

**Safety and security in the operating room in the time of Covid-19****Vincenzo D. Palumbo<sup>1</sup>, Marianna Messina<sup>2</sup>**<sup>1</sup>Euro-Mediterranean Institute of Science and Technology, Palermo, Italy<sup>2</sup>Department of Biomedicine, Neurosciences and Advanced Diagnostics, University of Palermo, Italy**CORRESPONDENCE:** Dr. Vincenzo D. Palumbo  
e-mail: vincenzopalumbo@iemest.euReceived: January 31<sup>st</sup>, 2021Revised: February 5<sup>th</sup>, 2021Accepted: February 8<sup>th</sup>, 2021**Abstract**

In the last few months, approximately 28,000,000 surgeries have been postponed, in order to allow healthcare personnel to face the most critical phase of the Covid-19 pandemic. Over 70 male patients are more prone to develop complications after major surgery procedures (neurosurgery, thoracic and abdominal surgery, emergency surgery, followed by all oncological procedures). To date, there is a debate about the possibility to prioritize surgery (with the risks that could follow) or recovery from Covid-19. In the time of Covid-19 pandemic, it is appropriate to consider each patient as a possible infected and take all the necessary precautionary measures, starting from the preoperative screening up to the use of all personal protective equipment. Modification of the checklists and implementation of practical activities aimed to reduce contacts can be considered as an easily attainable and positive step in the direction of improving safety for the operating room healthcare workers caring for patients and patients undergoing surgery.

**Keywords**

Checklist, pandemic; personal protection equipment; surgery

**Introduction**

In the last few months, approximately 28,000,000 surgeries have been postponed, in order to allow healthcare personnel to face the most critical phase of the Covid-19 pandemic (1). This choice was necessary to maximize the possibility of treating the most serious infected patients, but, unfortunately, there was also who was forced to enter the operating room, even if struggling with the new infectious disease. Certainly, such a choice could jeopardize the health of these people: a pulmonary function already impaired by SARS-CoV-2 infection, could be worsened by pulmonary complications of the postoperative period. A study published in July in *The Lancet* analysed risks and benefits deriving from the execution of a surgical procedure during a pandemic (2). The 29 authors of the research evaluated the course of 1128 patients operated on between January 1 and March 31 in 235 hospitals in 24 countries (mainly Italy, Spain, the United Kingdom and the United States). Considered procedures varied from general surgery to oncological ones, from gynaecological ones (including caesarean sections) to urological ones. The list also included cardiac surgery,

orthopaedic surgery, neurosurgery, vascular and hepatobiliary surgery. The analysis was focused on evaluating the results thirty days after surgery, starting from mortality. The results confirmed it as the worst-case scenario if patients struggling with Covid-19 end up in the operating room. The survey showed that almost 1 in 5 patients (23.8%) died within one month of surgery and over 1 in 2 (51.2%) suffered from pulmonary complications. In this category, 30-day mortality was 38.0% (219 of 577), accounting for 81.7% (219 of 268) of all deaths. These data allowed to trace the identikit of the patients most at risk in case of surgery: over 70 and male, data in line with the characteristics of the patients who died with Covid-19 in the last four months. The analysis also made it possible to reveal the procedures most exposed to complications. At the top of the list, those of major surgery (neurosurgery, thoracic and abdominal surgery) and emergency surgery, followed by all oncological procedures. More generally, acute respiratory distress syndrome, pneumonia, and the need for respiratory support occurred more frequently in those with co-morbidities. Patients waiting for surgery, in addition to running the risk of being infected into the hospital, if not already positive for SARS-CoV-2, are exposed to increased inflammatory response and blood clotting. This condition could lead to the so-called “perfect storm”, nullifying the outcome of an intervention. This would explain the detection of mortality rates and, more generally, of pulmonary complications, higher than those associated with patients who, before the pandemic, we considered to be at greater risk. However, the study has two limitations: the evaluation of very different surgical procedures and the lack of a control group. Nevertheless, undoubtedly, people

who undergo surgery during the pandemic could develop several additional risks, regardless of whether they have already contracted the infectious disease (Covid-19), or not (more exposed to the risk of contagion). Hence the dilemma: in this situation, is it appropriate to prioritize surgery (with the risks that could follow) or recovery from Covid-19? There is no answer that is valid for everyone. According to the study authors, when possible, it is best to postpone an operation (even those considered at low-risk), or prefer pharmacological treatments (instead of or while waiting for the intervention). A solution to be preferred especially when faced with a patient with various diseases. Unfortunately, this is not feasible for all patients. Postpone surgery for oncological patients waiting for tumour removal, for those who are victims of major trauma, women about to undergo a caesarean section, those who are about to have an organ transplant and for all those which are called to undergo interventional cardiology procedures (for the treatment of heart attacks) and vascular neurosurgery (for patients with a cerebral stroke), could be even fatal. In these cases, the benefit deriving from surgery is however considered to prevail. A reduction in the use of elective surgery (one-fifth of the cases considered), during a pandemic, is also important to avoid contagion among doctors. It is appropriate to consider each patient as a possible infected and take all the necessary precautionary measures, starting from the preoperative screening (possible only with the swab: when possible, it is better to wait for the outcome before bringing a patient to the operating table) up to the use of all personal protective equipment (mask, gloves, caps, visor, footwear). In case of acute non-deferrable surgical care, the staff taking responsibility

for positive or suspected infected patients must be limited to those who need to be primarily involved in each operation (3).

### **General recommendations for the management in the peri-operative phase**

In order to plan the gradual reintroduction of elective surgical procedures, knowledge of local hospital capacities (bed availability, diagnostic tests, operating theatres, doctors' offices), limitations (workforce, supply chain) and pandemic activity (including prediction of subsequent waves) are mandatory.

The purpose of the peri-operative management is to subject the patient and healthcare staff to elective surgery with relative safety, avoiding possible risks of contagion within the structure (4,5).

As a guideline, the decision to proceed with surgery should take into account the patient and disease characteristics, the expected benefits and potential harms of surgery, as well as the institutional resources available. This decision must also consider the potential risk of exposure to contagion from Covid-19 in relation to the severity of the pandemic at the regional and local level, resuming elective surgeries only after a decrease of infection cases, recorded at least in the previous 14 days.

Surgery department personnel must take into account the following recommendations (6):

- avoid importing asymptomatic cases;
- maintain a persistent COVID-free clinical path;
- keep patients, staff, health facilities safe;
- follow the legal restrictions and regulations of the local health authority.

### **Characteristics of the structure**

Ideally, elective surgery should be performed in an isolated and COVID-free health facility

or in a specific COVID-free building of a hospital, separate from it and specifically dedicated to this activity.

For emergency surgery in indeterminate or COVID-19 positive patients, the use of dedicated operating rooms should be recommended. In such cases, operating rooms with negative pressure and with separate access through specific routes would be ideal for minimizing the infectious risk.

The correct organization of operating theatres with personal protective equipment (PPE) and adequate protective measures for patients and room staff are recommended (7).

### **Basic requirements for healthcare professionals**

Ideally and according to the development of the pandemic, all healthcare workers should undergo COVID RT-PCR swab testing (+ possible immune / serological test) and should be regularly monitored. The medical staff assigned to the operating room includes:

1. personnel assigned to transport the patient from/to the operating room;
2. staff present within the operating block.

It is recommended that operating room personnel wear:

- surgical mask,
- level 1 disposable gown,
- gloves,
- eye protection devices
- surgical cap.

Frequent hand sanitization is recommended. The staff should limit contact with the patient according to distance (less than one meter) and time (less than 15 minutes) parameters. In the case of COVID-19 negative or indeterminate patients not subjected to procedures that generate aerosols (Aerosol Generating Procedures - AGP), the use of a surgical mask and surgical gown type 3 or 4, goggles or eye shield

and gloves, is recommended. In the case of indeterminate patients undergoing AGP and in COVID-19 positive patients, the room staff should wear FFP2 or FFP3 masks and full-face shield or surgical helmet, level 3-4 disposable gowns, double gloves. Particular attention is recommended for operating room personnel in following the "Procedures for dressing and removing PPE", especially in the case of undetermined or COVID-19 positive patients. The first (outer) pair of gloves should be considered infected and removed immediately. The other PPE should then be removed and the second pair of gloves (inside) removed at the end of the undressing procedure (3,8).

### **Access of the patient at the operating theatre**

A shorten surgical time and, in general, a short operating room stay is recommended in order to reduce the possibility of exposure to any risky contacts.

The hospitalization settings in Outpatient Surgery and Day Surgery must be privileged both for the speed of management and for the low impact on the resources of the structure and on the hospitalization capacity (9).

The transport and return time to the department should be limited in order to reduce the risk of contamination of the staff and the surrounding environment.

The transport of indeterminate or COVID-19 positive patients should take place according to rapid and predefined routes, separated from the Covid-free routes.

It is recommended that the patient within the operating complex wear the surgical mask. The mask must be kept for the entire duration of the stay in the operating block and during the operation in the case of local or loco-regional anaesthesia (10).

The use of shoe covers, disposable gowns, and surgical caps is optional, particularly in outpatient settings.

### **Anaesthetic procedures**

When possible, local anaesthetic techniques or loco-regional anaesthesia should be preferred.

General anaesthesia could cause the formation of aerosols (AGP - Aerosol Generating Procedures), especially during intubation and extubating. During these manoeuvres, the presence of personnel should be strictly limited to those directly involved, and they should be equipped with PPE suitable for AGP.

Surgical room staff wear an FFP2 or FFP3 mask and a face shield or surgical helmet, level 3-4 disposable gowns and double gloves, in the case of indeterminate patients undergoing AGP or in COVID-19 positive patients.

After intubation and extubation, the surgical team should wait a minimum of 15 minutes before entering the operating room.

At the end of the operation performed under general anaesthesia, the patients should be monitored into the same operating room and then bring the patient outside the operating block (11).

### **Intraoperative measures**

Venous thromboembolism prophylaxis and standards protocols of antibacterial prophylaxis do not require changes compared to the protocols used before the pandemic.

Operating room doors should be kept closed during the operation and the presence of furniture, surgical instruments, and containers not strictly necessary for the execution of a specific intervention, should be limited. The use of plastic films to cover any irregular surfaces or keyboards, in order to facilitate and make sanitization more accurate, is recommended. However, employed materials should be limited as much as possible and the use of disposables should be preferred.

The number of operators and the traffic of personnel in the operating room must be limited as much as possible. Ideally, the operating team should be made up of experienced personnel and it should be reduced in number. In order to limit the number of people present in the operating room during surgical procedures, the presence of

students, trainees, postgraduates who are not part of the active operating team, product specialists, or other technical personnel, should be avoided, if not strictly necessary for patient care (10).

The use of high-speed power tools such as saws, drills and cutters, intra-operative jet washing systems, and electrosurgical units can generate aerosols. Although there is no scientific evidence in relation to the extent of the risk of transmission of Covid-19 through this type of aerosol, there is a prudential attitude shared by many international guidelines aimed at limiting as much as possible the use of these devices during surgery (12). For the same attitude of prudence, it is advisable to adjust the electrosurgical unit and the speed of use of saws, drills, and cutters to the minimum possible and taking care to suck up the aerosol generated with systems equipped with a suitable microfiltration system.

The use of absorbable sutures and transparent dressings is recommended to limit the need for subsequent postoperative checks.

### **Post-operative measures**

When required, postoperative check x-rays should be performed into the operating room, avoiding possible contaminations of dedicated spaces of the operating block.

The operating room and patient transport areas should be sanitized as soon as possible after each procedure, paying particular attention to all instruments and devices that come into contact with the patient. It is recommended, as far as possible, to provide post-operative care in the operating room by bypassing the recovery room (PACU – Post-Operative Care Unit). Patients who could not be extubated in the operating room must be transferred to the Intensive Care Unit (ICU) directly, bypassing the PACU. If this is not possible, PACU patients must be separated from each other for a minimum distance of 2 m. The patient's stay in PACU must be reduced to a minimum while maintaining appropriate safety guarantees: after the transfer of the patient and before the arrival of the next patient, all surfaces

around each patient's bed must be thoroughly sanitized.

It is recommended that patients continue to wear the surgical mask throughout their postoperative stay in the healthcare facility (10).

### **Follow-up measures**

Patients should be discharged at home and transfer to rehabilitation/long-term care should be avoided. Follow-up should be managed to avoid unnecessary meetings and favoring telemedicine (10,12). It is advisable to carefully inform the patient also on the procedures for post-operative checks even before surgery. The implementation and dissemination of digital health programs and technologies that allow telemedicine practices for monitoring patients is desirable.

After surgery, whenever a patient develops respiratory symptoms and shows SARS-CoV-2 positivity, he should be isolated and any contact should occur using full PPE. All healthcare professionals who have come into contact with the patient should be tested and quarantined until the test results are available.

### **Conclusions**

The management of patients in the current COVID-19 era presents a new challenge for the operating room healthcare workers with a higher risk of contracting the infection. Modification of the checklists and implementation of practical activities aimed to reduce contacts can be considered as an easily attainable and positive step in the direction of improving safety for the operating room healthcare workers caring for patients and patients undergoing surgery.

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