



Major Actions of Preventive Measures on Sars-Cov-2: An Updated Vision for Emergency Physicians

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Abstract: Introduction: The new coronavirus (SARS-CoV-2), has infected more than 23 million individuals to date and has resulted in more than 800,000 deaths worldwide. The rapid spread of SARS-CoV-2 and its variants requires the urgent development of accurate diagnostic methods, effective treatments, and vaccines. The recommendations are also related to the Expert Consensus for Clinical Management of Covid-19, at the headquarters of the Pan American Health Organization / World Health Organization (PAHO / WHO) in Brasilia (Brazil). Objective: To gather the main pathophysiological considerations of COVID-19, as well as the actions of investigation, management, and adoption of preventive measures against the complications caused by SARS-CoV-2 in the emergency of hospitals. Methods: This study followed an integrative review model based on the systematic review model. The search for the articles occurred in the databases WHO, PAHO, Ministry of Health, PubMed, Embase, Ovid, Cochrane Library, and Google Scholar. The quality of the studies was based on the GRADE instrument. The risk of bias was analyzed according to the Cochrane instrument. Results and Conclusion: A total of 58 clinical studies were recruited and submitted to eligibility analysis and, after that, 26 studies were selected, including official public health guidelines and regulations. To the published articles, studies of high to medium quality and with risks of bias were selected that do not compromise the scientific basis of the studies. Based on the main literary findings, as well as the main public health guidelines published in the world, patients with COVID-19 may present respiratory syndromes very similar to the common influenza virus (influenza), being a challenge for early detection during screening. in emergency departments. According to the official health agencies of Brazil (Ministry of Health) and the world (WHO/PAHO) and their regulations, it was defined that the clinical criteria for hospital discharge should take into account the improvement of the clinical picture, the absence of tachypnea and hypoxia, the absence of O₂ supplementation for at least 24 hours, hemodynamic stability, good oral acceptance and absence of fever.

Keywords: Pandemia, COVID-19, SARS-CoV-2, SARS, Prevention, Emergency department

1. Introduction

In the COVID-19 pandemic scenario, the new coronavirus (SARS-CoV-2), has infected more than 23 million individuals to date and has resulted in more than 800,000 deaths worldwide [1,2]. In this sense, the rapid spread of SARS-CoV-2 and its variants requires urgent development of accurate diagnostic methods, effective treatments, and vaccines [3].

In Brazil, on January 22, 2020, the Public Health Emergency Operations Center for COVID-19 was activated, a strategy provided for in the National Public Health Emergency Response Plan of the Ministry of Health (MS) [4]. Thus, the Ministry of Health established a structured document based on existing actions (to influenza) for notification, registration,

investigation, management, and adoption of preventive measures [5-7]. In addition, the recommendations are also related to the Covid-19 Expert Consensus on Clinical Management at the headquarters of the Pan American Health Organization / World Health Organization (PAHO / WHO) in Brasilia (Brazil) [8,9].

In this context, Severe Acute Respiratory Syndrome (SARS) is a severe acute respiratory disease caused by SARS-CoV-2 [10]. This was initially detected in Guangdong Province, China, in November 2002 and subsequently spread to more than 30 countries [11], is transmitted from person to person by close personal contact. The communicability period of COVID-19 varies, but it is usually 2 to 14 days, and the main

signs and symptoms of COVID-19 are high temperatures, strong and consistent cough, and severe breathing problems [12].

In this context, complications result in severe inflammation of the lungs, and organ malfunction occurs in patients with comorbidities and health problems, especially diabetes, heart disease, and obesity. There is currently no cure for COVID-19. The world is faced with the containment of the spread of infection, highlighting that careful hand washing, use of hand sanitizer alcohol, frequent cleaning of surfaces, strict adherence to social distance, regular respiratory hygiene, use of protective face masks, tests Frequent self-isolation, quarantine and rigorous contact tracking will help prevent the spread and control the transmission of the viral pathogen [12].

In this scenario, the present study aimed to gather the main pathophysiological considerations of COVID-19, as well as the actions of investigation, management, and adoption of preventive measures against complications caused by SARS-CoV-2 in the emergency of hospitals.

2. Methods

2.1. Study Design

This study followed an integrative review model based on the systematic review model, following the rules of the PRISMA Platform (Transparent reporting of systematic reviews and meta-analysis- <http://www.prisma-statement.org/>) [13].

2.2. Search Strategy and Information Sources

The search for the articles occurred in the databases WHO, PAHO, Ministry of Health, PubMed, Embase, Ovid, Cochrane Library, and Google Scholar, following the search for MeSH Terms: *Pandemia. COVID-19. SARS-CoV-2. Severe Acute Respiratory Syndrome. Acute Respiratory Distress Syndrome. Prevention. Emergency department*, and use of Booleans "and" between mesh terms and "or" among historical findings.

2.3. Study Quality and Bias Risk

The quality of the studies was based on the GRADE instrument [14]. The quality of the evidence was classified as high, moderate, low, or very low, according to the risk of bias, clarity of comparisons,

precision, and consistency of the analyzes. The randomized controlled clinical trials (RCTs) have given the highest preference, as it provides high scientific evidence. The risk of bias was analyzed according to the Cochrane instrument [15].

3. Results and Discussion

A total of 133 studies were recruited and submitted to eligibility analysis and, after that, 29 studies were selected, including official public health guidelines and regulations. To the published articles, studies of high to medium quality and with risks of bias were selected that do not compromise the scientific basis of the studies (Figure 1).

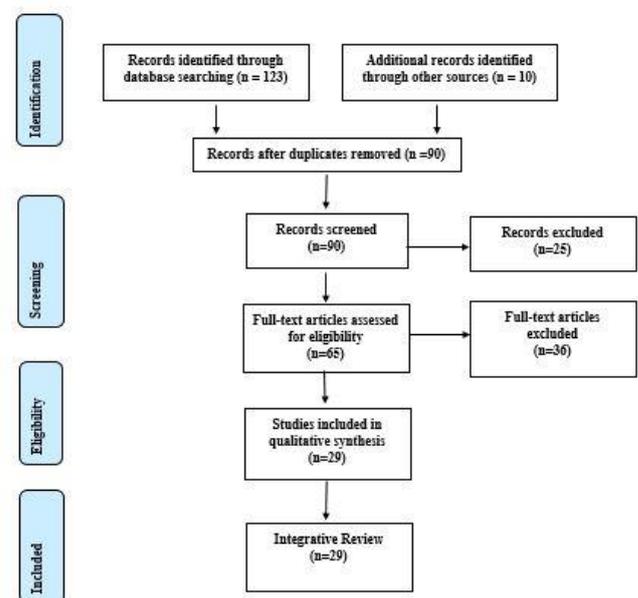


Figure 1. Eligibility of studies.

3.1 General Guidelines Information

Based on the main literary findings, as well as the main public health guidelines published in the world, patients with COVID-19 may present respiratory syndromes very similar to the common influenza virus (influenza), being a challenge for early detection during screening. in emergency departments. One study investigated a total of 1,841 cases with respiratory syndromes. Among these, 70 cases of COVID-19 were subsequently confirmed. The majority (84.2%) were detected in emergency screening because they met the criteria for a suspected case. Of these, 34 met the official selection criteria; another 25 were detected by the broader internal screening criteria. Over the 12 weeks, the cumulative sensitivity of the internal screening criteria was 84.3%, while the sensitivity of the official screening criteria was 48.6%.

There were no cases of nosocomial transmission of exposure in the emergency department. Therefore, frontline physicians need to have room for maneuver to decide on the disposition of cases based on clinical suspicion during an ongoing outbreak of COVID-19, and the use of appropriate PPE is essential to minimize nosocomial transmission [16].

In this context, one of the main concerns of hospitals is to limit the spread of SARS-CoV-2 in hospital environments. As the virus spreads mainly through respiratory droplets, it is imperative to redouble the care with the use of non-invasive ventilation (NIV), high flow nasal cannula (HFNC), and awake pronation (not intubated). As a corollary to this, patients who had increasing oxygen needs were intubated and mechanically ventilated to avoid exposure to aerosol-generating procedures. However, doctors realized that the mortality of invasively ventilated patients was high and it was not easy to extubate many of these patients [17].

In the SARS scenario, supplemental oxygen therapy must be administered immediately to patients with breathing difficulties, hypoxemia, or shock with a SpO₂ target > 94% [18]. Adults with obstruction or absence of breathing, severe respiratory distress, central cyanosis, shock, coma, or seizures must receive airway management and oxygen therapy during resuscitation to achieve SpO₂ ≥ 94%, it is important to start oxygen therapy at 5 L/min and assess flow rates to achieve the SpO₂ target ≥ 93% during resuscitation, or use a face mask with a reservoir bag (10-15 L/min) if the patient is in critical condition [18].

After patient stabilization, the target is SpO₂ > 90% in adults (without pregnancy) and ≥ 92% -95% in pregnant patients. In children with emergency signs (obstruction or shortness of breath, severe respiratory distress, central cyanosis, shock, coma, or seizures) they must receive airway management and oxygen therapy during resuscitation to achieve SpO₂ ≥ 94%, otherwise, the goal is SpO₂ ≥ 90%. The use of a nasal cannula is preferable in young children, as they can be better tolerated [19].

Still, it is indicated to use conservative treatment of intravenous fluids with caution in patients with SARS when there is no evidence of shock [20], as aggressive resuscitation of fluids can worsen oxygenation, especially in environments where the availability of mechanical ventilation is limited. It is also indicated to administer antibiotics within one hour of the initial assessment of patients with sepsis, as well as to collect cultures within one hour before starting

the antibiotic [21,22]. In addition, it has been indicated not to routinely administer systemic corticosteroids for the treatment of viral pneumonia or SARS outside clinical trials, except for other reasons [23]. Another important indication is the performance of laboratory tests and electrocardiogram (ECG) at the patient's admission, to monitor complications, such as acute liver injury, acute kidney injury, acute cardiac injury, or shock [24].

3.2 Hypoxemic Respiratory Failure

Severe hypoxemic respiratory failure occurs when a patient with difficulty breathing has failed standard oxygen therapy. Advanced oxygen/ventilation support must be provided. If these patients require O₂ via a nasal catheter greater than 5 liters/minute to sustain SpO₂ > 93% and/or have a respiratory rate > 28 irpm or CO₂ retention (PaCO₂ > 50 mmHg and/or pH < 7.25) they should be intubated and mechanically ventilated immediately [25].

Also, the procedure with endotracheal intubation is necessary if the patient does not respond to oxygen therapy. However, it is necessary to redouble the care in patients such as small children or people who are obese or are pregnant as they can quickly desaturate during intubation, requiring pre-oxygenation with an inspired fraction of oxygen (FiO₂) at 100% for 5 minutes, for using a face mask with a reservoir bag [26].

Furthermore, patients submitted to invasive mechanical protective ventilation may be ventilated in controlled volume or pressure mode with a tidal volume equal to 6 mL/kg of predicted weight and plateau pressure less than 30 cmH₂O, with distention pressure or driving pressure (= plateau pressure minus PEEP) less than 15 cmH₂O [5]. It is also necessary to adjust the smallest enough PEEP to maintain SpO₂ between 90-95%, with FiO₂ < 60% (using ARDSNet's PEEP / FIO₂ table for low PEEP. It was found that the use of higher PEEP proved to be causing pulmonary hyperinflation and worsening of the evolution of part of the patients with COVID-19 [5].

Also, the prone position can improve oxygenation, but patient safety must be guaranteed. In cases of PaO₂ / FIO₂ less than 150, with adequate PEEP according to the PEEP / FIO₂ table, it is suggested to use protective ventilation by placing the patient in a prone position for at least 16 hours. To perform the rotation and to maintain the patient in a prone position, adequate sedoanalgesia should be

provided and, if necessary, curarization. The patient can remain supine if, after being "unresponsive", he remains with $\text{PaO}_2 / \text{FIO}_2 > 150$. Otherwise, one can consider placing the patient in a prone position again [5].

3.3 Interventions to Avoid Complications

Severe hypoxemic respiratory failure occurs when a patient with difficulty breathing has failed standard oxygen therapy. Advanced oxygen/ventilation support must be provided. If these patients require O_2 via a nasal catheter greater than 5 liters/minute to sustain $\text{SpO}_2 > 93\%$ and/or have a respiratory rate > 28 irpm or CO_2 retention ($\text{PaCO}_2 > 50$ mmHg and/or $\text{pH} < 7.25$) they should be intubated and mechanically ventilated immediately [25].

In critically ill patients, NIV, mechanical ventilation, or extracorporeal life support is considered if necessary [27]. In this sense, the main treatments are highlighted as hemodynamic management, with vasopressor support, nutritional support, blood glucose control, prompt assessment and treatment of nosocomial or concomitant bacterial pneumonia, prophylaxis against deep vein thrombosis and

gastrointestinal bleeding, and proper patient positioning to assist in oxygenation and ventilation (Table 1).

In this sense, data from China and Italy suggest that patients with hypoxemic COVID-19 respond well to PEEP, indicating a crucial role of NIV as a therapeutic and palliative measure to prevent intubation. Retrospective analyzes in China indicate that up to 30% of the admitted patients needed NIV, and in Italy, they indicate values close to 31% [27]. In addition, a retrospective study of 1,591 consecutive laboratory-confirmed patients with COVID-19 and referred for admission to the ICU in Milan in Italy showed that the majority were older men, a large proportion required mechanical ventilation and high levels of PEEP, and ICU mortality was 26% [28].

Also, another retrospective study looked at the relationship between obesity and SARS-CoV-2, looking at the relationship between clinical characteristics, including body mass index (BMI) and the need for invasive mechanical ventilation (IMV) in 124 consecutive patients admitted to intensive therapy by SARS-CoV-2, in a single French center.

Table 1. Interventions to avoid patient complications.

Interventions	Management
<i>Reduction of invasive mechanical ventilation</i>	<ul style="list-style-type: none"> ❖ Daily assessment of spontaneous breathing capacity; ❖ Minimize sedation, continuous or intermittent;
<i>Reduce incidence of ventilator-associated pneumonia</i>	<ul style="list-style-type: none"> ❖ Prefer oral intubation to nasal intubation; ❖ Keep the patient in a semi-reclining position (head elevated between 30 ° and 45 °); ❖ Use closed suction system; ❖ Use a new ventilation circuit for each patient; ❖ Change the humidifier when there is a malfunction, following the manufacturer's recommendations; ❖ Reduce the time of invasive mechanical ventilation.
<i>Reduce incidence of venous thromboembolism</i>	<ul style="list-style-type: none"> ❖ Use pharmacological prophylaxis in patients without contraindications.
<i>Reduce incidence of blood catheter infection</i>	<ul style="list-style-type: none"> ❖ Create a reminder of the date of insertion of the catheter and its removal when it is no longer needed.
<i>Minimize the occurrence of decubitus ulcers</i>	<ul style="list-style-type: none"> ❖ Promote a change of position every two hours

Source: World Health Organization (adapted) [1]

Obesity (BMI > 30 kg/m²) and severe obesity (BMI > 35 kg / m²) were present in 47.6% and 28.2% of cases, respectively. Overall, 85 patients (68.6%) required IMV. The proportion of patients who needed IMV increased with the BMI categories ($p < 0.01$, chi-square test for trend), and was higher in patients with a BMI > 35 kg / m² (85.7%). In multivariate logistic regression, the need for IMV was significantly associated with male gender ($p < 0.05$) and BMI ($p < 0.05$), regardless of age, diabetes, and hypertension. The proportion ratio for IMV in patients with a BMI > 35 kg / m² versus patients with a BMI < 25 kg / m² was 7.36. Therefore, there was a high frequency of obesity among patients admitted to intensive care with COVID-19. The severity of the disease worsened with an increase in BMI. Thus, obesity is a risk factor for the severity of SARS-CoV-2, requiring greater attention to preventive measures in susceptible individuals [29]. In this context, it is recommended to expand the storage of NIV devices and ventilators in hospitals in general. Still, it is strongly recommended to provide part of the emergency and inpatient units for patients with COVID-19 [30].

In addition, a study provided recommendations for a systematic approach to the care of patients with AMI during the COVID-19 pandemic. The cardiovascular manifestations of COVID-19 are complex with patients who have AMI, myocarditis simulating a presentation of ST-elevation myocardial infarction (STEMI), stress cardiomyopathy, non-ischemic cardiomyopathy, coronary spasm, or nonspecific myocardial injury and the prevalence of COVID -19 remains unknown with risk of asymptomatic dissemination. During the COVID-19 pandemic, primary PCI remains the standard of care for patients with STEMI in PCI-capable hospitals, when it can be delivered promptly, with a team of specialists equipped with PPE in a dedicated CCL room [31].

In this context, about 20% of patients with COVID-19 have severe coagulation abnormalities, which can occur in almost all severe cases. Concomitant venous thromboembolism (VTE) has been frequently reported in cases of COVID-19. Experts and doctors from China and Europe have developed a consensus-based on evidence and opinions on the prophylaxis and management of VTE associated with COVID-19. This statement is aimed at physicians treating COVID-19 and provides practical recommendations in detailed situations, for example, how to choose thromboprophylaxis measures for patients with different severity of the disease and risk

of bleeding, or what type of anticoagulant should be prescribed. With limited experience in VTE associated with COVID19 [32].

Conclusion

According to the official health agencies of Brazil (Ministry of Health) and the world (WHO/PAHO) and their regulations, it is recommended that patients diagnosed with SARS be hospitalized, and the cases identified with the symptoms of severity hospitalized in an intensive care bed. It was defined that the clinical criteria for hospital discharge should take into account the improvement of the clinical picture, the absence of tachypnea and hypoxia, the absence of O₂ supplementation for at least 24 hours, the hemodynamic stability, the good acceptance of the oral route and the absence of fever. Prophylactic use of antibiotics was not recommended, but use should be considered based on the suspicion of associated bacterial infection.

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Data sharing statement

No additional data are available

Conflict of interest

The authors declare no conflict of interest.

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