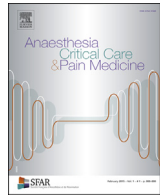




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Letter to the Editor

Implementation of a non-invasive oxygenation support strategy during the COVID-19 pandemic in an ephemeral Respiratory Intermediate Care Unit



During the COVID-19 outbreak, the French health care system had to face a huge influx of patients presenting respiratory failure while admission capacities to Intensive Care Units (ICU) were limited. To compensate for the shortage of ventilators and ICU beds, an ephemeral Respiratory Intermediate Care Unit (RICU) was created to implement Non-invasive oxygenation (NIO). We report here our experience involving a series of 17 patients.

The RICU was activated from April 8 to May 3, 2020 in our academic hospital. Patients with SARS-CoV-2 pneumonia complicated by refractory hypoxemia were eligible for RICU transfer to implement NIO, if no improvement was obtained after an increasing oxygen and medication therapy on conventional ward. NIO used was high-flow nasal cannula (HFNC) \pm Boussignac's continuous positive airway pressure (CPAP). The diagnosis of SARS-CoV-2 pneumonia relied on a positive Polymerase Chain Reaction, a chest-computed tomography (CT) scan with contrast, and suggestive symptoms.

Patients admitted to the RICU were managed by an anaesthesia medical team with a paediatric paramedical emergency team, counselled by an internal medicine and an intensivist physician. The 8-bed gynaecological surgery ward was selected for both its ICU proximity and single rooms. It was converted into a RICU with the HFNC equipment supplied by the paediatric emergency department plus standard cardiomonitors provided by the anaesthesia department. To compensate for the lack of centralised monitoring alarms, baby phones were positioned to connect the room monitors to the nursing station.

When arriving in the RICU, patients were given HFNC to reach oxygen saturation above 90% (Fig. 1). If there was a good response to HFNC, ventilatory support was continued for one hour and then the patient was encouraged to adopt the prone position (PP) for 30 minutes at least. Conversely, if no adequate response to HFNC was obtained within the first 10 minutes, patients were prompted to switch to the PP at once. In case of failure of HFNC and PP, patients were assisted by Boussignac's CPAP, alternating with HFNC. In case of successive treatment failures, ICU transfer was considered to implement orotracheal intubation. Nurses encouraged patients, according to their tolerance, to move to PP, lateral decubitus, or to sit up. Results were reported as median with interquartiles [25%–75%].

The RICU managed 17 patients (12 men). Median age was 65 years old [51–79], median BMI was 28 kg/m² [24–32]; 7 (41%) patients had hypertension, 6 (35%) were diabetic, 2 (12%) had ongoing treatment for haemopathy. Upon arrival, the median PaO₂/FiO₂ ratio was 124 [105–140] and 15 patients (88%) had an

entry PaO₂/FiO₂ ratio < 200. Amount of pulmonary ground-glass opacification on CT-scan was 25–50% in 6 cases, 50–75% in 8 cases and > 75% in the 3 most severe cases. During the study, 12 patients (71%) accepted to be positioned, 15 patients (88%) were given HFNC and 9 patients (53%) were given Boussignac's CPAP. Five patients had a “non-resuscitative” status (i.e., no intubation order) in case of deterioration. Two patients had thromboembolic complications: one ischemic stroke and one bilateral pulmonary embolism. The mean length of stay was 7 days [4–8]. Three patients (18%) died, 12 patients (70%) were discharged and 2 patients (12%) were transferred to a rehabilitation ward. Four patients (24%) required a transfer to the ICU for orotracheal intubation: one intubation for a caesarean section under general anaesthesia, two intubations for respiratory impairment (one of which resulted in death) and one intubation for neurological impairment (total median cerebral artery stroke), which also resulted in death. The third death occurred as a result of a treatment limitation decision.

To our knowledge, no articles have described the creation of a RICU by a mixed team outside the walls of an ICU to manage patients with SARS-CoV-2 pneumonia. A protocol was implemented for symptomatic management based on NIO support techniques and positioning [1,2]. In contrast to what is described in ICU, the patients had a mean length of stay of only 7 days and also a likely lower mortality rate (18%). A very good tolerance of HFNC was observed.

The monitoring of patients with respiratory failure outside of ICU areas required the optimisation of routine equipment. Each patient was monitored, and baby phones located in their room allowed centralised supervision from the nursing station. This innovative and cost-efficient technique allowed converting the standard ward into an ephemeral RICU to better handle the peak of the COVID-19 crisis.

The use of NIO support techniques remains controversial as they expose healthcare workers to an increased risk of SARS-CoV-2 contamination without a clear benefit demonstrated yet [2]. In our RICU, caregivers wore personal protective equipment, an FFP2 mask and a visor, and only one nurse became positive for SARS-CoV-2 (among 18 caregivers). The doors of the rooms were closed at all times, with one window in each room left half-open. Let aside the paramedical team not being accustomed to handling such patients, no major difficulties were encountered.

The implementation of the RICU enabled the intensification of treatment for 5 patients declined for ICU. To date, 4 of those patients are in rehabilitation wards whereas only one died. This very preliminary data suggests that there might be a real benefit to set up a RICU “outside the walls”.

Patients admitted to the RICU were able to benefit from respiratory assistance techniques not available in conventional

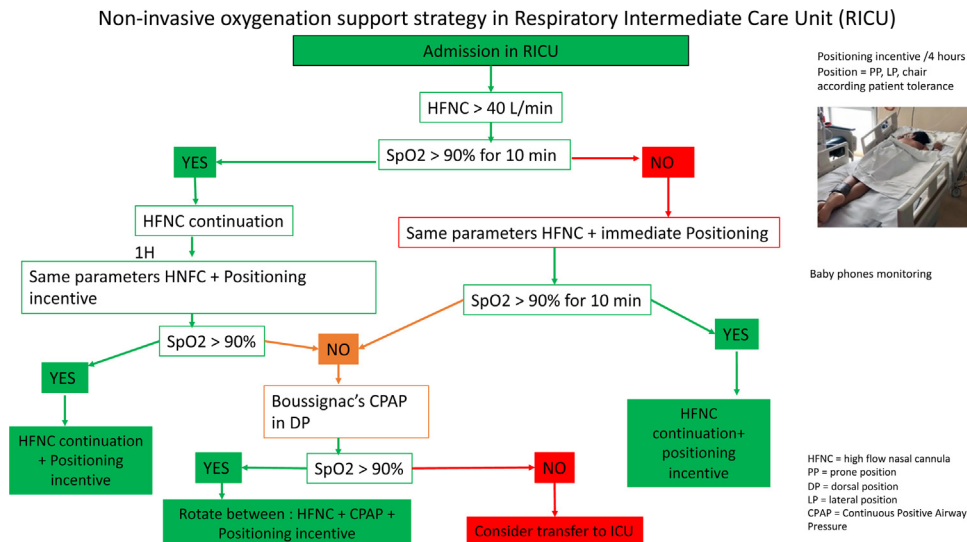


Fig. 1. Non-invasive oxygenation support strategy in Respiratory Intermediate Care Unit (RICU).

medical wards. A main advantage is that these techniques can be used without ventilators and outside the walls of the ICU. It is important to stress that the medical and paramedical team in charge of the RICU was, apart from the COVID-19 pandemic, already familiar with non-invasive respiratory assistance techniques, and had experience in crisis management.

In conclusion, this series of 17 patients describes the implementation of a RICU and the use of NIO support techniques outside the ICU walls during the COVID-19 outbreak. The results suggest that the use of NIO support techniques could be beneficial in the initial management of acute respiratory distress syndrome associated with SARS-CoV-2, particularly in times of ICU shortage.

Disclosure of interest

The authors declare that they have no competing interest.

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