

# Recommendations - High Flow Oxygen (HFO) Therapy

Version 1 - 27 March 2020

**Writer:** Jean-Damien RICARD

**Review :** Oriol ROCA, Jean-Michel CONSTANTIN, Charles CERF

---

## General principles:

- These recommendations apply to all hypoxemic patients with suspected or confirmed Covid-19 requiring oxygen therapy.
- These recommendations take into account parameters which would not necessarily have otherwise been taken into account given the current situation.
- The treatment of patients with Covid-19 who are breathing spontaneously under HFO treatment must be carried out with the same precautions as regards clothing, the wearing of masks and eye guards as is recommended for treating other patients with Covid-19.
- However, given the risk of aerosolisation with this technique, we recommend using a FFP2 mask here.
- Given the risk of these patients' health worsening rapidly, it essential to ensure that strict monitoring is in place.
- The ROX<sup>1,2</sup> score (and the variations over time) may be useful (see algorithm) (it is not in any way a universal remedy!) it is a tool that has the advantage of being simple (can be calculated by medical students, nursing staff, etc.) to help:
  - with the monitoring of these patients
  - identify patients whose condition is worsening
  - with the decision of whether to intubate or not
- NB: the algorithm suggested at the end of the document is only one element involved in the decision of whether to intubate. As we are lacking data for Covid-19 patients, the suggested thresholds have come from non-Covid patients in hypoxemic ARF.

If your patient exceeds an “intubation” threshold, it is in no way mandatory to intubate them; rather it is an alert that should lead to a more precise and urgent discussion about whether or not to intubate the patient. It does not work 100% of the time! Some patients need to be intubated earlier while others will turn the corner despite having

	Recommendations	Notes
<b>Choice of device</b>	<p>2 options:</p> <ul style="list-style-type: none"> <li>• Dedicated “stand alone” HFO devices</li> <li>• The HFO mode that a growing number of ventilators provide</li> </ul>	<ul style="list-style-type: none"> <li>➤ In the HFO mode of some ventilators, there is a maximum flow of 50 L/min</li> <li>➤ This is not so true of turbine ventilators</li> <li>➤ Disposable HFO kit</li> </ul>
<b>Precautions for use</b>	<ul style="list-style-type: none"> <li>• An FFP2 mask (as well as the usual Covid protective wear) should be worn by the staff</li> <li>• Have the patient wear – if possible (long-term tolerance is uncertain) – a surgical mask</li> </ul>	<ul style="list-style-type: none"> <li>➤ Depending on the room’s air pressure, it may be useful to regularly air it (for example, every 2 hours)</li> <li>➤ If the patient has problems with tolerating the masque, ask him or her to put it on as soon as someone comes into the room- if he or she is capable of doing so.</li> </ul>
<b>Regulating the FiO<sub>2</sub></b>	Qsp an SpO <sub>2</sub> >92-94%	<ul style="list-style-type: none"> <li>➤ In the current situation, it is very difficult to give a target saturation, firstly due to the sometimes very rapidly worsening condition of patients (and therefore a falsely reassuring SpO<sub>2</sub> at particular time) and because, conversely, it may be difficult for certain patients who would benefit from this technique to achieve this target</li> </ul>
<b>Regulating the flow</b>	<ul style="list-style-type: none"> <li>• A minimum of 30 L/min</li> <li>• Do not exclude the option of higher flows</li> <li>• The need to increase flows should also serve as an alert on the</li> </ul>	<ul style="list-style-type: none"> <li>➤ The following must be borne in mind: <ul style="list-style-type: none"> <li>- all of the physiological effects are flow-dependent</li> <li>- some effects are only observed with a flow of 60L/min</li> </ul> </li> </ul>

	possible worsening of the patient's condition (see ROX score)	<ul style="list-style-type: none"> <li>➤ There is a risk of dispersion. However, it is very limited and not all that different to the risk with an O2 mask.</li> <li>➤ Having the patient wear a mask reduces this dispersion</li> </ul>
<b>Clinical monitoring</b>	<ul style="list-style-type: none"> <li>• Respiratory rate</li> <li>• SpO<sub>2</sub></li> <li>• ROX score</li> </ul>	<ul style="list-style-type: none"> <li>➤ Le score ROX se calcule en divisant la SpO<sub>2</sub>/FiO<sub>2</sub>, et en divisant le result by the respiratory rate</li> <li>➤ The higher it is, the better the respiratory status of the patient, and vice versa.</li> <li>➤ The range of values observed varies very broadly between: 2.9 and 11</li> </ul>

## Suggestion for a monitoring algorithm with ROX

Introduction: - A ROX > 4.88 at 12 hours is associated with a lesser risk of intubation<sup>1</sup>

- A ROX <2.85 at 12 hrs, < 3.47 at 6 hrs and < 3.85 at 12 hrs is associated with an increased of intubation<sup>2</sup>

- these thresholds have not been validated in Covid-19 patients

- **as an example**, this is the evolution of ROX scores at 0 hours, 2 hours, 6 hours, 12 hours, 18 hours and 24 hours between patients who were intubated in the end and those who were not intubated, in the study to validate the score<sup>2</sup>

Time	Non-intubated	Intubated	p
H0	5.81 (4.21–8.00)	4.06 (2.98–6.54)	0.169
H2	5.71 (4.62–7.28)	4.43 (3.57–6.16)	0.001
H6	6.55 (5.44–8.17)	4.86 (3.43–6.64)	0.001
H12	7.53 (5.83–9.93)	4.78 (3.67–6.99)	0.001
H18	8.60 (6.30–10.03)	5.10 (3.84–7.31) ,	0.001
H24	8.68 (6.93–11.77)	5.05 (4.00–6.74)	0.001


### Example of ROX


- Where SpO<sub>2</sub> = 88 %
- under FiO<sub>2</sub> 90% (=0.9)
- and FR = 35

==> ROX = 88/0.9/35 = **2.79**

## In practice



### Between 0 hrs and 2 hrs: monitoring ++++

if ROX < 2.85, and not at maximum HFO\*  put on maximum HFO and reassess after 30 mins  
if HFO is already at maximum: pursue intubation



If after 30 mins: no ROX progression or progression < 0.5  pursue intubation

Where progression > 0.5: pursue HFO and monitor



### Between 2 hrs and 6 hrs

- If ROX < 3.5 and not at maximum HFO\*  put on maximum HFO and reassess after 30 minutes
- If HFO is already at maximum: pursue intubation
- If after 30 mins: no ROX progression or progression < 0.5  pursue intubation
- Where progression > 0.5: pursue HFO and monitor

### Between 6 hrs and 12 hrs

- If ROX < 3.80 and not at maximum HFO\*  put to maximum HFO and reassess after 30 minutes
- If HFO is already at maximum: pursue intubation
- If after 30 mins: no ROX progression or progression < 0.5  pursue intubation
- Where progression > 0.5: pursue HFO and monitor

### At 12 hrs

- If ROX < 4.80 and not at maximum HFO\*  put on maximum HFO and reassess after 30 minutes
- If HFO is already at maximum: pursue intubation
- If after 30 mins: no ROX progression or progression < 0.5  pursue intubation
- Where progression > 0.5: pursue HFO and monitor

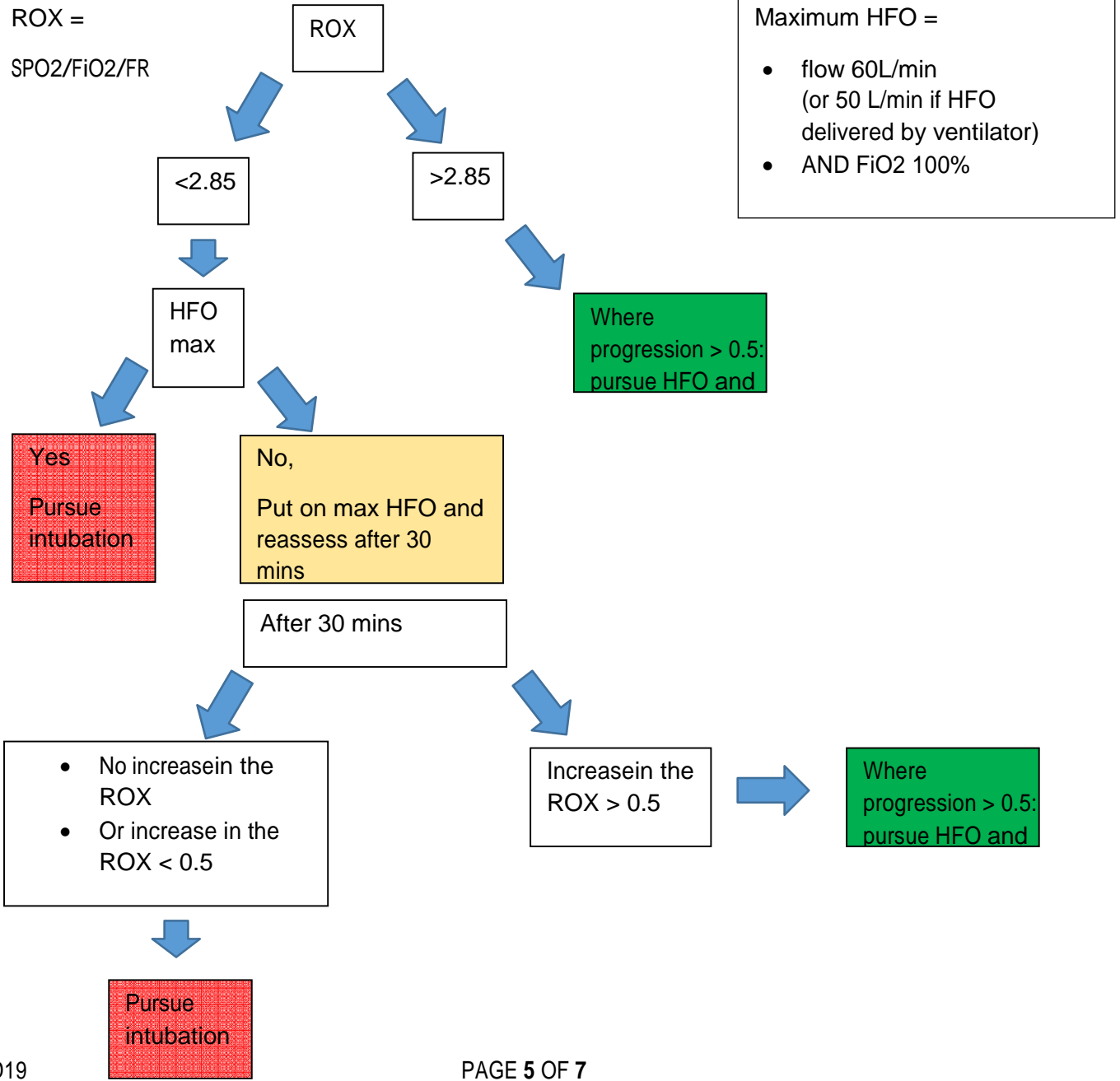
\* Maximum HFO =

- flow 60L/min  
(or 50 L/min if HFO delivered by ventilator)
- AND FiO2 100%

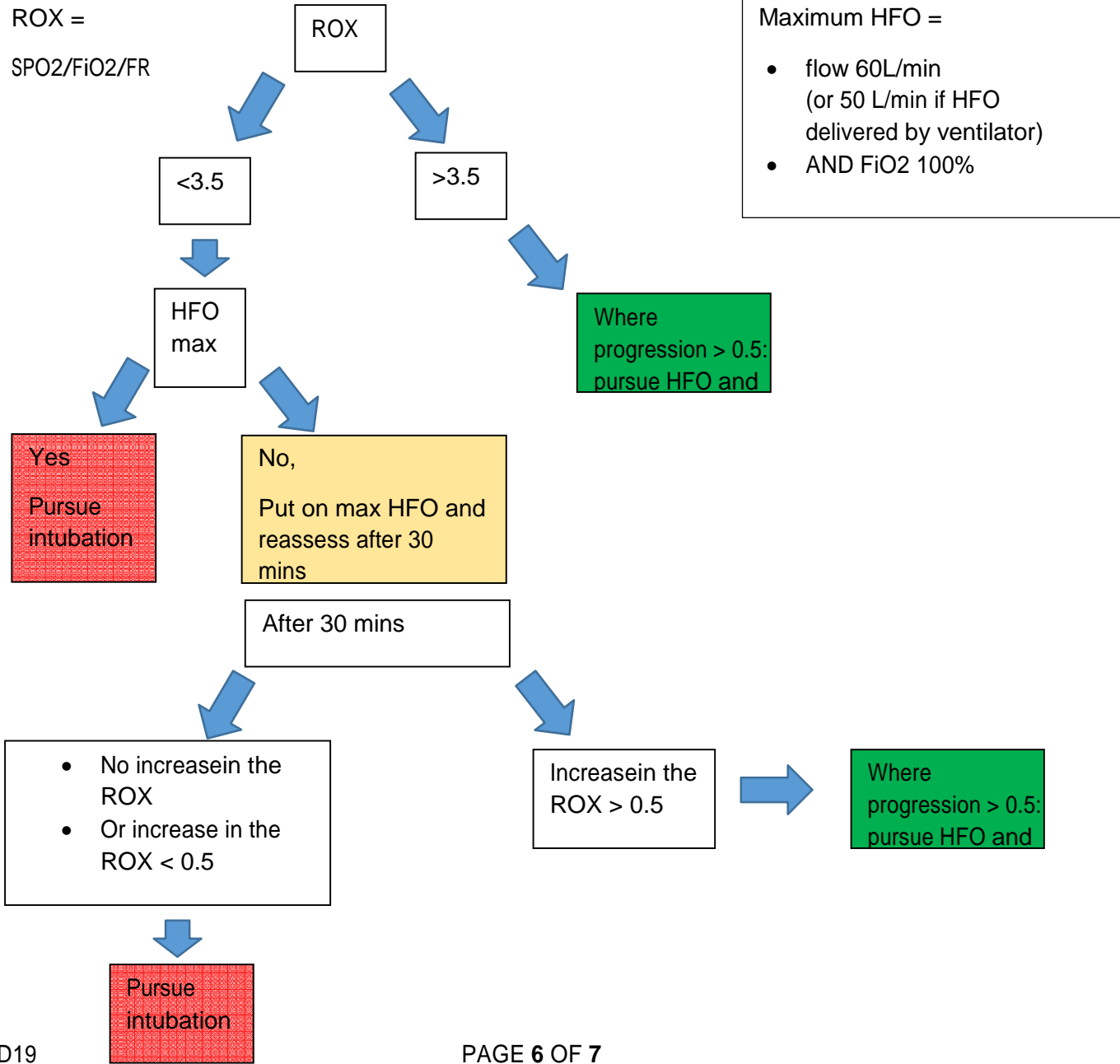
<sup>1</sup>Predicting success of high-flow nasal cannula in pneumonia patients with hypoxemic respiratory failure: The usefulness of the ROX index. Roca O et al, J Crit Care. 2016

<sup>2</sup>An Index Combining Respiratory Rate and Oxygenation to Predict Outcome of Nasal High-Flow Therapy. Roca O, et al Am J Respir Crit Care Med. 2019 1;199:1368-1376.

Between  
0 hrs  
And  
H2

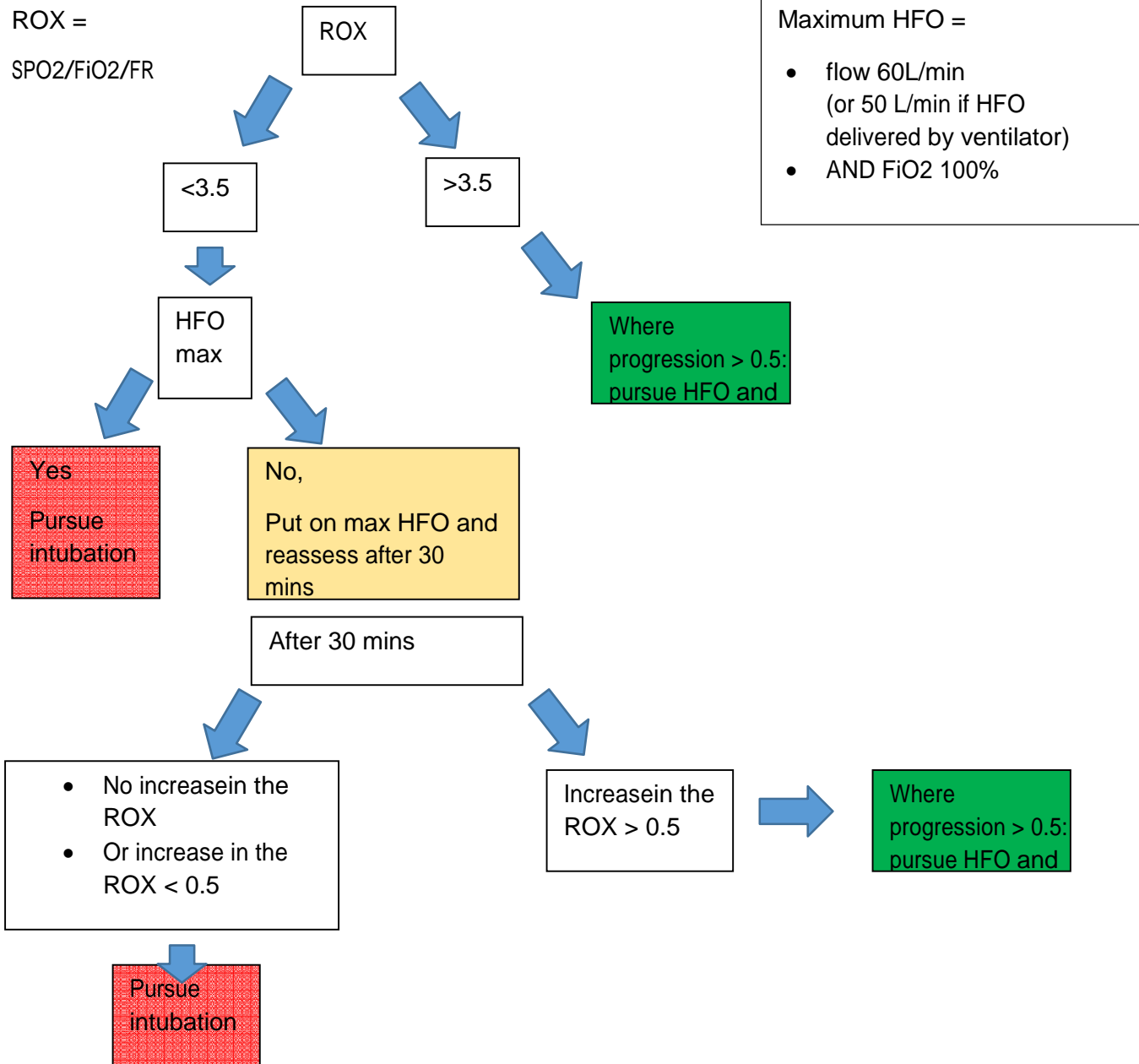


Between  
H2  
And  
H6



Between  
H2  
And  
H6

ROX =  
SPO<sub>2</sub>/FiO<sub>2</sub>/FR



Maximum HFO =

- flow 60L/min (or 50 L/min if HFO delivered by ventilator)
- AND FiO<sub>2</sub> 100%

Entre H6 et H12	Between 6 hrs and 12 hrs
ROX= SPO2/Fio2/FR	ROX= SPO2/Fio2/FR
OHD maximale	Maximum HFO
Débit 60/Lmin (ou L/min si OHD délivrée par un ventilateur)	Flow 60L per min (or 50 L per min if HFO delivered by ventilator)
ET Fio2 100%	AND Fio2 100%
ROX	ROX
OHD max	Maximum HFO
Poursuivre OHD et surveiller	Pursue HFO and monitor
Oui	Yes
Envisager intubation	Pursue intubation
Non, Mettre en OHD max et réévaluer apres 30 min	No, Put on max HFO and reassess after 30 mins
Après 30 min	After 30 mins
Pas d'augmentation du ROX	No increase in the ROX
Ou Augmentation du ROX <0.5	Or increase in the ROX < 0.5
Envisager intubation	Pursue intubation
Augmentation du ROX >0.5	Increase in the ROX > 0.5
Poursuivre OHD et surveiller	Pursue HFO and monitor