

CHALLENGES WITH COVID-19 PATIENTS IN INTENSIVE CARE UNITS

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Abstract

Airway management in patients with COVID-19 presents significant challenges due to the highly infectious nature of the virus and the potential for respiratory failure in severe cases. Effective management strategies are essential, not only to optimize patients' outcomes, but also to protect healthcare providers. This article examines the clinical considerations, procedural adaptations and protective measures required for managing airways in COVID-19 patients, particularly in critical care settings. The collaborative role of the anesthesiologist and nurse practitioner is emphasized, as teamwork enhances efficiency and safety in these high-risk procedures. Nurse practitioners support anesthesiologists through rapid response, preparation of necessary equipment, and ensuring compliance with infection control protocols, allowing anesthesiologists to focus on complex airway interventions.

Techniques like early intubation, high-flow nasal cannula (HFNC) and non-invasive ventilation (NIV) are balanced with the risks of aerosol generation. Additionally, the use of personal protective equipment (PPE) and modified intubation techniques, such as video laryngoscopy, reduce exposure risk. Rapid sequence intubation (RSI) is preferred to limit aerosolization, while prone positioning and lung-protective ventilation strategies manage severe hypoxemia. This structured, team-based approach underscores the vital role of interdisciplinary collaboration in optimizing airway management for COVID-19 patients while safeguarding healthcare personnel. The COVID-19 pandemic has fundamentally transformed airway management practices, emphasizing stricter infection control protocols and adaptations to reduce aerosol generation. Increased reliance on techniques like video laryngoscopy, rapid sequence intubation, and enhanced teamwork among healthcare providers has become essential to minimize exposure and ensure patients' safety in high-risk settings.

Keywords: *airway management; acute respiratory distress syndrome; Sars-CoV-2; covid19.*

Introduction

Securing and managing the airways in patients with COVID-19 posed significant challenge for the entire medical team. On one hand, this was due to the infectious nature of the virus and the severe respiratory complications often associated with the infection. On the other hand, the methods for securing and maintaining the airway had to be carefully considered to minimize the potential transmission of the infectious agent to healthcare workers and other hospitalized patients. Managing airway hygiene and oral cavity care was one of the challenges during the pandemic.

Nurses working in intensive care units possess specialized skills that separate them apart from other healthcare professionals, such as airway management, the use and maintenance of life support equipment including ventilators, and the use of high-flow oxygen therapy devices.

COVID-19, caused by the SARS-CoV-2 virus, primarily affects the respiratory system, which can be manifested in a range from mild upper respiratory infections to pneumonia, and can lead to the development of acute respiratory distress syndrome (ARDS) and respiratory failure. In severe cases, patients may require advanced airway management, including oxygen therapy, non-invasive ventilation (NIV) or intubation with mechanical ventilation. These interventions require careful planning and execution to ensure patients' safety and protect healthcare workers.

One of the main concerns when managing airways in COVID-19 patients is the high risk of aerosol generation, which increases the likelihood of virus transmission to healthcare workers. Procedures such as intubation, extubating, and bag-mask ventilation generate aerosols containing viral particles. This necessitates the use of personal protective equipment (PPE), such as N95 respirators, face shields, gowns and gloves during these high-risk interventions and airway manipulations. Additionally, reducing the number of personnel involved in the procedure and using rapid sequence induction (RSI) can help minimize exposure time and risk.

Regarding airway management techniques, pre-oxygenation, careful planning and skilled intubation are critical to avoid complications. Video laryngoscopy is often preferred over direct laryngoscopy due to the ability to intubate from a greater distance from the patient's airway. The use of mechanical ventilation strategies that align with lung-protective principles, including low tidal volumes and appropriate positive end-expiratory pressure (PEEP), is essential to prevent further lung damage.

Effective airway management in COVID-19 patients, not only provides optimal respiratory support, but also prioritizes infection control measures to protect healthcare workers, making it a key aspect of managing critically ill patients during the pandemic.

Materials and Methods

Oxygen therapy is a key aspect of the treatment of patients with COVID-19, especially those with moderate to severe hypoxia. For the purposes of this study, different types of oxygen

therapy used in COVID-19 patients were reviewed to ensure proper oxygenation and to monitor blood oxygen levels.

Nasal Cannula

Materials: Sterile nasal cannulas are used, which are placed into the patient's nostrils. The cannulas are secured with elastic straps behind the ears and under the chin.

Method: The oxygen flow is adjusted to 1-6 liters per minute, depending on the patient's needs. Oxygen saturation (SpO₂) is regularly monitored to ensure adequate oxygenation.

Simple Oxygen Face Mask

Materials: Simple face masks are used, covering the patient's nose and mouth. The masks are secured with elastic straps or ties behind the ears or around the head.

Method: The oxygen flow is adjusted to 5-10 liters per minute, and oxygen saturation is monitored to ensure sufficient oxygenation.

Non-Rebreather Mask (NRM)

Materials: The non-rebreather mask is used to deliver high concentrations of oxygen. It contains one-way valves that prevent re-inhalation of exhaled air. It has a reservoir bag that fills with oxygen before use.

Method: The oxygen flow is set to 10-15 liters per minute. This method is used for patients with moderate to severe hypoxia, and blood oxygen levels are regularly monitored.

In all cases, for each type of oxygen therapy, standard procedures are followed for equipment preparation, patient's assessment, and monitoring of the patient's response to the therapy. All patients are monitored for signs of discomfort, skin irritation or respiratory distress. Each treatment is documented in the patient's medical chart, noting the oxygen saturation level and any issues encountered during therapy.

Results

The results from the analysis of airway management and therapy for patients with COVID-19 highlight key aspects and challenges faced by nurses and healthcare workers in intensive care units. Key results include:

High Risk of Aerosolization and Virus Transmission: The generation of aerosols during procedures such as intubation, extubating and bag-mask ventilation, increases the risk of virus transmission to the medical team. These procedures require the use of appropriate personal protective equipment (PPE) such as N95 respirators, face shields, gloves and protective gowns to reduce the risk of infection.

Safe Intubation and Ventilation Techniques: Proper execution of pre-oxygenation and intubation, using video laryngoscopy, has proven to be an effective method for safer airway management, with a lower risk of complications in COVID-19 patients. The use of mechanical ventilation with low tidal volumes and appropriate positive end-expiratory pressure (PEEP) helps minimize lung damage.

Non-Invasive Respiratory Support (NIV): Non-invasive ventilation with CPAP and BiPAP was used as the initial respiratory support option for some COVID-19 patients. These methods help reduce the need for invasive intubation and are effective in improving oxygenation. However, they require careful control and monitoring, as they may increase risks such as hypoxemia or inadvertent virus transmission.

Dangers of Severe COVID-19 Patients: Patients with severe COVID-19 often experience impaired breathing and significant lung damage. They require continuous intensive care with mechanical ventilators, while healthcare staff must be trained and prepared to perform complex interventions, such as extubating and the administration of respiratory stimulant medications.

Risk of Hypoxemia and Over-Deep Breathing: Excessive use of high oxygen levels can lead to hypoxemia and organ damage, particularly to the brain and heart. Monitoring oxygen levels and optimizing ventilation parameters is crucial in preventing these complications.

Protocols for Respiratory Support Management: Developing protocols that include clear guidelines for respiratory support and therapy in COVID-19 patients is essential for improving outcomes. Healthcare professionals must be continuously trained on new protocols while working as a team to ensure rapid and accurate diagnosis and treatment.

Need for Continuous Monitoring: Continuous monitoring of vital parameters, such as oxygen saturation, pulmonary function and arterial pressure, is key to preventing complications and detecting deteriorations early. Monitoring and the use of advanced technologies (such as invasive and non-invasive methods for respiratory function monitoring) can be particularly important for healthcare workers.

Overall, the results emphasize the need for thorough preparation and strict adherence to respiratory support protocols during the COVID-19 pandemic, as well as the importance of using innovations and modern methods in medical care to improve patients' outcomes.

Statistics

During the COVID-19 pandemic, data were collected from 160 tested patients in the COVID center of the Intensive Care Unit, all of whom required hospitalization, indicating a hospitalization rate of 100%. This means that all patients had sufficiently severe conditions that required urgent medical intervention. However, out of these 160 patients, 42 died, resulting in a mortality rate of 26.25%. This high mortality rate highlights the seriousness of the disease and the challenges faced by medical teams in treating critical cases.

Table 1. Patients in the COVID Center.

Tested	Hospitalized	Survived	Deceased
160 (100%)	160 (100%)	118 (73.75%)	42 (26.25%)

During hospitalization, 109 patients (68.12% of the total) required oxygen support, indicating that most of the patients faced moderate to severe respiratory distress that required additional

oxygen. Oxygen therapy is often the first line of intervention for patients with respiratory failure, highlighting the seriousness of their condition. Of the 109 patients who required oxygen support, 58 patients (36.25%) progressed to the point where mechanical ventilation was necessary, indicating the severity of their respiratory weakness.

Table 2. Types of Support in the COVID Center.

Hospitalized	Oxygen Support	Ventilator Support
160 (100%)	109 (68.12%)	58 (36.25%)

Respiratory Support:

Non-invasive Mechanical Ventilation (NIV): 52 patients were treated with non-invasive mechanical ventilation (NIV), out of which 42 patients survived, and 10 died. NIV was most used as the first line of therapy for patients with respiratory weakness, as it helps avoid complications that can arise from invasive ventilation, such as infections or airway injuries.

Mechanical Ventilation (MV): 18 patients required mechanical ventilation (MV), indicating the severity of their condition. Only two of these patients survived, while 16 died. This difference in outcomes emphasizes the severity and risks associated with mechanical ventilation.

Table 3. Outcome of Respiratory Support:

Type of Ventilation n/%	Deceased	Survived
NIV (Non-invasive Mechanical Ventilation) 52 (100%)	10 (19.23%)	42 (80.76%)
MV (Mechanical Ventilation) 18 (100%)	16 (88.8%)	2 (11.11%)

The data from the COVID Center show a high percentage of hospitalization and mortality among patients with COVID-19, highlighting the severity of the disease and the need for intensive respiratory support. However, non-invasive mechanical ventilation (NIV) demonstrated significant effectiveness in treating patients with respiratory weakness, while mechanical ventilation (MV) carries greater risk and a higher mortality rate. These statistics emphasize the importance of early detection and treatment of respiratory issues, as well as the need for continued efforts to optimize respiratory interventions.

Conclusion

The COVID-19 pandemic significantly impacted airway management in healthcare settings, primarily due to the risk of virus transmission through aerosol-generating procedures. Healthcare workers implemented enhanced protective measures, such as wearing full personal protective equipment (PPE), including N95 masks, face shields, and gowns, particularly during intubation and extubating.

Airway management protocols shifted towards methods that minimize aerosol spread. For example, non-invasive ventilation methods like CPAP and HFNC were used cautiously, often in negative pressure rooms, when possible, to reduce exposure. Additionally, intubation became a priority over manual ventilation whenever feasible, and rapid sequential intubation (RSI) became more common to limit the duration of close contact with patients. Video laryngoscopy also gained importance as it allowed maintaining a greater distance during intubation. These changes improved healthcare worker safety but added complexity and required more resources in airway management practices.

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