



## **Extracorporeal Life Support Organization (ELSO)**

# **Endotracheal extubation in patients with respiratory failure receiving venovenous ECMO**

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These guidelines describe useful and safe practice for extracorporeal life support (ECLS, ECMO) but these are not necessarily consensus recommendations. These guidelines are not intended as a standard of care, and are revised at regular intervals as new information, devices, medications, and techniques become available. These guidelines are intended for educational use to build the knowledge of physicians and other health professionals in

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## **I. Overview**

Select patients with respiratory failure receiving ECMO may be safely and successfully managed without invasive mechanical ventilation. It must be emphasized that not all respiratory failure patients receiving ECMO will be appropriate for endotracheal extubation, even if gas exchange is adequate. In fact, in current practice, only a minority of patients would even be eligible at experienced centers.

### Potential Benefits

- 1) Decreased risk of ventilator-associated events, e.g.: ventilator-associated pneumonia
- 2) Decreased occurrence of unplanned extubations
- 3) Decreased need for analgo-sedation
- 4) Increased comfort
- 5) Increased oral nutrition
- 6) Improved delivery of inhaled medication
- 7) Facilitation of physical rehabilitation
- 8) Facilitation of patient communication

### Potential Risks

- 1) Insufficient gas exchange support
- 2) Increased work of breathing and energy expenditure
- 3) Respiratory failure
- 4) Decreased ability to suction and provide secretion clearance

## **II. Assessing readiness for endotracheal extubation**

- 1) Patient's clinical condition is appropriate for attempting to decrease the level of respiratory support, e.g.: without severe shock or multi-organ failure
- 2) Patient is awake enough to at least protect his or her airway, cooperative enough not to be at significant risk for dislodgement of cannulas or other important catheters or devices, and not requiring heavy or frequent analgo-sedation
- 3) Secretions are manageable without an artificial airway
  - a. Bronchoscopy should be considered prior to extubation to assess for deep or impacted secretions.

## **III. Gas exchange criteria for endotracheal extubation**

- 1) The patient should have an acceptable arterial blood gas on minimal ventilator settings, e.g.: FiO<sub>2</sub> 0.4, PEEP 5.
  - a. Goal PaO<sub>2</sub> >80 on FiO<sub>2</sub> of 0.4 and FDO<sub>2</sub> 1.0
  - b. Goal pH >7.35 with minute ventilation <10 L/min while receiving a sweep gas flow <6 L/min

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- 2) Extra consideration should be taken if the adequacy of gas exchange may be more dependent on PEEP, such as in cases of congestive heart failure or morbid obesity

#### **IV. Guideline Steps:**

- 1) Determine that patient meets readiness and gas exchange criteria for extubation (see II and III)
- 2) Recommend informing the patient's main surrogates of the plan
- 3) The patient should be NPO prior to extubation
- 4) Perform chest physiotherapy and suctioning prior to extubation
- 5) Prepare supplemental oxygen
  - a. Consider extubating to a non-rebreather mask or high-flow nasal cannula
  - b. Consider extubating to non-invasive positive pressure ventilation if potentially PEEP-dependent
- 6) Prepare airway kit in case of extubation failure
- 7) Extubate
- 8) Perform chest physiotherapy post-extubation to further mobilize secretions as needed
- 9) Check arterial blood gas post-extubation to assess need for changes in sweep gas flow rate
- 10) Consider a chest radiograph post-extubation to assess for mucous plugging or lung collapse

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