

# Management and treatment of patients in the surgical area during COVID-19 pandemic

## Orthopedic literature review

Andrés Cattáneo, Esteban F. Coppola, A. Federico Medina, Alejandro Pachón Guzmán

Hospital Zonal General de Agudos "Mi Pueblo" (Buenos Aires, Argentina)

### ABSTRACT

The current coronavirus (COVID-19) pandemic has led to a large number of measures at the individual and global levels, seriously affecting healthcare systems. Although COVID-19 does not directly involve specialists in Orthopedics, we are nevertheless compelled to implement preventive hospital measures aimed at reducing the chances of infection during our specific procedures. This literature review aims to provide basic dynamic information on how health care specialists should act in surgical areas when facing suspicious/confirmed cases of COVID-19. We advocate the design of updated workflow processes for patient care before, during and after surgery.

**Key words:** Coronavirus; COVID-19; operating room; surgery; Orthopedics; pandemic.

**Manejo y tratamiento de pacientes en áreas quirúrgicas durante la pandemia COVID-19.**  
**Revisión en el área de Ortopedia y Traumatología**

### RESUMEN

La pandemia actual ocasionada por el coronavirus (COVID-19) ha promovido el desarrollo de gran cantidad de medidas en el ámbito individual y global, que afectan gravemente a los sistemas de salud. Aunque la epidemia no involucra directamente a los especialistas en Ortopedia y Traumatología, indirectamente, nos vemos compelidos a implementar medidas hospitalarias preventivas tendientes a disminuir las posibilidades de contagio durante nuestros procedimientos específicos. Esta breve revisión bibliográfica pretende aportar información dinámica básica respecto a de qué manera actuar como especialistas en las áreas quirúrgicas ante casos sospechosos/confirmados de COVID-19. Promovemos el diseño de planes de trabajo para la atención de pacientes antes de la cirugía, durante esta y después.

**Palabras clave:** Coronavirus; COVID-19; quirófano; cirugías; Ortopedia y Traumatología; pandemia.

### INTRODUCTION

The unfolding events related to the rapid and worldwide spread of SARS-CoV-2 resulting in the COVID-19 pandemic have a particular impact by putting strain on the healthcare systems. This scenario forces the implementation of new patient care and patient pathway protocols in the hospital setting in order to effectively and safely address the demands that COVID-19 could place on the healthcare system. These demands include the need for ER surgical procedures when facing suspicious/confirmed cases of COVID-19.

In light of such events, and being members of the Department of Orthopedics of the Hospital Zonal General de Agudos "Mi Pueblo" in Florencio Varela (Buenos Aires), we decided to conduct a scientific literature search on PubMed, European online specialized medical-surgical journals (AO Foundation, Spanish Society of Orthopedic Surgery and Traumatology, Argentine Society of Orthopedics) and online sites of relevant health care organizations (World Health Organization [WHO], Pan American Health Organization, Centers for Disease Control and Prevention). We used the following keywords: "covid-19", "coronavirus", "cirugía" [surgery], "surgery", "estrés

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*quirúrgico*” [surgical stress]. Our goal was to put forward institutional protocol guidelines for healthcare worker behavior in the pre- and intra-hospital setting as well as for postoperative follow-up. Such guideline would aim at reducing COVID-19 impact and its potential transmission to other patients and to members of the health-care team, in order to prevent the contamination of the hospital clean areas. To that end, we searched through journals from northern hemisphere countries that had to adapt their protocols in advance due to the initial origin and distribution of the pandemic.

Orthopedics specialists deal mainly with skeletal-muscle pathologies, and so their practice has not been deemed indispensable as part of a first-line response team against viral infections. However, under the current situation, we deem them essential in helping battle the pandemic and assisting patients as part of emergency teams. Thus, their participation encompasses getting involved in the institution collective and interdisciplinary workflow set up to reduce COVID-19 impact and implementing the relevant biosafety measures.

In the daily medical practice, we must be aware of the significance of adopting measures aiming to reduce as much as possible the transmission scenarios. These measures entail changes regarding the contact with patients requiring urgent or pressing elective procedures. These procedures are vital as part of damage control strategies for severe trauma injuries and severe osteo-articular infection processes. The former are usually associated with high-energy accidents with osteo-articular and surrounding soft tissue involvement, such as joint fractures, open fractures, Compartment Syndrome, dislocation of large joints, complete or partial tendon lesions, and tegument lesions associated with loss of substance and exposure of vital structures (tendons, nerves, blood vessels). The severe osteo-articular infection processes include Septic Arthritis, active Osteomyelitis, severe limb infections requiring surgery, and malignancies with an Orthopedics component (associated or not with pathologic fractures), because failure to treat them may result in severe sequelae and entails risk of limb loss or general condition deterioration.

## DATA COLLECTION RESULTS

### COVID-19: Background and clinical condition

Coronaviruses are a large family of viruses which may cause respiratory infections ranging from the common cold to more severe diseases such as Severe Acute Respiratory Syndrome (SARS).

This new strain, called SARS-CoV-2, responsible for the current COVID-19 outbreak, was first identified in Wuhan City, Hubei’s provincial capital, China, in December 2019. In January 2020, the outbreak was considered a Public Health Emergency of International Concern, and in March 2020 WHO Director-General declared COVID-19 as a pandemic.<sup>1</sup>

SARS-CoV-2 infection most common symptoms are fever and respiratory symptoms, such as cough, shortness of breath, and sore throat. COVID-19 patients may experience a range of symptoms of mild presentation, including gastrointestinal symptoms, conjunctivitis, rhinorrhea, anosmia, muscle pain, and fatigue. Some patients may develop more serious conditions, such as pneumonia and other respiratory disorders (including SARS), and acute renal failure, with some of the most severe cases resulting in death.<sup>2</sup> SARS-CoV-2 transmission, not unlike other viruses and flues, is a person-to-person transmission, through respiratory droplets produced when an infected person coughs or sneezes. Reports show a high contagion rate, even during the incubation period, thus hindering the efforts to prevent transmission and to achieve an early detection of positive cases. Some COVID-19 patients were asymptomatic carriers for longer periods of time or experienced only some mild symptoms.<sup>3,4</sup>

## GENERAL GUIDELINES TO PREVENT TRANSMISSION

WHO general guidelines to prevent COVID-19 transmission include:

- Regularly and thoroughly washing hands with soap and water.
- Using disinfecting solutions, such as alcohol-based hand rub.
- Practicing respiratory hygiene measures, such as covering mouth and nose when coughing or sneezing.
- Avoiding close contact with any person with acute respiratory symptoms.
- Avoid touching eyes, nose, and mouth.
- Maintaining social distancing.

Guidelines for hospital health workers are:

- Increasing the protection measures in all health care levels, from primary to specialized care.
- Using the adequate personal protective equipment (PPE) for the assessment and treatment of COVID-19 patients.
- Maximizing biosafety measures in inter-ward patient transfers.
- Avoiding the use of common spaces.
- Avoiding, whenever possible, prolonged hospitalizations.

## IMPACT ON SURGICAL COMMUNITY

The rapid worldwide spread of COVID-19 has led to the implementation of significant changes that have affected the surgical routine, including canceling elective surgeries, relocating supplies, making postoperative monitoring harder, a shortage of blood components, the shift of surgery personnel into outpatient areas, the use of ORs for COVID-19 inpatients, and an increasing number of biosafety measures to be observed during surgery.

The surge of positive cases associated with the need for advanced life support and for highly trained health professionals, including critical care physicians and anesthesiologists, to operate mechanical ventilators, results in these resources being less available for the surgical activities.

The decrease of blood donations and subsequent shortage of blood components results in establishing surgery priorities in order to decrease the immediate demand, whenever the clinical condition permitted. Regarding cancer patients, for example, the institution of neoadjuvant chemotherapy, the accurate measurement of the tumor size by means of imaging studies and the subsequent performance of planned surgical procedures warrant patient exposure and the immediate demand for hospital resources.

Mobility restrictions have significantly reduced motor-vehicle injuries. Therefore, in Northern Italy, the health-care providers devoted to these injuries were relocated into three Level I trauma centers so as to concentrate injured patients and avoid mixing them with COVID-19 suspicious cases.<sup>5</sup>

## SPECIFIC RECOMMENDATIONS ON TRANSMISSION PREVENTION FOR SURGICAL AREAS

Surgical practice should be limited to patients requiring urgent and emergency procedures, who if left untreated would suffer from permanent sequelae. These limitations aim at reducing the infection risk to healthcare providers, the use of medical supplies that are vital for the control measures against the pandemic, and the morbidity and mortality of negative COVID-19 patients<sup>6</sup> since surgery may *per se* immediately generate depression of cell-mediated immunity. A non-impaired immune system is vital to protect against viral infections.<sup>7</sup>

Surgery involves altering the physical barriers of the organism and its anatomical constitution. This alteration generates a combination of somatic and autonomic afferent impulses resulting in an endocrine response together with an immune and an inflammatory response, mediated by cytokines and hormones, following the exposure of intracellular molecules and the secretion of endothelial cells, activated leukocytes, and fibroblasts. This imbalance is known as “surgical stress,” a consequence of the combining effects of injury, hypoxia, bleeding, shock, organ manipulation, hypothermia, and pain. The inflammatory response seeks to repair damaged tissues and to initiate the wound healing process.

Every surgical procedure involves a high risk of contamination, due to the abundant materials produced, including biological droplets and aerosols. Therefore, protection measures must be raised increased for asymptomatic or COVID-19 negative patients and maximized for suspicious/confirmed cases of COVID-19.

Scientific societies’ recommendations consider using a face mask alone does not constitute an effective barrier against COVID-19. Face masks must be worn together with a N95 filtering face piece and non-vented safety goggles for adequate eye protection.

Additionally, Balibrea *et al.* suggested that institutions with several ORs should reorganize their distribution and assigned one OR for surgical procedures in COVID-19 suspected and confirmed patients. Such an organization would allow for separate pathways for COVID-19 patients and health care personnel, thus avoiding further contamination or areas and people.

## POSTOPERATIVE EVOLUTION

The available data shows a higher rate of ICU hospitalized confirmed COVID-19 patients that underwent surgery (44%) than of those without surgery (21%). This disparity may result from the surgical stress occurring during the COVID-19 incubation period.

Most patients in ICU were elderly patients, patients that had underlying comorbidities and patients that had undergone longer surgical time, and more difficult surgeries. Findings from northern hemisphere health institutions suggest that surgery may accelerate and exacerbate disease progression of COVID-19 based on a lower average time for symptoms onset in operated patients when compared to non-operated patients. Likewise, worldwide reports show mortality rate in COVID-19 patients that underwent surgery to be higher (up to 20%) than in COVID-19 patients without surgeries.

## RECOMMENDATIONS FOR PREOPERATIVE MANAGEMENT

Rodrigues-Pinto *et al.* remark how the Orthopedics practice has experienced a significant impact associated with the COVID-19 outbreak: recommendations been issued for critical care physicians, clinicians, and anesthesiologists on the appropriate PPE to use when diagnosing and treating patients with COVID-19 and the appropriate protocol management for ICUs, wards, and anesthesia tables. However, to date, there is little information on how to assemble an OR for a patient with COVID-19 and how the surgical staff should be protected when performing pressing or urgent surgical procedures on these patients. The Spanish Surgeon Association deems these situations call for measures minimizing the risks of patient-to-patient transmission, health personnel exposure, and developing postoperative complications.<sup>10</sup>

Chang Liang *et al.* published recommendations that several European institutions have issued during the pandemic, which do not go beyond stating that only urgent and emergency surgeries should be performed.<sup>11</sup> In turn, Rodrigues-Pinto *et al.* stated that for patients with pressing conditions who require urgent or early orthopedic surgery the recommendation is to perform surgeries requiring no more than a 24-hour hospitalization, such as hip, knee, ankle, and soft tissue arthroscopic procedures. Elective, non-urgent procedures requiring >24 hours of hospitalization should be postponed or canceled. Long hospital stays (3-5 days) increase the risk of nosocomial infections and the use of limited health-care resources.

Medical specialists acting in surgical areas must exercise their full attention to the preoperative, intraoperative and postoperative organization and any and all adjustments required to minimize the risks of nosocomial spread.

## PREOPERATIVE RECOMMENDATIONS

Below we summarize recommendations from the Spanish Surgeon Association and papers published by Journal of Bone & Joint Surgery:

- All members of the health-care team working in surgical areas must agree on the pathways for health-care personnel, patients and surgical material according to its condition (cleaned, sterilized, contaminated, and highly contaminated) as well as its cleaning protocol in order to prevent person-to-person nosocomial spread. Assign an OR exclusively for COVID-19 patients in order to avoid contaminating the other ORs.
- Patients must be interviewed the day before surgery in search of respiratory symptoms and any risk factor or history or recent travel (within the previous 14 days).
- Hospital admission must be scheduled for the same day as the surgery. Whenever possible, do not admit elective surgery patients 1 or 2 days before surgery.
- All patients attending health-care facilities will undergo an assessment including a detailed history regarding risk factors and an admission physical exam which will include temperature monitoring by using a thermal scanner.
- Whenever possible, conduct routine COVID-19 carrier screening tests before any urgent or elective surgery.
- Patients presenting fever or respiratory symptoms, especially those with a positive travel or contact history, will be referred to the emergency department for further evaluation to minimize disease spread.
- On the day of the surgical procedure, patients will have their temperature checked and comorbidities stability assessed.

- Non-urgent surgeries for elderly, immunocompromised patients should be deferred until an opportune time.
- PPE should be donned along with standard surgical equipment for any procedure consider of “close contact,” both for confirmed and for unconfirmed cases. During a pandemic, all patients should be assumed positive.
- Before surgery, produce a list comprising only the minimum essential personnel required to perform the procedure and verify an adequate supply of available PPE. Avoid unnecessary exposure of crew members.
- It is of vital importance that all surgical team members had undergone training on how to don and remove PPE safely before entering a surgical procedure.
- Trained standing-by personnel must be available in case any incident occurs, such as suffering from excessive heat or similar circumstances.
- Orthopedic medical teams are advised to wear surgical masks for all patient encounters and to follow strict hand hygiene practices.
- Check the condition and availability of the PPE (surgical caps, goggles, N95 masks, gowns and surgical gloves) as required for the procedure.
- Produce a list of all the materials involved in the procedure so as to avoid retrieval of necessary material and personnel entering/leaving the OR.

To minimize the risk of cross-contamination, we suggest dividing the Orthopedics Department into segregated teams: a) care and follow-up of confirmed cases; b) care of urgent cases; c) care of outpatients; d) care in inpatient wards, and e) surgical practice. In the event of a surge of COVID-19 confirmed or suspected patients within a health center, the center would implement a lock-down with no visitors allowed and all elective surgical procedures canceled. Orthopedic surgery would be limited to trauma cases involving severe injuries and to cancer patients unresponsive to neoadjuvant chemotherapy.

## INTRAOPERATIVE WORKFLOW RECOMMENDATIONS FOR SUSPECTED/ CONFIRMED COVID-19 PATIENTS

All hospital workers must be informed which OR is assigned for COVID-19 patients and the recommendations and regulations that must be observed within the hospital setting.

Distribution of the OR areas is advised, which will ensure pathways allowing for a heal-care workflow while maintaining clean areas free of COVID-19 contamination. This distribution will be based on the progressive and gradual stages of protective and isolation measures that surgical team members must follow.

According to published recommendations, the surgical team route into and out of the OR must comprise 5 zones where crew members must strictly comply with each zone purpose:

**Zone 1: Entry dressing room**, where the basic PPE is donned.

**Zone 2: Anteroom**, where the disinfection and surgical dressing take place.

**Zone 3: OR** (COVID-19 patient room).

**Zone 4: Exit room**, where the PPE is removed.

**Zone 5: Exit dressing room**, where the staff showers.

Immediately before entering the OR, it must be verified that the requirements ensuring safety measures regarding personnel and the required surgical material pathways have been met. Additionally, all surgical crew members must have the proper PPE and required surgical materials, including surgical masks and goggles.

OR must be adequately marked with a door sign indicating that a confirmed/suspected COVID-19 patient is in surgery.

Personnel present in the OR during surgery should move around as little as possible, the doors must be kept closed at all times, and all required surgical material should be available in the OR before surgery. The supply of objects and devices within the OR should be kept to a minimum so as to avoid contamination. At the end of each intervention all disposable materials must be disposed of, even if not used.<sup>12</sup>

Any and all patients not requiring intubation as part of the anesthesia procedure must wear a surgical mask.

Whenever possible, surgeries on COVID-19 patients should be brief and should be performed using minimally invasive approaches in order to reduce the risk of infecting members of the surgical team. In trauma and orthopedic surgical procedures, the use of power tools, such as electrocautery, bone saws, and drills, should be reduced to a minimum as they release aerosols, increasing the risk of virus spread.

Negative-pressure suction devices to remove smoke and aerosols should be used during the surgical procedures. Tables 1-5 show an adaptation of our literature, research findings regarding the steps to be followed through the 5 zones, and highlight that each step must be conducted only in the assigned area. It is important to be supervised by another member of the team during this procedure in order to ensure control measures to be at the highest level of protection.

**Table 1.** Guidelines for surgical staff in Zone 1, before entering the operating room

Zone 1
Remove ALL personal effects and items from the surgical cloths pockets (watches, earrings, rings, etc.), before donning PPE.
Hand hygiene with water and soap.
Put on waterproof boots and first surgical hood (disposable).
Put on a leaded apron with thyroid collar (if required, according to the type of surgery).

**Table 2.** Guidelines for surgical staff in Zone 2, before entering the operating room

Zone 2
Put on the waterproof gown.
Put on a filtering face piece: FFP2, FFP3 or N95.
Put on non-vented safety goggles.
Put on the surgical mask over the first one.
Put on a disposable surgical cap covering the ears (over the previously donned hood).
Put on the face shield.
Surgical hand scrubbing following the standard guidelines.
Put on the first pair of sterile surgical gloves.
Surgical hand hygiene with gloves on with an alcohol solution.
Put on the standard surgical gown (with assistance to tie the gown from back side).
Put on a second pair of sterile surgical gloves covering the sleeves (using a third pair of sterile surgical gloves is advised)

**Table 3.** Guidelines for surgical staff in Zone 3, after surgical procedure

Zone 3 - After surgery
Remove the third pair of gloves, not touching the exterior surfaces.
Washing the interior gloves with an alcohol solution (an assistant rinses the healthcare professional gloves).
Remove the surgical gown. Avoid touching its exterior surface. Stretch the gown beginning from the chest and tearing its laces. Fold it into itself leaving the external, contaminated surface facing inwards.
Dispose these garments in the wastebasket (which should be nearby) with slow movements.
Washing the interior gloves with an alcohol solution (an assistant rinses the healthcare professional gloves).
Removed the waterproof boots.
Remove the surgical gloves (second pair).
Wash hands with an alcohol solution.
Remove the face shield: lower your head, keeping eyes and mouth closed. Place the face shield on a tray with sanitizer if reusable or dispose of it in a wastebasket in case if disposable.
Remove the surgical cap (keeping eyes and mouth closed) and dispose of it.
Wash hands with an alcohol solution.
Remove the surgical mask. Lower your head, keeping eyes and mouth closed. Grab the laces from behind and removed them in an anterior and downward movement. Do not touch the anterior surface of the mask. Dispose of it into the wastebasket touching only its laces.
Wash hands with an alcohol solution.
Remove the protective gown (same instructions as with the surgical gown). Dispose of it into the wastebasket (which must be nearby).
Wash hands with an alcohol solution.
Remove the nitrile gloves, without touching the external surface.

**Table 4.** Guidelines for surgical staff in Zone 4, after leaving the operating room

Zone 4
Surgical hand hygiene.
Remove goggles: lower your head, keeping eyes and mouth closed.
Wash hands with an alcohol solution.
Remove the filtering face piece (FPP2, FPP3 or N95).

**Table 5.** Guidelines for surgical staff in Zone 5, after leaving the operating room

Zone 5
Remove the surgical hood.
Wash hands with an alcohol solution.
Put on nitrile gloves.
Spray the shoe covers with an alcohol solution and removed them.
Wash hands and arms from the wrist to the elbow with an alcohol solution.
Shower.

## RODRIGUES-PINTO PPE DONNING SEQUENCE FOR SURGERY PERSONNEL

Using a third pair of sterile gloves may hinder dexterity involving precise and delicate movements, and may disrupt the normal flow of the surgical procedure. Therefore, we advise to use them when removing the surgical PPE. This clarification serves as a way to remember that we are at a moment of high risk of contact and infection.

There are literature discrepancies on designing the physical space where health-care personnel should don the sterile surgical gown. The Spanish Surgeon Association advocates for donning inside the OR while Rodrigues-Pinto *et al.* advocate for donning the entire sterile attire in the anteroom and only then entering the OR once the patient is already under anesthesia. Rodrigues-Pinto *et al.* alternative aims at preventing unnecessary air circulation and reducing aerosols risks involved in donning the surgical attire within the OR.

Patients under general anesthesia are of particular concern while extubating, because this procedure entails a high risk of the patient coughing or expectorating. The recommendation for the surgical team is to wait until the patient is discharged from the OR to begin the procedure for removing their surgical attire and PPE (Tables 1 and 2).

## PPE REMOVAL SEQUENCE FOR SURGERY PERSONNEL

At the end of the surgical procedure, it is vital that PPE removal is performed using slow movements, observing the recommended times and measures, one surgeon at a time, under the supervision of a trained team member, avoiding any sudden movements, aerosol generation and potential contamination of any garment worn beneath the PPE (Tables 3-5).<sup>15</sup>

## RECOMMENDATIONS FOR POSTOPERATIVE MANAGEMENT

Visitor policies for surgical patients requiring prolonged hospital stays must limit the number of visitors and assign a separated area/ward for COVID-19 suspected patients, who must be isolated following the international protocols. All dressing changes must observe the applicable personal protective measures. No visitors will be allowed and patients will only be able to contact their relatives via telephone.

Discharge planning of operated patients should be multi-disciplinary and subject to clinical improvement (regarding COVID-19) as well as to postoperative early evolution. In terms of postoperative care, whenever possible, hospital discharge should be instituted as early as possible.

Healthcare providers must provide patients with all indications, in detail, regarding appropriate post-operative surgical wound care and drug therapy, and emphasize which signs constitute postoperative alarms in order to minimize unnecessary hospital consultations.

We consider necessary and vital that each department should plan and implement pain management protocols in relation to the undergone surgical procedure. Whenever possible, basal pain scores should be obtained together with intervention pain scores, if necessary, since pain is one of the most frequent symptoms in the early postoperative period. Concomitant conditions should be considered to adapt pharmacologic therapy to the specific clinical case.

Outpatient follow-up for these patients should adapt to their surgical complexity. If the medical center has an independent sector within its facilities destined for postoperative care of COVID-19 patients or an ambulatory setting for their management, patients will be scheduled for weekly follow-up controls and wound dressing changes until stitches are removed and an adequate wound healing is achieved. After that point, controls should be less frequent and follow-up imaging studies limited to potential significant shifts in their medical status and clinical management. Patients must be examined in clean, safe areas by healthcare providers wearing the essential PPE, who had had their hands properly sanitized by means of surgical hand scrubbing. Several hospitals in Argentina lack the facilities to accommodate COVID-19 patients in an independent area for postoperative orthopedic care. Therefore, scheduled remote visits on a weekly basis could be instituted for the control and management of surgical wounds in these particular patients, adopting the mentioned biosafety measures. Such an initiative would prevent COVID-19 patients' public circulation, thus in line with minimizing the infection spread and also decongesting the hospital transfer services.

Chang Liang *et al.* stated that healthcare centers should evaluate the use of novel technologies, such as telemedicine, teleconferences, and telerehabilitation initiatives, which will allow for patients to be reviewed in their own homes, thus preventing patients to be subject to cumbersome hospital visits while reducing exposure risk to COVID-19 infection.

Considering the limitations imposed on rehabilitation services, alternate methods should be adopted, comprised of thorough written information and home-based rehabilitation programs tailored for each patient including follow-up communication through digital platforms.



On an occupational note, all health providers who have close contact with suspected/confirmed COVID-19 patients must immediately inform thereof to the Preventive Medicine Department, Occupational Health Department or Occupational Risk Prevention Department of their workplace.

## DISCUSSION

The constant production of recommendations and modifications by healthcare systems and governments due to the rapid spread of COVID-19 result in major limitations regarding the conduct to adopt by healthcare workers. There is little substantial evidence on patients operated during incubation or clinical disease period. The incubation period involves difficulties concerning early diagnosis due to the particular characteristics of the infection in asymptomatic patients and the shortage of diagnostic tests for asymptomatic patients as testing has been prioritized in patients with clinical manifestations in order to institute the appropriate isolation measures. However, the isolation measures and their subsequent circulation reduction constitute a new factor that seeks to limit the pandemic's spread by flattening the transmission curve and to lower the rate of infected patients who sustain motor-vehicle injuries and require urgent care, as we used to frequently face before the social, preventive and mandatory isolation was implemented in Argentina. This steep reduction in the number of patients requiring hospitalization and urgent care by the Orthopedics Department allows for the planning of circulation protocols for hospital pathways and within the OR concerning COVID-19 patient management by orthopedic specialists.

Although orthopedic specialists are not considered a vital part of the control team against COVID-19 pandemic, we have a key role to play in helping with the occupational/health behavior change that aims at reducing the cases of hospital-acquired infections and virus spread associated with invasive procedures. Whenever possible, human and economic resources should be assigned to the fight against COVID-19 in order to alleviate the impact of the disease. This measure aims at preventing the healthcare system collapse and the shortage of medical supplies that are required to face this disease. Therefore, we should establish strict priorities when assigning the type of surgical procedure, and postpone or cancel non-urgent procedures. Patients suffering from non-urgent conditions should be considered candidates for orthopedic treatment, despite a less than ideal final outcome, identifying those patients who may require late delayed reconstruction. These patients must be duly informed before treatment institution, and a medical record entry must be made to record that the medical decision was taken during the pandemic. We propose operating on patients with conditions requiring urgent intervention in which there is an actual risk of losing an extremity or dying, or who present conditions that may result in severe functional sequelae if left untreated. Obtaining a detailed disease history is indispensable, trying to mitigate the possible postoperative complications worsened by COVID-19. The surgical team must be comprised of as few specialists required to achieve an optimal outcome as possible, and the team should be under the direction of the most experienced surgeon in order to minimize surgical time and intraoperative complication rates.

Likewise, specialists must actively be involved in the nosocomial organization in charge of creating treatment algorithms and distributing working areas by observing a sensible segregation of clean and contaminated areas. The latter involves designing routes or circulation pathways for medical material, personnel, and patients.

Healthcare providers must receive information on how to prevent infection and training on the proper use of PPE, how to don and remove equipment without risking contamination of their personal effects, hands or face.

Our daily activity must find us alert, even when assisting low-risk patients since there is a high rate of asymptomatic patients. We must champion good hygiene practices and be open to the adoption of novel technologies in the workplace in order to reduce patient exposure.

In our role as doctors and healthcare providers, we must stand together and provide our services to the best of our knowledge so that we defeat this pandemic as a community. A sick and isolated doctor is a doctor who cannot save lives. And we must be clear, we specialists in Orthopedics can do more than fix fractures; we can fix lives.<sup>11</sup>

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A. Cattáneo ORCID ID: <https://orcid.org/0000-0001-5254-0760>  
 E. F. Coppola ORCID ID: <https://orcid.org/0000-0002-2132-7286>  
 A. F. Medina ORCID ID: <https://orcid.org/0000-0002-5815-3232>

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