ECRONICON OPEN ACCESS

EC ANAESTHESIA
Review Article

How we Face SARS-CoV-2 in Madrid, Spain. An Anaesthesia Department, and Two Emergency Medical Services

Julio Marcotegui Caminero[1]*, Fernando Somoza Sáez[2], Rafael Gil Ochayta[3], Leticia Rodríguez Martín[4] and Esperanza González-Rojano[5]

[1]Department of Anaesthesiology, Reanimation and Pain Treatment, Clínico San Carlos Hospital, Complutense University of Madrid and SAMUR - Protección Civil city of Madrid, Spain

[2]Anesthesiologist, Department of Anaesthesiology, Reanimation and Pain Treatment, Clínico San Carlos Hospital, Complutense University of Madrid and SUMMA112, Madrid, Spain

[3]Emergency Department, Hospital Central de la Defensa Gómez Ulla and SAMUR - Protección Civil city of Madrid, Spain

[4]Department of Anaesthesiology, Reanimation and Pain Treatment, Clínico San Carlos Hospital, Complutense University of Madrid, Madrid, Spain

[5]Department of Clinical Pharmacology, Clínico San Carlos Hospital, Complutense University of Madrid, Madrid, Spain

***Corresponding Author**: Julio Marcotegui Caminero, Department of Anaesthesiology, Reanimation and Pain Treatment, Clínico San Carlos Hospital, Complutense University of Madrid and SAMUR - Protección Civil city of Madrid, Spain.

Received: March 16, 2020; **Published:** May 25, 2020

Abstract

The SARS-CoV-2 pandemic in the world has caused huge numbers of infected, threatening to overwhelm the health systems of many countries. In this article we describe the basic epidemiological pattern, the diagnostic criteria, the patient management protocol, the special risk procedures, the basic management recommendations, and the protection that health workers use in the Anesthesiology and out-of-hospital emergency services in the city of Madrid, capital of Spain.

Keywords: *SARS-CoV-2; Coronavirus; COVID-19; Personal Protection Equipment; PPE; Anaesthesia; SAMUR; SUMMA*

Background and Epidemiology

In December 2019, a total of 27 cases of pneumonia with unknown etiology were reported in the city of Wuhan, China. All of them have been previously exposed to a local food market were alive animals were sold and sacrificed. It has been proposed that the disease comes from an animal reservoir, but to date it has not been possible to identify this source with certainty. The way the virus used to cross from the animal reservoir to humans is still unknown. The condition was named as COVID-19 and the virus causing it as 2019-nCoV at the first time, SARS-CoV-2 after that [1,2]. By the end of January 2020, the WHO declared the outbreak as a Public Health Emergency, and March 11, COVID-19 was declared a pandemic, which means it has been spread all over the world. By the date of this article is written, COVID-19 has spread over 180.000 cases all around the world, over 80,000 in China, over 60,000 in Europe and over 9,000 in Spain, which is the second most affected country in Europe, only behind Italy. Spain declared the national emergency state on March 14. Previously, six types of coronavirus which can cause infection in humans have been describe (MERS-CoV among them), so SARS-CoV-2 is the seventh.

The standard route of transmission among humans is considered similar to that described for other coronaviruses: through the secretions of infected persons, mainly by direct contact with respiratory drops of more than 5 microns (capable of being transmitted over

distances of up to 2 meters) and the hands or fomites contaminated with these secretions followed by contact with the mucosa of the mouth, nose or eyes. Aerial transmission by aerosols (capable of being transmitted over a distance of more than 2 meters) has not been demonstrated for SARS-CoV-2. However, it is believed that this could occur during the performance of invasive medical procedures of the respiratory tract (like endotracheal intubation, bronchoalveolar lavage or aspiration of secretions) and even in their absence.

The incubation period has been estimated between 2 and 14 days, being the median around 5 days. At 12,5 days from exposition, 95% of the cases have clinical manifestations. At this moment, there is no or contradictory evidence about transmission from asymptomatic patients or patients in incubation period.

COVID-19 should be suspected in patients with fever and lower respiratory tract symptoms who reside or have recently traveled to areas with community transmission or who have close contact with a suspected or confirmed case of COVID-19. When this disease is suspected, infection controls measures should be implemented immediately and public health services should be notified [3].

As the national protocol from Health Ministry states [4], we consider a case under investigation any patient who meets the following criteria (both):

1. Shows clinical symptoms related to acute upper airway infection (cough, fever, malaise, sore throat, dyspnea) of any severity, and
2. In the 14 previous days have resided or traveled in areas with evidence of community transmission (which are periodically updated via web https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov- China/areas.htm) or had close contact with a probable or confirmed case.

We also consider case under investigation any hospitalized patient with signs or symptoms related to lower airway infection and at least one of the following radiological findings:

1. Bilateral infiltrates with interstitial or ground-glass pattern or bilateral alveolar pulmonary infiltrates compatible with ARDS.
2. Unilateral multilobar infiltrate with suspected viral etiology.

We classify a close contact as:

1. Any person caring a probable or confirmed patient with symptoms without using complete personal protection equipment (PPE).
2. Any person staying in the same place of a probable or confirmed patient with symptoms without using complete personal protection equipment (PPE).
3. Any person traveling in an airplane (or similar transportation facility) located in a two-seat radio around a probable or confirmed case while the case had symptoms and the crew who have had contact with such cases.

Anaesthesia department

Our center is a 3rd-grade universitary hospital placed in the city of Madrid, with around 650 beds; 40 of them are intensive care beds, and about 45 of them are intermediate-care beds which can be quickly converted in intensive care beds by placing appropriate personal and equipment. Efforts were aimed at maintaining the basic activity of the hospital regarding the management of common urgent pathologies (bone fractures, coronary syndromes, non-delayable surgeries...), suspending all scheduled delayable activities from March 11 and releasing a large amount of resources to be able to attend to the foreseeable avalanche of patients affected by COVID-19.

When the infections started to increase, a two-way triage in Emergency Department (ED) was designed, intended to separate all respiratory patients from the standard patients from the very beginning. So, patients with suspected COVID-19 (cases under investigation) are send to a separate facility (former "acute pathology unit") and "standard" patients are send to a central facility into the ED (former "short-staying unit). In the first triage contact, suspected patients will be asked to perform handwashing with hydroalcoholic solution and will be given a surgical mask to wear from then on. At the moment of writing this article, there are also four complete hospitalization plants closed and equipped with personal and PPE to receive COVID patients. Travel routes have also been scheduled to safely transfer patients from one hospital location to another: for example, from the ED to the hospitalization plant, or from the Intensive Care Unit (ICU) to the Radiodiagnosis service. These routes cross certain areas of the hospital (corridors, floors) not dedicated to patients with COVID-19, so it has been established that patients must be wearing a surgical mask, full bed coverage with disposable sheet, and the personnel in charge of their transfer must be wearing surgical mask and glasses in case of patient in spontaneous ventilation, or full PPE in case of intubated patient; it should also be ensured that no person without PPE comes into close contact with the transferred patient.

Specifically speaking about PPE, when treating patients with suspected or confirmed SARS-CoV-2 infection (distance between patient and personal < 2 meters), the equipment listed below should be used [1,2,5]. In Spain, in order to guarantee its suitability, this equipment must have the CE marking, and must be certified as a medical device by the Spanish Agency for Medicines and Medical Devices (AEMPS):

- Surgical mask for the patient, or any other similar without an exhalation valve, if possible. It will help to avoid or drastically reduce the amount of droplets projected.
- Autofiltering mask with a minimum efficiency of FFP2. In the case of performing procedures on the airway that can produce large amounts of aerosols, FFP3 filter is recommended, although at this moment it is unknown if this difference can have a real effect since it is believed that SARS-CoV-2 is only transmitted by thick drops (more than 5 microns).
- Disposable gloves. It's recommended to use double glove, first of them should be placed under the robe, second of them should be long and cover partially the forearms over the robe.
- Disposable robe/coat/gown/overalls resistant to splashes of biological fluids and secretions; it should at least cover the front and laterals of the body. In the event that the disposable gown used is not totally impermeable to secretions, it must be complemented with a plastic disposable apron or a chemical protection apron.
- Eye and face protection against splashes and drops: integral glasses with protection of the front, top, bottom and side of the eye sockets, or full face protector (mask or screen).
- Surgical cap and disposable leggings in selected patients if the possibility of a large projection of secretions or splashes is anticipated.

It is very important to train the personnel who will use the PPE into its correct placement and removal. Withdrawal is especially important, and it must be carried out in a series of protocolized steps designed to avoid contact with the contaminated parts of the PPE by the healthcare worker. First, the gown is removed by stretching it from the neck forward, one arm is removed touching with the other only the outer part and including the outer glove, the second arm is removed touching with the first only the inner part, the hat and face protection are removed from the back of the head to the front, and finally the inner glove is removed. Between each step and the next, hand hygiene should be carried out with hydroalcoholic solution (when necessary, on the gloves). All the contamined equipment should be discarded in a Class 3 special waste container (hazardous bio-sanitary), except reusable components (usually, only the glasses and occasionally some aprons/overalls) which should be specifically cleaned. There are very helpful visual instructions provided by WHO [6].

There are a series of procedures considered to be at high risk of viral transmission due to their high probability of generating aerosols and droplets from the patient to the ambient air [1]; while performing them it is necessary to take extreme measures to protect health personnel. They are as follows:

- Nebulization and aerosol therapy.
- Use of high flow nasal glasses.
- Manual ventilation with face mask.
- Non-invasive ventilation (CPAP/BiPAP) with facial interface.
- Orotracheal intubation.
- Tracheostomy.
- Bronchoscopy, gastroscopy.
- Aspiration of secretions from the upper or lower airway.
- Cardiopulmonary resuscitation.

Some anesthetic consideration should be known before performing procedures in the operating room (OR) [1,5]:

- No need to disable operating room positive-pressure ventilation (because of the very limited range of the droplets).
- Limit access to the operating room to strictly essential personnel. Signpost the access ban.
- Locate class 3 containers (hazardous bio-sanitary) at the entrance and exit of the operating room as well as inside. All one-use materials should be disposed of in this containers. Reusable material must undergo sterilization or high-grade disinfection by immersion.
- Remove all non-essential material from the operating room. Ideally, the medication cart will be located outside, leaving only the essential medication and supplies on a table. The computer must also be located outdoors.
- Cover the anesthesia machine and constant monitor with plastic transparent covers that allow it to be used without direct contact with the surface.
- Prioritize the election of neuroaxial/regional anesthesia over general anesthesia.
- If possible, carry out pre-oxygenation with 100% oxygen using a face mask for a period of at least 5 minutes.
- Intubation will be performed by the most experienced professional in airway management available, in order to reduce the attempts and total time of exposure.
- A rapid sequence induction protocol with succinylcholine or rocuronium is recommended, avoiding if possible positive pressure facial ventilation. Deep neuromuscular relaxation must be ensured to avoid contractions and cough during airway manipulation. If manual ventilation is required, try to use low tidal volume and high respiratory frequency.

- If the patient's clinical condition will likely determinate prolonged mechanical ventilation, perform tracheal intubation with subglottic aspiration.
- Avoid awake intubation if it involves the use of powdered local anesthetic (aerosols) unless it is considered essential. In the event of a difficult airway, consider a video laryngoscope with hiper-angled blade as intubation device.
- A highly efficient hydrophobic filter must be used to connect the tube to the ventilator or the self-inflating manual ventilation bag.
- Decontamination of anesthesia machine and operating room cleaning according to the protocol of the center with surface disinfectants. Allow an operating room aeration time of 20 minutes.

There are also a series of recommendations related to the obstetric patient:

- Neuroaxial anesthesia (intradural or epidural) is the choice for caesarean section. Regional anesthesia techniques must be performed with the same protective measures as general anesthesia.
- Women should not be sent to a general post-anesthetic recovery room to avoid transmission of the virus to other patients and/or health professionals. Post-anesthetic surveillance should be performed in an isolation room with similar characteristics to those of any other SARS-Cov-2 infected patient.
- There is no current evidence regarding neonatal safety, although several cases of neonatal transmission of the disease have been described. Communication with the pediatric team is essential to plan the care of the newborn from birth.

Emergency medical services

The out-of-hospital medical urgencies in Madrid are attended by two different Emergency Services: SAMUR-PC (dependent on the Madrid city council, specifically works in the city of Madrid) and SUMMA 112 (dependent on the autonomous community of Madrid, works throughout the region). It should be taken into account that nearly all of its warnings are conducted through telephone calls from citizens without medical training who are often unable to obtain adequate clinical data, so there is great uncertainty about the patient's condition until the ambulance reaches the point of attention.

SAMUR-PC differentiates various patient care situations according to its protocol [7]:

1. Assuming that Madrid is already an epidemic zone of transmission of the disease, in all the assistances that are carried out to patients with a low level of consciousness (often of unknown origin) health providers will use a mask with a FFP2 filter, full-frame protective glasses, a level 1 protection suit (a full white suit that includes a hood and leggings) and double gloves.
2. In the care of a patient with suspected SARS-CoV-2 infection (fever, general malaise, non-productive cough, headache, sore throat), the first contact with the patient and the initial evaluation should be carried out outside the ambulance, limiting the number of healthcare personnel exposed directly to the patient. A paper mask (similar to a surgical mask) will be placed on the patient as soon as possible, and he should perform hand hygiene. FFP2 mask and double glove will be used as PPE by healthcare personnel.
3. If the patient does not present signs and symptoms of seriousness, it will be recommended to return to his home and contact his health center (outpatient) to join the protocol of suspected cases in the Community of Madrid.

4. If care has been carried out outside the ambulance, decontamination of the material used (electrocardiographic monitor, blood pressure monitor, pulse oximeter, thermometer, glucometer...) will be carried out in the same place without removing the PPE; Subsequently, the PPE will be removed according to the security protocol and the clean material will be reintroduced into the ambulance.

5. If care has been carried out inside the ambulance or the patient is transferred to the hospital, the staff will request permission from the Communications Central to go to the ambulance park to proceed with their complete decontamination.

6. If the patient shows signs of clinical deterioration and requires endotracheal intubation, maximum protection will be prioritized for the person who is going to perform the technique. This doctor will wear a level 2 protective suit ("diver's suit" completely sealed with insulating tape), FFP2 mask, full protection face shield and double nitrile glove sealed with insulating tape to the suit.

7. Whenever a patient suspected of SARS-CoV-2 infection is transferred to the hospital, the Communications Central will contact the triage of said hospital, reporting the case and the protective measures of the personnel carrying out the transfer, with the aim of enabling, if the hospital deem it appropriate, a specific space in the area of isolated patients.

Speaking about SUMMA112, its protocol [8] states that in the case that a patient with suspected SARS-CoV-2 infection is identified by the Coordination Center of SUMMA112 or from any other assistance resource, it will be immediately disclosed to the Guard Chief. An Advanced Vital Support resource will be activated preferably for triage and patient transport. All professionals of mobile resources of the service that come in contact with a suspicious or confirmed case must:

1. First, provide a surgery mask to the patient.

2. Decrease to the minimum the people in contact with the patient.

3. All who intervene must wear: a highly effective mask FFP2 (or preferably FFP3 if available), ocular protection adjusted with an integral mount, full facial protector, gloves and impermeable coat/suit. These protection measures are independent of the fact that medical procedures that generate aerosols (endotracheal intubation, manual ventilation…) are carried out or not.

In case of the suspicion of a patient in an Emergency Service of Primary Attention (these are managed and coordinated by the Coordination center of SUMMA112):

1. The first act will be providing a surgery mask to the patient and take them to an individual room previously prepared, maintaining the door closed with restricted access to the essential staff for the attention.

2. The health personnel must wear the described protective equipment.

3. The patient must remain alone, without any company. In the event the patient is in company, the companion he will need to wear protective equipment similar to that used by healthcare personnel.

4. If the patient meets the criteria for suspected case, the Chief of Guard will be notified, who will give the directions for the transfer to the hospital preferably in an Advanced Vital Support resource.

Once the intervention has finalized, surfaces and non-disposable material/equipment that has been in contact with the patient must be cleaned and disinfected. The Guard Chief or the Center Coordinator, before any transfer to a hospital of a suspected or confirmed case will be communicated with triage, informed with the case and of the measures of protection of the personnel which will carry out the transfer of the patient.

Conclusion

We are facing a rapidly expanding global pandemic in which the vast majority of healthcare professionals have no experience. We are forced to suspend our daily practice and adapt the entire health system to deal with the avalanche of patients; hospitals may become saturated due to the number of patients who will require intensive care, the very possibility of healthcare personnel getting sick, and the lack of PPE. Protection and action protocols are essential to allow safe assistance that preserves the wellbeing of health professionals and allows them to continue working to serve the population.

Bibliography

1. Servicio de Anestesiología Hospital 12 de Octubre De Madrid M. Guía de Actuación Frente a SARS-CoV-2 (2020).
2. Hospital Clínico San Carlos de Madrid. Procedimiento de Actuación Frente a Casos de COVID-19 Del Hospital Clínico San Carlos (2020).
3. UpToDate. UpToDate Coronavirus disease 2019 (COVID-19) (2020).
4. Ministerio de Sanidad Gobierno de España. Procedimiento de actuación frente a casos de infección por el nuevo coronavirus (SARS-CoV-2) (2020).
5. SEDAR (Spanish Society of Anaesthesia and Reanimation). Recomendaciones En El Manejo de La Vía Aérea En Pacientes Infectados Por Coronavirus.
6. WHO. How to put on and how to remove personal protective equipment (2020).
7. SAMUR Protección Civil Ciudad de Madrid. Procedimiento de Actuación ante posibles casos de Pacientes infectados por Coronavirus (2020).
8. SUMMA112. Procedimiento de actuacion frente a casos de infeccion por el nuevo coronavirus (2019-NCoV) EN SUMMA 112 (2020).

Volume 6 Issue 6 June 2020