

Diagnosis and Management of COVID-19 Disease

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ABSTRACT

The SARS-CoV-2 virus is likely from a zoonotic source. Transmissibility between humans occurs primarily through droplets and surface contacts. Persons with the virus may shed it while symptomatic or asymptomatic. Although incubation period is up to 12 days, median duration of viral shedding can be up to 20 days. Clinical symptoms vary widely and may be mild (80%), moderate (15%), or severe (5%).

Keywords: COVID-19; Coronavirus; SARS-CoV-2; Respiratory syndrome; RNA virus

STUDY ANALYSIS

On March 30th, 2020, Healthcare Provider Education Rapid Response document was published in American Journal of Respiratory and Critical Care Medicine by American Thoracic Society's Rapid Response Document team. In this paper the authors reviewed evidence-based literature pertaining to the diagnosis and management of COVID-19 disease caused by novel SARS-CoV-2 virus in a succinct and factual order. The following is a short summary of their document.

The novel coronavirus was named as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) due to its homology (80%) to SARS-CoV which caused severe respiratory illness and high mortality in 2002-2003. Coronaviruses are enveloped, positive sense, single-stranded RNA viruses of ~30kb, which are largely divided into four genera: α , β , γ , and δ based on their genomic structure. The α and β coronaviruses infect only mammals. Human coronaviruses such as 229E and NL63 belong to α genera and produces common cold and croup. SARS-CoV, Middle Eastern respiratory syndrome coronavirus (MERS-CoV) and SARS-CoV-2, on the other hand cause severe respiratory disease, high morbidity and mortality and are classified as β coronaviruses. Structural and functional analysis reveals that spike of SARS-CoV-2 binds to angiotensin converting enzyme 2 (ACE2) receptors on cell membrane. ACE2 is highly expressed in lung epithelial cells, heart, kidney, endothelial cell and gastrointestinal tract. This feature has clinical significance. The virus likely originated from a zoonotic source. Transmissibility between humans occurs primarily through droplets and surface

contacts. Persons with the virus may shed it while symptomatic or asymptomatic. Although incubation period is up to 12 days, median duration of viral shedding can be up to 20 days. Clinical symptoms vary widely and may be mild (80%), moderate (15%), or severe (5%). Severe cases have required intensive care management with mechanical ventilation [1]. Most patients deteriorate gradually with a median of 9 days from symptom onset to ICU admission. Symptoms include: cough, fever, shortness of breath, loss of smell or taste, nausea, vomiting, diarrhea, and fatigue. It is important to note that initial presentation may not be with respiratory symptoms. Common laboratory findings include: leucopenia, lymphopenia, thrombocytopenia, high BUN: creatinine, transaminitis, hyperbilirubinemia, and presence of a normal procalcitonin level. Inflammatory markers are often elevated later in the course of disease including elevated levels of: C-reactive protein, ferritin, lactate dehydrogenase, D-dimer and interleukin 6. On imaging infiltrates are often bilateral. Early in the course of disease they may not be present. The infiltrates are peripheral and patchy on chest radiograph. On chest CT findings include bilateral ground glass opacities, crazy paving, and consolidation. Importantly, chest CT should not be routinely done to avoid unnecessary exposures during transport. Diagnostic testing includes nasopharyngeal swab for SARS-CoV-2 polymerase chain reaction testing (RT-PCR) and testing for usual respiratory pathogens as co-infection is possible [2]. Major Respiratory societies have recommended against performing sputum induction, bronchoscopy, spirometry or PFTs in COVID-19 patients due to concerns for viral spread.

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Once the patient has been diagnosed with infection or is under investigation, it is imperative to place them in enhanced droplet and contact precautions immediately and restrict visitors. All healthcare professionals caring for the patients should be trained and follow appropriate Personal Protective Equipment (PPE) guidelines which include standard, contact and droplet precautions (including face and eye protection) and airborne precautions for aerosolizing procedures such as intubation, extubation, non-invasive positive pressure ventilation (NIPPV), open circuit suctioning, bronchoscopy, and aerosol treatments.

General treatment suggestions are to avoid nebulizers and substitute with inhalers, consider alternatives to non-steroidal anti-inflammatory agents, monitor for and treat cardiomyopathy and cardiogenic shock which have been reported as a late complication of COVID-19 in up to 33% of patients [3]. If patient has been on ACE-I or ARBs, these should be continued based on several Cardiology societies recommendations. Steroids are indicated if a patient presents with COPD or asthma exacerbation, develops refractory shock, or evidence of cytokine storm.

Patients presenting with hypoxia should be provided oxygen by nasal cannula or simple mask or non-rebreather masks. Consideration should be given to timing of intubation to avoid both the use of aerosolizing NIPPV and emergent intubations. The best strategy is rapid-sequence intubation using video laryngoscopy and avoiding bag-mask valve if possible due to risk of droplet spread. It is recommended to connect suction and capnography in advance to avoid circuit breaks and using high-efficiency particulate air (HEPA) filters between endotracheal tubes and CO₂ detectors to minimize circuit breaks. If the acute respiratory distress syndrome (ARDS) develops in these patients a lung protective ARDS.net strategy employing positive end-expiratory pressure should be implemented. Patients with severe ARDS should be considered for prone position therapy and/or paralysis. Extracorporeal Membrane Oxygenation (ECMO) can

be considered if conventional ARDS management fails. Prognosis appears to be worse with increasing age, co-morbidities including diabetes, cardiovascular disease (including hypertension), and chronic lung disease, higher admission sequential organ failure assessment (SOFA) score and those with elevated D-dimer, ferritin, and troponin. Pregnant women and children appear to have a better prognosis [4].

Many investigational therapies have been used off-label as there is no U.S. Food and Drug Administration (FDA) approved drugs specifically identified for COVID-19. There is paramount interest in finding a cure and Information on registered clinical trials for COVID-19 in the U.S. is available at: <https://clinicaltrials.gov/>. The following strategies are recommended to slow the rate of SARS-CoV-2 spread: Contact tracing, social and physical distancing, quarantine of suspected cases and exposed individuals [5].

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