Re-Thinking the Early Intubation Paradigm of COVID-19: Time to Change Gears?

Rola, Philippe, MD, Farkas, Joshua, MD, Spiegel, Rory, MD, Thomas, Adam, MD, Kyle-Sidell, Cameron, MD, Weingart, Scott, MD, Duggan, Laura, MD, Garrone, Marco, MD.

Author affiliations

Rola, Philippe, MD, FRCPC
Chief of Service, Intensive Care Unit
Santa Cabrini Hospital, CIUSSS-CEMTL
Montreal, Canada
correspondence: philipperola@gmail.com

Joshua Farkas, MD
Department of critical care.
University of Vermont, VT, USA

Rory Spiegel, MD,
Departments of Critical Care and Emergency Medicine,
Washington Hospital Center, Georgetown University,
Washington, DC, USA

Cameron Kyle-Sidell, MD,
Emergency Physician
Maimonides Medical Center, Brooklyn, NY USA.

Weingart, Scott, MD
Professor – Department of Emergency Medicine
Chief of the Division of Emergency Critical Care
Renaissance School of Medicine
Stony Brook University, NY, USA.

Laura V. Duggan MD FRCPC
Associate Professor
Department of Anesthesiology and Pain Medicine
University of Ottawa, Canada

Marco Garrone, MD,
Emergency department,
Mauriziano Ospedale, Torino, Italy.

Adam Thomas, MD, FRCPC
Emergency Physician - Island Health Authority
Fellow - Adult Critical Care, University of British Columbia,
Canada

Abstract - SARS-Cov2 infection causes a new disease with unique pathophysiological features which are currently being described. The initial cohort of physicians dealing with the outbreak shared observations and approaches that rapidly became worldwide guidelines. However, the optimal way to manage these patients remains unclear. In this article, authors call into question some of the current recommendations based on the evolving knowledge of the disease features and pathophysiology, particularly that of an unusually early intubation for hypoxia which bypasses attempting non-invasive ventilatory techniques.

The twenty first century’s first true pandemic has taken the world by storm in the first months of 2020. Originating in Wuhan, China, the SARS-Cov2 virus has spread to all corners of the globe in under 4 months and shows little signs of slowing. The medical community has much to thank the Chinese physicians and health care workers - who were the first hit - for organizing a rapid and focused response which included a huge amount of data collection around prevention, diagnosis and management. From this came invaluable information describing this unique illness (Wu & al 2020, Onder & al., 2020, WHO Report). While most other forms of acute lung injury present with a somewhat similar clinical pattern of respiratory failure, and, if severe enough, are often grouped together in a category we have called acute respiratory distress syndrome or ARDS.

ARDS tends to be a process of lung inflammation resulting in bilateral alveolar infiltrates, lung unit collapse, ventilation and perfusion mismatch and progressive hypoxia and respiratory distress and failure. The physiological pattern is one of low pulmonary compliance. Great strides were made in the management of these entities by the work of Gattinoni and colleagues (Pelosi & al., 1994, Gattinoni 1987, 1988) in the 1990’s and the advent of the ARDSnet group and the concept of lung protective ventilation, characterized by high positive end expiratory pressure (PEEP) and low tidal volumes. Countless lives were saved using this approach which minimized ventilator-induced lung injury (VILI). In the COVID-19 disease process, however, Gattinoni himself recently described a very different pattern with two distinct phenotypes, with only 20-30% cases evolving to the classic ARDS-like pattern of lung disease, suggesting they need to be managed differently.

The initial message from the Chinese medical teams was to intubate early, somewhere around a 5-6 liter by nasal prong O2 requirement. This seemed to stem from the accurate observation that many of these patients deteriorated precipitously and that they may be more safely intubated at an earlier stage, particularly given the levels of hypoxia encountered during intubation. Additionally, a high work of breathing generating large swings in intrapleural pressure may result in self-inflicted lung injury (SILI) and worsen the disease process. There is certainly a rationale for early intubation.

However, this also can come at a cost. Mechanical ventilation is inherently associated with a number of well described and accepted complications such as ventilator
associated pneumonia (VAP), ventilator-induced lung injury (VILI), hemodynamic disturbances, as well as all those related to sedation and immobilization.

Interestingly, it appears that SARS-Cov2 “runs its course” and seems to “turn off” at some point for survivors, who tend to have a two-week course of mechanical ventilation. Hence an early intubation strategy may result in more ventilated days vs a delayed approach.

It appears fair to say that at the very least, there is clinical equipoise as to whether it is best to intubate early before sudden decompensation occurs, or to assess the patient’s respiratory strain and whether the physician feels there is substantial risk of SILI, and to delay intubation by the use of high flow nasal cannulae (HFNC) or non-invasive ventilation (NIV).

Another icon of the ventilatory literature (Tobin, 2020), noted the need for physiological assessment of the COVID-19 respiratory syndromes and a need to understand that “Respiratory rates of 25 to 35 breaths per minute should not be viewed as ipso facto (knee jerk) justification for intubation.”

Additionally, it has become apparent to many clinicians that a significant amount of COVID pneumonia patients present very differently to respiratory failure patients we have been accustomed to see, where the degree of dyspnea correlates relatively well with that of hypoxia. In what has been termed the “happy hypoxic” of SARS-Cov2, there appears to be an uncoupling of this relationship where the patient is in little or no distress, without tachycardia, yet with profound hypoxia with oxygen saturations often well below 80%. It is these patients where the wisdom of early intubation is being put into question, with several clinicians opting to tolerate lower saturation goals (variable but generally over 80%) in the absence of distress.

At Santa Cabrini Hospital in Montreal, a scale of respiratory strain is being used (Cabrini Respiratory Strain Scale or CAB-RSS) to aid in clinical documentation and in an effort to validate it as a marker of severity and potentially a decision tool for progressing to a higher level of ventilatory support. Data should be forthcoming in the upcoming weeks (figure 1).

Figure 2 shows a decisional algorithm being used at Maimonides Medical Center in Brooklyn, New York, as an example of a potential approach, though the authors do have variation between their practices despite the common thread.

Our current ventilatory approach is to delay intubation if it clinically appears safe and feasible. This requires, ideally, negative pressure rooms and for the patient to be closely monitored in an intensive care unit, given the risk of rapid decompensation, with physicians able to rapidly respond and intubate. We would encourage that other clinicians who are considering this type of management take the time to document cases in an effort to show that, in all likelihood, a proportion of patients can be altogether managed with non-invasive ventilation. Others who fail NIV may still benefit from having potentially a shorter course of mechanical ventilation. This is important data especially in a resource-limited setting as a shorter ventilator course means more ventilators would be available to other patients.

It is important to recognize that this disease is new and that we must find strategies to determine the best course of action as rapidly as possible. The pathophysiology remains unclear, and once intubated, the optimal ventilatory strategy is equally undetermined, with some authors favoring airway pressure release ventilation (APRV) while others attempt various modes. It is key to keep a keen eye on almost daily developments, understanding that guidelines on COVID-19 are, in these early phases, highly fluid constructs. As clinicians we should try to adhere to the principle of individualizing ventilatory therapy to the patient’s physiology while avoiding iatrogenic injury.

**Figure 1 : Cabrini Respiratory Strain Score (CAB-RSS)**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate</td>
<td></td>
</tr>
<tr>
<td>&lt; 20</td>
<td>0</td>
</tr>
<tr>
<td>20-30</td>
<td>1</td>
</tr>
<tr>
<td>31-40</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 40</td>
<td>4</td>
</tr>
<tr>
<td>Retraction/accessory muscle use</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Mild</td>
<td>1</td>
</tr>
<tr>
<td>Significant</td>
<td>2</td>
</tr>
<tr>
<td>Respiratory amplitude</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>0</td>
</tr>
<tr>
<td>Increased</td>
<td>1</td>
</tr>
<tr>
<td>Significantly increased</td>
<td>2</td>
</tr>
<tr>
<td>Overall state</td>
<td></td>
</tr>
<tr>
<td>Relaxed</td>
<td>0</td>
</tr>
<tr>
<td>Uncomfortable</td>
<td>1</td>
</tr>
<tr>
<td>Very anxious</td>
<td>2</td>
</tr>
</tbody>
</table>

TOTAL

*CAB-RSS - 0-2 low, 3-5 moderate, 6-10 high*
Figure 2: Decisional algorithm being used at Maimonides Medical Center

COVID+ by CT scan or symptomology

Increase O2 for SpO2 > 90%

Physician does not believe pt will tolerate non-invasive

Hypoxemia SpO2 < 90% on nonbreather

Intubation – go to vent and sedation protocol

**HFNC preferred non-invasive strategy**

**HFNC Management**
- FiO2 should always be sent at 100%.
- Initial LPM should be set at 20LPM.
- LPM should be titrated up with a maximum of 50LPM as needed in order to achieve an SpO2 >88%.

NPPV

NPPV Management
- **Should be performed in negative pressure room. If this is not possible, should be performed behind closed curtains with HEPA filter bedside.**
  - FiO2 should always be set at 100%
  - EPAP should be set at 5.

NRB w/ 5L NC

When HFNC and CPAP are not available for patient on a nonbreather w/ SpO2 < 90%, a nasal cannula should be applied under the nonbreather at 5L/min.

Requiring 90% - 100% to achieve sat 88-90%

ALL PATIENTS ON NPPV

On NRB w/ 5L NC w/ SpO2 < 85

PRIORITY 1 – Patient’s at HIGH risk for requiring intubation

Proning should be encouraged in all patients and may be considered in PRIORITY 1 patients however Physician should be aware that proning appears to induce a non-sustainable improvement in SpO2. Proning should therefore be seen as “buying time” rather than “recruiting.” Regardless of SpO2 improvement, PRIORITY status should not change based on SpO2 improvement during proning.

Consider intubation:
- Hypoxemic patient on maximal non-invasive oxygen with SpO2 < 85 – 88% w/ distress. (Presenting typically in the form of anxiety and tachypnea).
- Hypoxemic patient on maximal non-invasive oxygen with sustained SpO2<80%

Post intubation Vent Settings
- FiO2 100%
- TV 6- 8 cc/kg, RR <20
- PEEP 5 - 10
- Target Sat > 80 % (higher the better)

If SpO2 < 80%, carefully consider the clinical context and determine as best we can whether increased PEEP (vent lung injury) or low SpO2 is more injurious to the patient

Vitals should look the same after intubation as before. If hypotensive, consider decreasing PEEP

Post-intubation sedation
- Sedatives/Pain drip
- Paralytic drip x 24hrs
- Rocuronium 100mg 30 min – 1hr after intubation

IF POSSIBLE

PRONE

Patient should ideally have the following placed:
- NG tube
- Central line (L. JI preferred site)
- Arterial line
- Foley
References


Matos, R, Lt Col, Chung, K, Col, Department of Defence COVID-19 Practice Management Guide.


