

Information for healthcare professionals

ECCO₂R therapy: expert consensus on extracorporeal CO₂ removal to help manage ARDS and aeCOPD

Toward a better understanding of ECCO₂R therapy



Recent advancements have made it easier to deliver extracorporeal CO₂ removal (ECCO₂R) therapies to patients with acute respiratory failure, including acute respiratory distress syndrome (ARDS),¹⁻⁴ or acute exacerbations of chronic obstructive pulmonary disease (aeCOPD).^{5,6} However, guidance on best practices for these therapies is relatively limited.

To better understand how ECCO₂R therapy is used, 14 senior intensivists gathered for an expert roundtable in Brussels, Belgium in 2019, with support from Baxter.⁷ These experts had extensive experience providing ECCO₂R and other forms of extracorporeal treatments in hospitals across Europe, using a range of devices. Several roundtable participants also served (or were serving) as principle investigators in trials investigating ECCO₂R therapy.

The meeting's objectives were to:



Understand the application of ECCO₂R in managing ARDS and aeCOPD



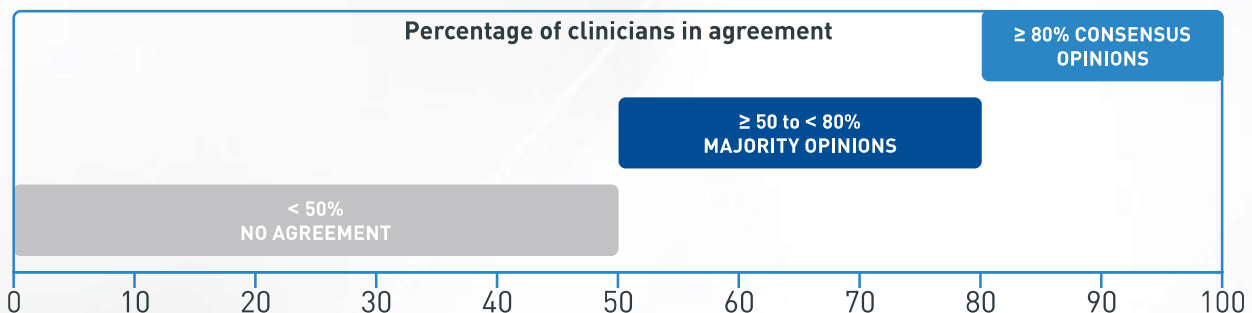
Identify patient selection criteria for both indications, as well as when to initiate therapy and wean patients from treatment



Determine points of consensus in clinical practice among the centers represented at the meeting

Methodology

- A modified Delphi-based method was used to collate the clinicians' views on the use of ECCO₂R therapy and to identify points of consensus.





Using ECCO₂R therapy in patients with ARDS



GOAL OF ECCO₂R THERAPY

- To facilitate ultra-protective lung ventilation (UPLV) for patients with ARDS [*consensus*].

✓ INITIATION CRITERIA

- Prior to the initiation of ECCO₂R therapy, it is recommended patients meet the following criteria:

Criteria	Target	Agreement
Driving pressure	≥ 14 cmH ₂ O	Consensus
P _{plat}	≥ 25 cmH ₂ O	
PaCO ₂	> 60–80 mmHg	Majority
pH	< 7.25	
V _T reduced to <6 mL/kg PBW	–	
Respiratory rate	≥ 25 to > 30 breaths/min	
PaO ₂ /FiO ₂	100–200	
PEEP	–	No agreement

PaCO₂, partial pressure of carbon dioxide; PaO₂/FiO₂, ratio of arterial partial pressure of oxygen to fractional inspired oxygen; PBW, predicted body weight; PEEP, positive end-expiratory pressure; P_{plat}, plateau pressure; V_T, tidal volume.



TREATMENT TARGETS

- The following are recommended ECCO₂R treatment targets for patients with ARDS:

Criteria	Target	Agreement
Driving pressure	< 14 cmH ₂ O	Consensus
Respiratory rate	< 25 or < 20 breaths/min	
P _{plat} ^a	< 25 cmH ₂ O	Majority
pH	> 7.30	
V _T	≤ 6 mL/kg PBW	
PaCO ₂	< 50–55 mmHg	

^a For P_{plat}, a consensus threshold of 80% was not reached in the meeting; in the post-meeting survey, it was rated as the second most important target.



WEANING PROTOCOL

- Recommended criteria and steps for weaning from ECCO₂R therapy are as follows:

Recommended criteria and steps	Agreement
ECCO ₂ R applied for at least 48 hrs, after which weaning can be attempted	Consensus
PaO ₂ /FiO ₂ > 200 mmHg before testing the possibility of weaning	
Set V _T at 6 mL/kg PBW and PEEP at 5–10 cmH ₂ O	
Driving pressure should be < 14 cmH ₂ O	
Respiratory rate should be 20–30 breaths/min	
Reduce gas flow to zero, using 2 L/min decremental steps	
While weaning, pH should remain at > 7.30 and respiratory rate at < 25 breaths/min	
Patient will be weaned off ECCO ₂ R therapy after ≥ 12 hrs of stability under these settings (including pH > 7.30 and respiratory rate < 25 breaths/min)	



Using ECCO₂R therapy in patients with aeCOPD

USES OF ECCO₂R THERAPY



- Support patients who are at risk of non-invasive ventilation (NIV) failure [*consensus*].
- Allow for early extubation within 24 hrs of initiating ECCO₂R therapy for patients who have recently initiated invasive mechanical ventilation (IMV) after NIV failure [*consensus*].
- Allow for early extubation of patients recently initiated on IMV after NIV failure [*no consensus reached*].

✓ INITIATION CRITERIA

- Prior to initiating ECCO₂R therapy for patients at **risk of NIV failure**, it is recommended to assess the following criteria:

Criteria	Agreement
No decrease in PaCO ₂ while on NIV	Consensus
No decrease in respiratory rate while on NIV	
Clinical signs of respiratory failure	Majority
pH 7.25–7.30	
Baseline PaCO ₂	No agreement
Baseline respiratory rate	

- For patients who are **already intubated**, the following criteria may be important to consider [*no consensus reached*]:

Criteria ^a
Patient looks like they will not be extubated early without ECCO ₂ R therapy, considering signs such as:
<ul style="list-style-type: none"> • Previously intubated for aeCOPD • Failed a spontaneous breathing trial due to increased dyspnea • Reintubated after first extubation attempt despite NIV • Severe bronchospasm and are difficult/impossible to ventilate adequately, or otherwise are not responding to medical treatment • Remain hypercapnic and not improving with IMV
Patient has no hypoxemia preventing extubation
Patient has been on IMV for < 72 hrs
Patient is able to receive NIV at home, and has good quality of life

^a Initiation criteria for this patient group varied and no consensus was reached.

🎯 TREATMENT TARGETS

- Recommended ECCO₂R treatment targets for patients with aeCOPD:^a

Criteria	Target
Patient comfort	–
pH	> 7.35/7.30
Respiratory rate	< 20–25 breaths/min
PaCO ₂	Decrease of 10–20%
Weaning from NIV	–
Decrease in HCO ₃ ⁻	–
Maintaining hemodynamic stability	–

^a Participants selected criteria from a provided list and ranked them in order of perceived importance.



WEANING PROTOCOL

- Recommended criteria and steps for weaning from ECCO₂R therapy:

Recommended criteria and steps	Agreement
Patients weaned from NIV for > 6 hrs, excluding patients on home NIV or candidates for long-term NIV	Consensus
Intubated patients should be weaned from IMV for > 6 hrs	
Maintain SpO ₂ ≥ 88%, with supplemental O ₂ if needed	
Reduce sweep gas flow rate by 1–3 L/min, checking arterial blood gas after 1 hrs for: <ul style="list-style-type: none"> • pH ≥ 7.35 with respiratory rate < 25 breaths/min • PaO₂ > 55 mmHg • SpO₂ > 88% • FiO₂ < 40% 	
Repeat sweep gas reduction until zero gas flow is reached, while arterial blood gas targets are maintained	
Remove ECCO ₂ R after 6 hrs of stability of the aforementioned criteria	

SpO₂, oxygen saturation.

Insights



ECCO₂R therapy may be a useful and effective supportive treatment for adults in the intensive care unit with either ARDS or aeCOPD.⁷

Recent and ongoing trials continue to advance evidence on the feasibility of using ECCO₂R therapy with different devices and are helping to clarify the observational evidence provided by practicing intensivists.^{8–11}

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ABBREVIATIONS

aeCOPD, acute exacerbations of chronic obstructive pulmonary disease; **ARDS**, acute respiratory distress syndrome; **ECCO₂R**, extracorporeal CO₂ removal; **FiO₂**, fraction of inspired oxygen; **IMV**, invasive mechanical ventilation; **NIV**, non-invasive ventilation; **PaCO₂**, partial pressure of CO₂; **PaO₂**, arterial partial pressure of oxygen; **PBW**, predicted body weight; **PEEP**, positive end-expiratory pressure; **P_{plat}**, plateau pressure; **SpO₂**, oxygen saturation; **UPLV**, ultra-protective lung ventilation; **V_T**, tidal volume.

Please note the findings presented here represent the personal experience of the meeting attendees and are not intended to replace local guidelines or practices.

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