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Patients with Coronavirus 2019 (COVID-19) and Surgery: Guidelines and Checklist Proposal

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The management of patients with novel coronavirus 2019 (COVID-19) represents a new challenge for medical and surgical teams. Each operating room in the world should be prepared thoughtfully, and the development of a protocol and patient route seems mandatory. An adequate degree of protection must be used. We propose recommendations to help different professionals in the establishment of protocols for the management of patients with COVID-19. We also offer a checklist that could be used in the operating room.

INTRODUCTION

In December 2019, pneumonia of unknown causes was described in the Wuhan province of China.^{1,2} Patients were identified, and a new coronavirus 2019 (COVID-19) was described quickly (2019-nCoV).¹ Many cases have been described, and the spread has occurred quickly in China but also internationally, with the virus reaching Europe.²⁻⁵ The disease seems to spread with human-to-human transmission,⁶ implying professionals can be contaminated during the care of some patients.^{7,8} As of February 11, 2020, 3019 Chinese health care workers were infected with COVID-19, and 6 died from it.⁹ In recent decades, we have had examples of epidemic coronaviruses. During the severe acute respiratory syndrome and Middle East respiratory syndrome epidemics, infected patients had to undergo emergency surgery.¹⁰⁻¹³ Cases of transmission to health professionals while in operating theaters also have been described in previous epidemics and should be prevented.^{10,14}

The situation is rapidly evolving, and we have observed an alarming increase in cases around the world. The European

situation is worrying: at the beginning of March 2020, 15 million people were placed in quarantine in Italy and thereafter the whole country, and a significant increase in the number of cases has been observed in other countries, especially in France, which is now in quarantine (Figure 1). The situation subsequently spread worryingly to North America. Surgical emergencies may be multiple, and some infected patients will need surgical care. Facing this increase of cases, in the same way as China,^{8,15,16} we will be confronted with patients needing emergency surgery. It is necessary to anticipate and prepare to take care of patients with COVID-19 in the operating room (OR).

The objective of this study is to establish recommendations for the management of a patient with COVID-19 coronavirus in the OR. It is essential to be prepared and to have received good information to deal with the management of these cases to reduce the risk of contamination.

BEFORE SURGERY

The degree of emergency must be assessed, and it is preferable to postpone the surgical procedure if it is not urgently needed. It is necessary to use protective material in the right situation and avoid shortages. We recommend seeking the advice of the hospital's infectious disease department to consider surgery in a patient with COVID-19. In our centers, scheduled patients are hospitalized 48 hours before surgery. If the patient is asymptomatic, we perform a polymerase chain reaction (PCR) screening test on the patient's arrival. If the patient is symptomatic, we perform 2 screening tests 24 hours apart, combined with a computed tomography scan of the chest. The same procedure is applied for patients arriving in emergency adjusted to the required delay of surgery. Antibodies are not routine tests at this time. As soon as they will be available and reliable, they probably should be

Key words

- Checklist
- COVID-19
- Health care workers
- Operating room
- Surgery

Abbreviations and Acronyms

COVID-19: Coronavirus 2019

OR: Operating room

PCR: Polymerase chain reaction

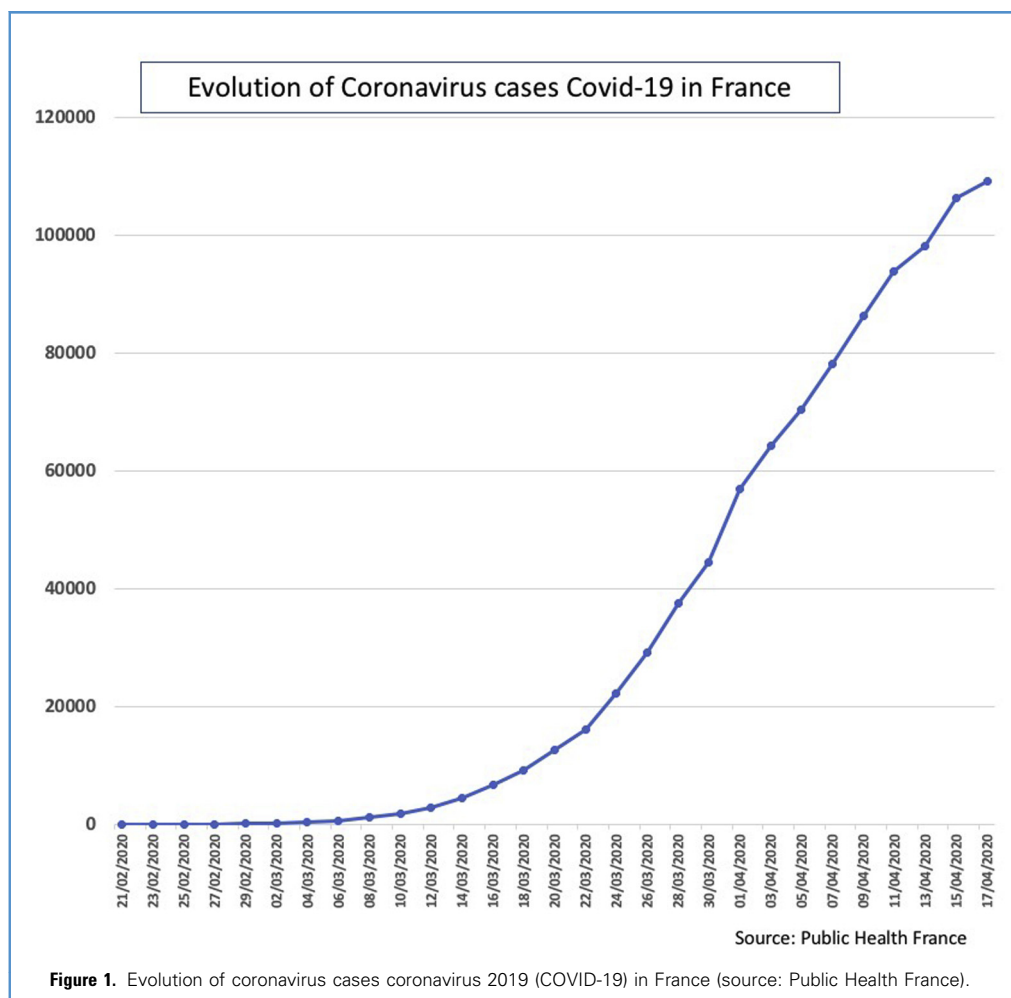
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Citation: World Neurosurg. (2020) 139:e769-e773.
<https://doi.org/10.1016/j.wneu.2020.04.155>

Journal homepage: www.journals.elsevier.com/world-neurosurgery

Available online: www.sciencedirect.com

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added to the screening strategy and coupled with the PCR technique to optimize preoperative screening.

Several situations can be encountered:

- 1) If the patient is suspected or confirmed to have coronavirus COVID-19, it is necessary to take the utmost precaution for the management of this patient. A specific protocol should be followed in the OR. It is obvious that a PCR test must be performed to obtain a necessary diagnosis in these patients.¹⁷
- 2) If the patient is cured (resolution of clinical symptoms), we currently advise taking the same precautions in the OR as for a confirmed patient. The precautionary principle should be followed, given the absence of follow-up on this disease (risk of asymptomatic case, risk of second contamination of the patient, risk of carrying the virus longer).
- 3) If a coronavirus diagnosis is made after surgery, it is necessary to identify all the surgical staff who have been in contact with the patient and consider quarantining them after advice from the infectious disease department.

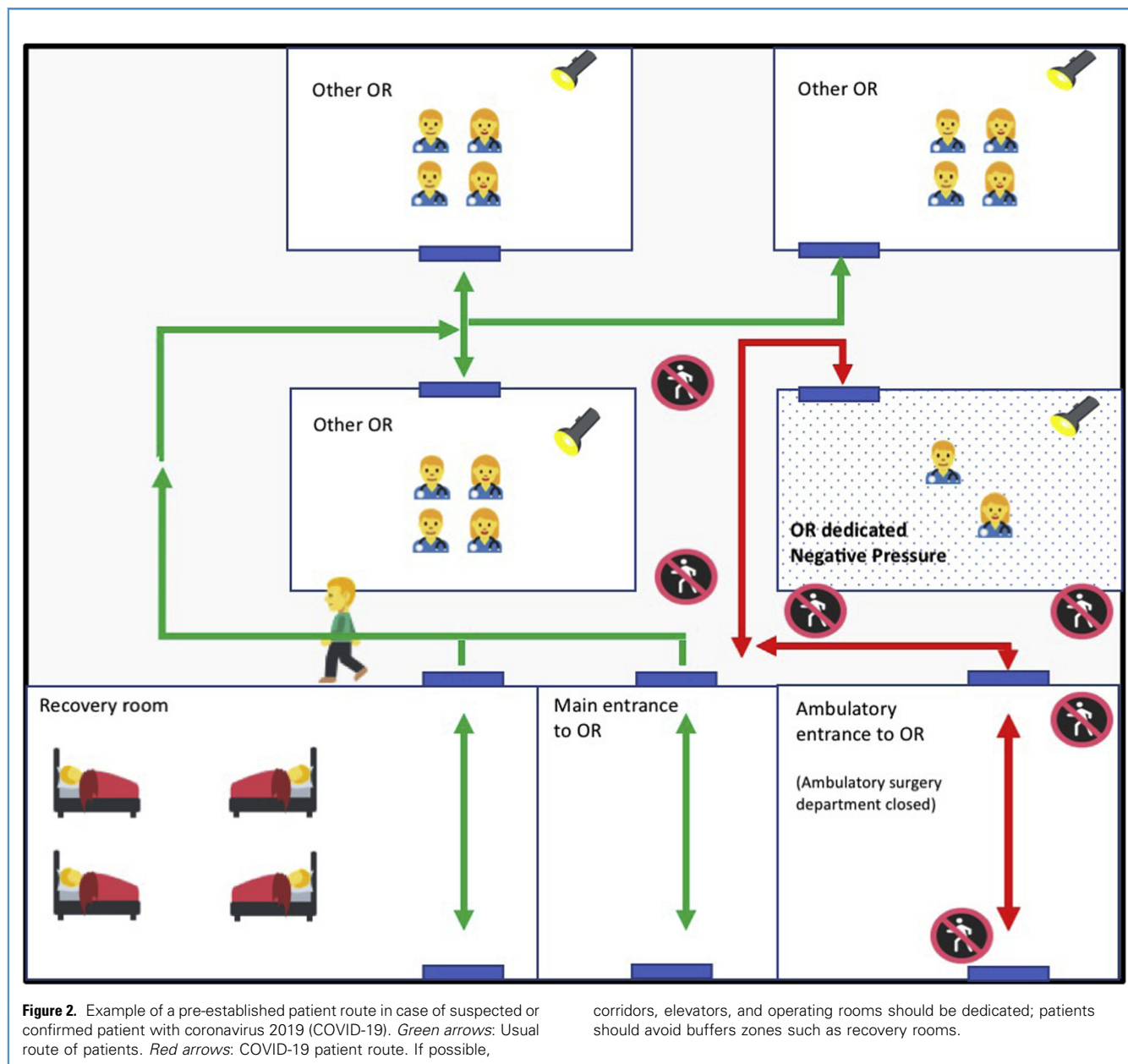
The surgical staff that will take care of this type of patient must have been trained in this risk management and aware of the protocol established in the institution. In this protocol, the patient's journey must be planned in advance by the OR referents.

It is necessary to delimit a precise route, to avoid as much as possible the patient's contact with other unprotected personnel as well as other patients, by the use of dedicated elevators and corridors (**Figure 2**). In this course, the patient's route should avoid buffer zones such as the recovery room or the induction room. An OR must be dedicated for these patients.

The patient must wear a surgical mask when transferring to the OR. Personnel must use a dedicated stretcher with disposable protections that will be well disinfected after use. Moreover, caregivers should take their temperature before surgery.

DURING SURGERY

ORs are generally under positive pressure. In these cases, an OR must be dedicated and should be switched to negative pressure.^{10-13,15} We must therefore anticipate this situation and plan to



modify the environment in these rooms. In fact, the passage of air from the room to the outside must be limited as much as possible.¹⁸ This procedure should be planned upstream with the hospital engineers, to obtain a negative room pressure (-5 Pa).¹⁰ We recommend for each surgical team to approach their engineering team to study the feasibility and prepare their structure to anticipate such a situation.

A clear display must be set up outside the room to inform other health care workers. The number of people in the OR must be reduced to the strict minimum. It is necessary to establish the traceability of any health care worker present during the surgery. All the equipment necessary for the surgery procedure must be

prepared and present in the OR. It is necessary to avoid entering and leaving the room as much as possible during surgery. Disposable equipment is preferred.

All health staff in the OR area should use the following protections¹¹: head cover, shoe cover, surgical gowns, surgical goggles, 2 pairs of surgical gloves, and respiratory masks (FFP2 [i.e., filtering facepiece particles 2]). If the material is available, it is possible to use a system-powered air-purifying respirator.¹⁰ The staff must be trained to wear the equipment in good conditions, in particular the FFP2 respiratory masks.

The anesthesiologist must wear the same protective equipment when faced with a very high risk of contamination during

Management of Suspicion of Covid-19 in Operating Room (OR): Checklist

| Before OR | In OR | After OR |
|---|--|---|
| <ul style="list-style-type: none"> Confirmed Covid-19 case (PCR)? <input type="checkbox"/> YES <input type="checkbox"/> NO Necessary surgery? <input type="checkbox"/> YES <input type="checkbox"/> NO Infectious disease department is informed? <input type="checkbox"/> YES <input type="checkbox"/> NO Itinerary of the patient is planned? <input type="checkbox"/> YES <input type="checkbox"/> NO Surgical team, anesthesiologist, nurses are informed and ready to take care of the patient? <input type="checkbox"/> YES <input type="checkbox"/> NO Patient wears a surgical mask? <input type="checkbox"/> YES <input type="checkbox"/> NO | <ul style="list-style-type: none"> OR is under negative pressure? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NOT APPLICABLE Health care workers in the OR are identified and listed? <input type="checkbox"/> YES <input type="checkbox"/> NO All surgical equipment is in OR? <input type="checkbox"/> YES <input type="checkbox"/> NO Health care workers follow the personal protection equipment protocol? <input type="checkbox"/> YES <input type="checkbox"/> NO Patient wears a surgical mask after extubation? <input type="checkbox"/> YES <input type="checkbox"/> NO | <ul style="list-style-type: none"> Any incident during the procedure? <input type="checkbox"/> YES <input type="checkbox"/> NO Elimination and destruction of infectious medical waste? <input type="checkbox"/> YES <input type="checkbox"/> NO OR is decontaminated strictly? <input type="checkbox"/> YES <input type="checkbox"/> NO Itinerary of the patient is planned? <input type="checkbox"/> YES <input type="checkbox"/> NO Surgical department, nurses are informed and ready to take care of the patient? <input type="checkbox"/> YES <input type="checkbox"/> NO Patient wears a surgical mask? <input type="checkbox"/> YES <input type="checkbox"/> NO |

Figure 3. Management of suspicion of coronavirus 2019 (COVID-19) in the operating room: safety checklist of mandatory points to limit the surgical

staff exposure and the spread of the disease.

intubation and extubation procedures.¹¹ The patient must benefit from an adequate sedation, preferably associated with a curarization to avoid agitation and episodes of cough. After the intubation, a wet compress can be added to the patient's nose to avoid spreading the virus in the air in the event of a cough.¹⁵ It is also important limiting disconnection of the circuit when positioning the patient.

The surgeon must take the utmost precaution during the surgical procedure to reduce the risk of accidents involving exposure to body fluids and tissues. In the event of an exposure accident, the establishment's standard protocols should be followed to deal with a blood exposure accident. The infectious disease department should immediately be contacted and a test could be considered.¹⁹

The patient should be awakened in the OR. The patient should wear a surgical mask as soon as he or she is awake. Once again, the recovery room should be avoided and the patient should be brought back to his or her room directly if possible.¹⁰ A 30-minute ventilation of the room at the end of surgery should be achieved.^{12,20}

AFTER SURGERY

At each transfer, the patient should wear a surgical mask when leaving the OR. A strict disinfection of the OR should be achieved. The OR should be closed for 2 hours and then switched to the laminar flow again. We recommend the elimination and destruction of body fluids and tissues using bags that allow double closure, and waste and liquids to be destroyed with infectious medical waste. For bacteriological or anatomopathologic samples,

also use a hermetically sealed bag with a double closure and call the center to recover and inform about the situation.

The health care staff must undress at the end of the procedure, helped by another caregiver because of the risk of contamination during this procedure. Strict decontamination of the OR is required. The infectious disease department of the hospital or hygiene department may be requested to perform tests in the OR to check the presence of viruses. The reusable material used must be carefully cleaned with the usual decontaminating detergent products.

Concerning patients, during postoperative time, they present with a high risk of pneumonia, fevers, infections, with an increase in the level of white blood cells, which can make diagnosis of postoperative infection difficult. In addition to regular temperature monitoring for patients, the surgical staff in contact also must monitor their temperature twice a day.¹⁵ Postoperative temperature monitoring is necessary for patients not at risk who are being treated for another pathology. Indeed, we can cite the situation in a Wuhan hospital with the postoperative appearance of several cases of COVID-19 coronavirus, both in asymptomatic patients.¹⁶

We recommend the daily washing of hands for staff, patients, and families of patients. Family visits should be limited to the strict minimum. However, in the current situation in our centers, family visits are prohibited. In the case of visits, the patient's family also should wear a surgical mask when visiting the patient, and staff should pay attention to contact with families. Indeed, they can also carry COVID-19, so it is necessary to apply the protection procedures for suspicious cases.

CONCLUSIONS

The management of patients with COVID-19 represents a new challenge for medical and surgical teams not accustomed to a large flow of patients. It is important, as of now, that each establishment and structure became aware of the development and prepare for an adequate crisis management.

It is obvious that these recommendations are the result of thinking and research between health care professionals working in the OR (Figure 3). These recommendations will be confirmed by additional studies with more perspectives on the situation concerning this new virus.

Patient supervision in the OR must be considered and organized previously to guarantee the safety of the surgical staff and to limit the spread of the disease. Each OR in the world must prepare

with thinking by developing a protocol and patient route. The surgical staff must be aware of the procedure for the care of patients with COVID-19, well trained in the establishment, and prepared to deal with it, including during emergencies.

CRedit AUTHORSHIP CONTRIBUTION STATEMENT

Michael Grelat: Writing - original draft, Conceptualization. **Benjamin Pommier:** Writing - original draft, Writing - review & editing. **Sylvain Portet:** Writing - review & editing. **Aymeric Amelot:** Writing - review & editing. **Cédric Barrey:** Conceptualization, Writing - review & editing. **Henri-Arthur Leroy:** Conceptualization, Writing - review & editing. **Rachid Madkouri:** Writing - review & editing, Supervision.

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Conflict of interest statement: The authors declare that the article content was composed in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received 20 March 2020; accepted 20 April 2020

Citation: *World Neurosurg.* (2020) 139:e769-e773. <https://doi.org/10.1016/j.wneu.2020.04.155>

Journal homepage: www.journals.elsevier.com/world-neurosurgery

Available online: www.sciencedirect.com

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