**Indication:** Mechanically ventilated patients with severe hypercapnia and respiratory acidosis

**Location:** United States

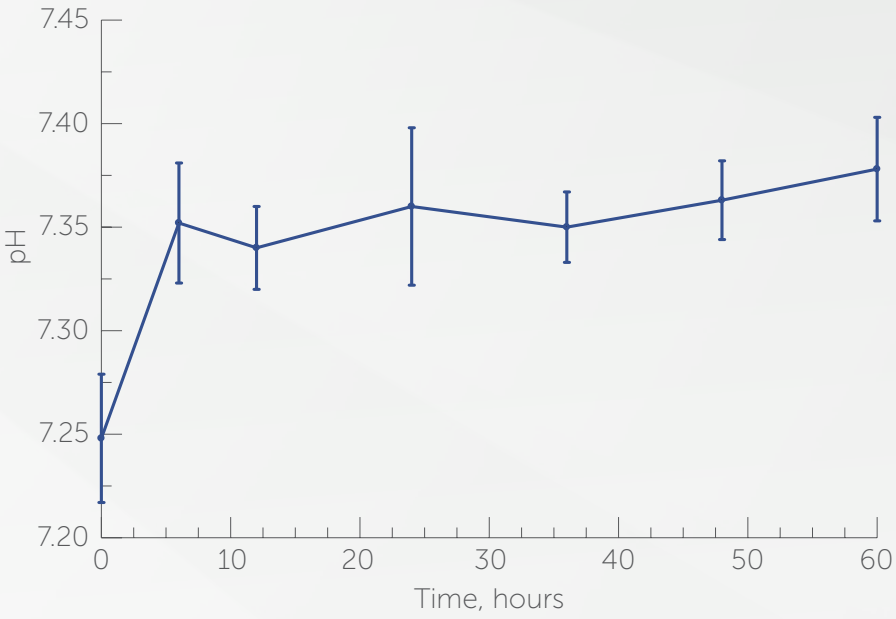
**Study Type:** Multicenter retrospective cohort analysis

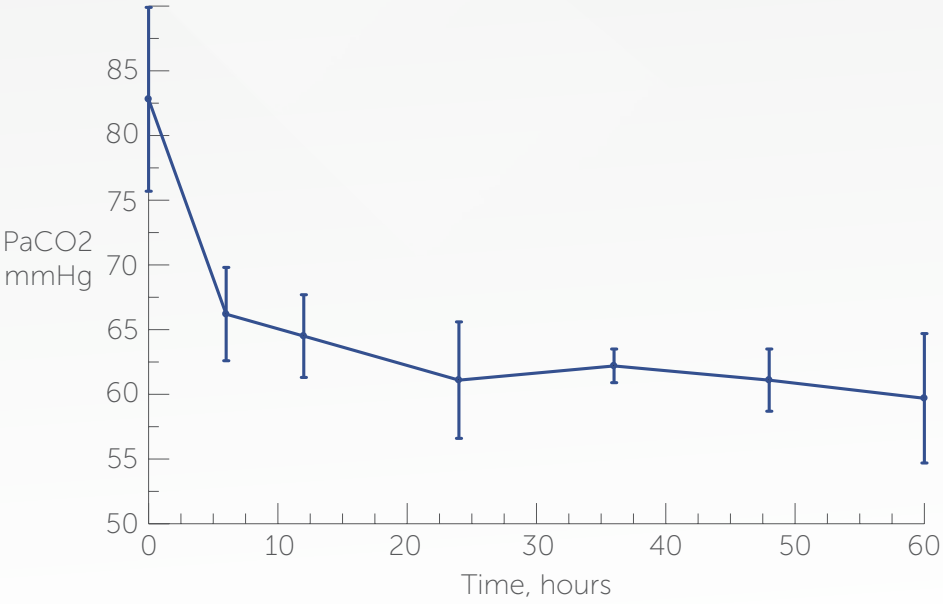
**Key Results:**

- pH and $PaCO_2$ improved significantly within the first 24 hrs of Hemolung therapy
- 58% survived to 48 hrs post treatment and 38% survived to hospital discharge
- Two hospitals who had not used the Hemolung device previously were able to use this technology during the pandemic
- The data "demonstrate[s] the efficacy of $ECCO_2R$ using the Hemolung RAS to improve respiratory acidosis in patients with severe hypercapnic respiratory failure due to COVID-19."

# A Novel Extracorporeal $CO_2$ Removal System: Results of a Pilot Study of Hypercapnic Respiratory Failure in Patients With COPD

Burki, et al. (2013) CHEST.[1]




**Primary Diagnosis:** COPD

**Number of Patients:** 20

**Indication:** Failing NIV (n=7), Failure to Wean from NIV (n=2), Failure to Wean from IMV (n=11)

**Location:** Germany & India

**Study Type:** Phase 1 Feasibility Study

**Key Results:**

- The Hemolung "provided clinically useful levels of $CO_2$ removal in these patients"
- All NIV patients avoided intubation or were successfully weaned from NIV
- 3 IMV patients were able to be weaned and the level of ventilatory support was able to be reduced in 3 patients
- "Complications and rates [were] similar to those seen with central venous catheterization"

# Summary of Hemolung Case Reports*

## HEMOLUNG to Avoid Intubation in Patients Failing NIV

The $CO_2$ removal, and concomitant correction of respiratory acidosis, provided by the Hemolung can enable avoidance of intubation in patients failing non-invasive mechanical ventilation (NIV).[1,2,4-7] The Hemolung works by correcting respiratory acidosis, which is an independent predictor of NIV failure in COPD patients.[8] NIV failure and the requisite transition to invasive mechanical ventilation is associated with an increase in in-hospital and 2-year mortality in COPD patients.[9]

Five case reports have been published documenting the use of the Hemolung in COPD patients failing NIV.[4-7] The results of these cases are summarized below:

- Within the first 24 hrs of Hemolung therapy pH increased and $PaCO_2$ decreased compared to baseline for each patient
- All 5 patients treated with the Hemolung avoided intubation[4-7]
- "Imminent death due to DNI order was avoided" in 2 of the patients[6,7]
- All 5 patients were discharged home alive

## HEMOLUNG Use in Intubated Patients

Hypercapnia and hypercapnic acidosis in intubated patients are associated with poor outcomes including increased mortality, ICU and hospital lengths of stay, organ dysfunction and ventilator complications.[10,11] Furthermore, reductions in mechanical ventilatory support and liberation from the ventilator are associated with improved mortality.[12,13] The Hemolung corrects hypercapnia and hypercapnic acidosis in intubated patients which can enable application of lung protective ventilation strategies.

Six Hemolung case reports documenting the applications of Hemolung therapy in intubated patients are summarized below:

- Mechanical ventilatory support was decreased while satisfactory gas exchange was maintained in an asthmatic[14]
- Hemolung therapy resulted in clinical improvement allowing the patient to be accepted as a transplant candidate[15]
- Mechanical ventilatory support was reduced in an ARDS patient[16]
- Dangerously high airway pressures were reduced in a COVID-19 patient[17]
- Lung protective ventilation strategies were achieved in a COVID-19 patient[18]
- Hemolung permitted a decrease in both the minute ventilation and respiratory rate and optimization of the inspiratory to expiratory time ratio to minimize the risk of barotrauma in a hypercapnic patient post-cardiac arrest[19]

* Greater than 1100 Hemolung therapies have been performed to date. Data presented here represent only peer-reviewed, published case reports of Hemolung patients.

# References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16. Akkanti B, et al. Low-flow extracorporeal carbon dioxide removal using the Hemolung Respiratory Dialysis System® to facilitate lung-protective mechanical ventilation in acute respiratory distress syndrome. *J Extra Corpor Technol.* 2017;49(2):112-114.
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19. Tiruvoipati R, et al. Management of severe hypercapnia post cardiac arrest with extracorporeal carbon dioxide removal. *Anaesth Intensive Care.* 2014;42(2):248-252.


# Indications for Use

The HEMOLUNG is indicated for respiratory support that provides extracorporeal carbon dioxide ($CO_2$) removal from the patient's blood for up to 5 days in adults with acute, reversible respiratory failure for whom ventilation of $CO_2$ cannot be adequately or safely achieved using other available treatment options and continued clinical deterioration is expected.

The HEMOLUNG is indicated for use only through prescription from qualified healthcare personnel.

# About ALung

ALung Technologies is a leading developer of advanced technologies for the treatment of respiratory failure. ALung is dedicated to enhancing the quality of life, improving the health, and reducing the cost of care for patients with respiratory failure.


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