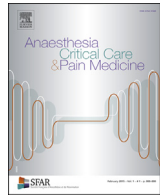




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Letter to the editor

Urgent development of an anaesthesiology-based intensive care unit for critical COVID-19 infected patients



The global COVID-19 pandemic requires anaesthesiologists to adapt themselves to this unprecedented situation [1]. Beyond this first adaptation, the major influx of patients imposes to rapidly manage critical patients outside the usual intensive care structures, in addition to required care of surgical patients.

In France, the first cases are diagnosed on January 24th, 2020. On March 14th, all unessential institutions are shut down. Since March 17th at noon, the population is confined at home with strict rules. On April 1st, 6,017 patients are hospitalised in intensive care units while national maximal admissions are estimated to be 5,000 patients. We shortly describe the use of professional skills and existing structures in a French anaesthesia department to deal with this COVID-19 crisis.

French anaesthesiologists have 5 years of training with mixed skills in anaesthesia (3 years) and resuscitation (2 years). Our 390 beds University Hospital is part of the Assistance Publique–Hôpitaux de Paris, the first hospitals group in Ile-de-France, a region that is severely affected by the COVID-19 pandemic. Our structures include 10 operating theatres and 14 beds of recovery room (RR), performing an average of 10,000 scheduled or urgent surgical interventions a year in trauma, visceral and vascular surgeries. The medical team includes 14 anaesthesia consultants

and 8 residents; the paramedic team includes 25 nurse anaesthetists and 13 RR nurses. The intensive care unit (ICU), managed by intensivists, has a capacity of 12 resuscitation beds and 14 continuous care beds.

A regulatory team headed by an anaesthesiologist with the help of surgeons, usually meeting once a week, decides a new organisation evaluating rapidly both management of critical negative and positive COVID-19 patients and surgical activity; chronological details are listed in Table 1. Surgeons were committed to find all alternative solutions to transfer scheduled surgeries outside our hospital (dermatological and visceral cancer surgery, semi-urgent vascular). Anaesthesiologists lead with surgeons the development of these new organisations. On March 26th, the RR and 6 operating theatres nearby were organised to create with the anaesthesia and operating theatre staff (anaesthesiologists, nurse anaesthetists as nurses, operating theatre nurses as nursing assistants) an ICU receiving patients ventilated with anaesthesia [Perseus® (Dräger)] and resuscitation (Mindray® S300) ventilators.

The manpower includes 40 anaesthetist nurses and RR nurses and 10 anaesthesiologists (2 anaesthesiologists present 24 hours a day). All these professionals work in 12-hour shifts, 24 hours a day, 7 days a week.

This radical reorganisation within 2 weeks of an operating theatre and a RR relies on the professional, structural and material

Table 1

Chronological details on management of critical negative and positive COVID-19 patients and surgical activity.

Date	Situation in anaesthesia	Operating theatre	Intensive care unit (ICU)	Comments
24/01/2020	Fourteen beds in recovery room (RR)	Twelve operating theatres	Twelve resuscitation beds and 14 continuous care beds	Two independent operating theatres separated with respectively 6 (vascular, visceral, plastic, and ophthalmologic) and 4 operating theatres (orthopedic, dermatological). Endoscopic activity on two rooms on a separated level
17/03/2020	Fourteen beds in recovery room	Reduction of surgical activity on 4 operating theatres (emergency and oncological surgery)	Eighteen resuscitation beds and 8 continuous care beds	Transfer to the ICU of 3 anaesthesiologists, 4 RR nurses and 6 ventilators; partial transfer of nurse anesthetist in the RR
20/03/2020	Management of COVID-19 negative patients in RR shifted in 10 continuous care beds	Surgery maintained in two isolated operating theatres combining negative and positive COVID-19 patients. Creation of a dedicated RR of two beds in a room previously used for regional anaesthesia	Twenty two resuscitation beds and 4 continuous care beds	Endoscopy activity was restricted to haemorrhagic emergencies and cancer diagnosis
22/03/2020	Management of positive COVID-19 patients in RR shifted in 10 continuous care beds	Surgery maintained in the same organisation	Twenty six resuscitation beds including 3 reserved for negative COVID-19 patients	
24/03/2020	Management of COVID-19 positive patients in RR and 6 operating theatres to 4 continuous care beds and 6 resuscitation beds (HFO and NIPPV)	Surgery maintained in the same organisation	Same organisation	

COVID-19: Coronavirus Disease 2019; HFO: High-flow oxygenation; ICU: Intensive Care Unit; NIPPV: Non-invasive positive-pressure ventilation; RR: Recovery room.

resources of an anaesthesia department to create an ICU with 10 beds dedicated to critical COVID-19 infected patients while maintaining the management of selected scheduled and emergency surgery. Problems to overcome are numerous, covering both patient care, professional protection and urgency of management; here, we only discuss three of them:

1. the isolation of COVID or non-COVID patients by restructuring the circulation areas, using the advantages of an operating theatre (clean and contaminated circuit, closed operating theatre under negative pressure) and identifying two separate care teams selected both on professional skills and risk of viral exposition (age over 60 years old and/or comorbidities). All successive decisions were validated with hospital hygiene team;
2. making the best of existing structures for patient care and professional protection: the RR allows easy centralised monitoring of patients but exposes to aerosolised virus, especially with high oxygen flow and requires enhanced protection for nursing professionals (FFP2 mask changed every 8 hours, dressing and take-off procedures, gown) but also an adaptation of the RR [1,2]. Negative pressure was installed on day 2 after admission of first critical patients and RR was equipped with 3 air extractors Plasmair© (Dalkia) which allow treating 7500 m³ of air per hour (i.e. 10 volumes per hour for a 750 m³ RR) [3];
3. the medical and paramedical anaesthesia teams had to upgrade rapidly their skills to be able to use high and very high oxygen flow therapy, ventilation of the patient with severe adult respiratory distress syndrome and to be kept informed of additional therapeutic solutions specific to these patients in collaboration with intensivists. The target physician/patient ratio was set to 1/5 (2 anaesthesiologist 24 hours a day) and 1/2 for nurses in the acute phase and 1/2.5 in the steady phase.

After 10 days of functioning as ICU for critical COVID-19 infected patients, 20 patients were admitted with 7 patients with mechanical ventilation. Patients start to be discharged from ICU and hospital (respectively 12 and 3) and 1 patient is deceased.

We report our experience with mobilisation of an anaesthesia team and use of existing structures for urgent creation of an ICU managing critical COVID-19 patients in a pandemic which exceeds the usual resources of resuscitation structures.

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Disclosure of interest

The authors declare that they have no competing interest.

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