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Coronavirus

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Introduction

Novel coronavirus (COVID-19) emerged late in 2019. COVID-19 is known as a severe respiratory illness which is caused by a new coronavirus named severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2 (Shetty, 2020). Since emergence, COVID-19 has become a pandemic illness that is easily spread through respiratory droplets from human to human (Shetty, 2020). In addition to severe respiratory illness, patients who contract COVID-19 may also experience complications such as cardiac arrhythmia, myocardial injury, kidney injury, shock, multiple organ dysfunction, and death in many instances (Shetty, 2019). COVID-19 has also been responsible for neurologic symptoms such as dizziness, headache, stroke, epilepsy, and impaired consciousness (Levy & Suarez, 2020). COVID-19 was chosen because it is a new illness that has had insurmountable effects throughout the world. COVID-19 has disrupted every area of human normalcy, will go down in history, as well as recreate a new normal for daily living and medical care.

Signs & Symptoms

According to Liang and Acharya, 2020, COVID-19 presentation can include the following:

- Fever
- fatigue
- myalgia
- dry cough
- shortness of breath.

Other symptoms could include:

- runny nose
- Diarrhea
- sore throat
- nasal congestion (Liang & Acharya, 2020)

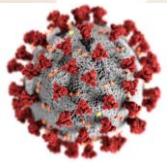

Figure 1. (Center for Disease Control and Prevention, 2020)

Underlying Pathophysiology

- Coronavirus belong to the Cornoviridae family and are "nonsegmented, enveloped, positive-sense, single-strand ribonucleic acid viruses" (Kooraki et al, 2020)
- According to Dr. Ashok Shetty (2020) "The pathogenesis of SARS-CoV-2 has been suggested to include the recognition of the angiotensin I converting enzyme 2 receptor (ACE2) by its spike protein, and priming of its spike protein by the cellular transmembrane protease, serine 2 (TMPRSS2) facilitating host cell entry and spread (Shetty, 2020)
- ACE2 can be found in the heart, liver, kidney, and digestive organs (Shetty, 2020). Consequently, SARS-Co V-2 can enter multiple organs and further extenuate the illness. Some patients are requiring ICU care as the result of the spread and damage to multiple organs (Shetty, 2020)
- Persons who have been confirmed to have COVID-19 can suffer from acute respiratory distress syndrome and can require the need for additional oxygenation up to and including mechanical ventilation (Shetty, 2020)
- Some patients are also experiencing further complications such as:
  - Myocardial injury
  - Arrythmia
  - Acute kidney injury
  - Shock
  - Death resulting from multiple organ dysfunction due to the SARS Co V-2 virus (Shetty, 2020)
- COVID-19 is a direct virus infection that "infects cardiomyocytes and replicates intracellularly" creating cardiomyocyte degeneration as well as necrosis that can result in loss of cardiac function and arrythmia (Li, et al, 2020)
- Limited vascular tone could be mistaken for vasculitis with hypercoagulability resulting from liver dysfunction and vascular endothelial (Levy & Suarez Sanchez, 2020)
- D-dimer results can be used as an indicator of magnitude of disease that could signify disseminated intravascular coagulation (DIC) with a sudden increase in the marker (Levy, 2020)
- ALT, AST, LDH, ferritin, bilirubin, ammonia, myoglobin, creatinine kinase and cardiac troponin may also increase with tissue injury and as organs become affected (Levy & Sanchez, 2020)
- Individuals with COVID-19 may also experience a cytokine storm due to elevation of numerous proinflammatory cytokines which leads to:
  - Edema
  - Air exchange dysfunction
  - Acute respiratory distress
  - Secondary infection
  - Potential death (Shetty, 2020)
- A cytokine storm happens because of "inflammatory mediators, monocytes, and macrophages activation of the inflammatory cell store lease proinflammatory (stress activated) cytokines (Li, et al, 2020)
- Activated cytokines in turn "act on leukocytes, lymphocytes, platelets, and vascular endothelial cells to secrete inflammatory mediators, which can increase blood C-reactive protein, a2-macroglobulin, and fibrinogen levels while decreasing albumin and transferrin levels", (Li et al, 2020). This process produces circulation to be in a high-output, low resistance state (Li, et at, 2020)
- Once the inflammatory cytokines level reduces, the high output low resistance state as well as peripheral circulation are lightened and the blood circulation can return to normal which also reduces hypotension and tachycardia (Li, et al, 2020)
- Viral RNA has been detected in the urine and renal tissues of some patients positive for COVID-19 further demonstrating negative effects from the virus (Murbank & Nasari, 2020)
- COVID-19 can adversely affect the central nervous system (CNS) by infecting the endothelial cells in the blood brain barrier or cerebrospinal fluid (Acarli et al, 2020)

Significance of Pathophysiology

COVID-19 viral illness is caused by SARS Co V-2 virus. It is spread mostly via droplets within 3 feet of origin; however, the droplets could span out to 6 feet (Kooraki et al, 2020). The incubation period of COVID-19 is 2-14 days; however, an infected person can spread the illness via droplets prior to being symptomatic (Liang & Acharya, 2020). Anyone at any age can become sick from COVID-19. Senior citizens are more susceptible to COVID-19 and the many complications. Patients who have pre-existing comorbidities such as hypertension, cardiovascular and/or cerebrovascular disease are at higher risk to develop a severe case of COVID-9 that may require ICU care (LI et al, 2020).

Pregnant women are more susceptible to viral infections due to immune suppression; however, limited data suggests there may not be transplacental transmission to the unborn fetus (Liang & Acharya, 2020). The disease process of COVID-19 is quite dynamic that can lead to shock as a result of ischemia and hypoxia in multiple organs and a reduction in circulation (Lin et al, 2020).

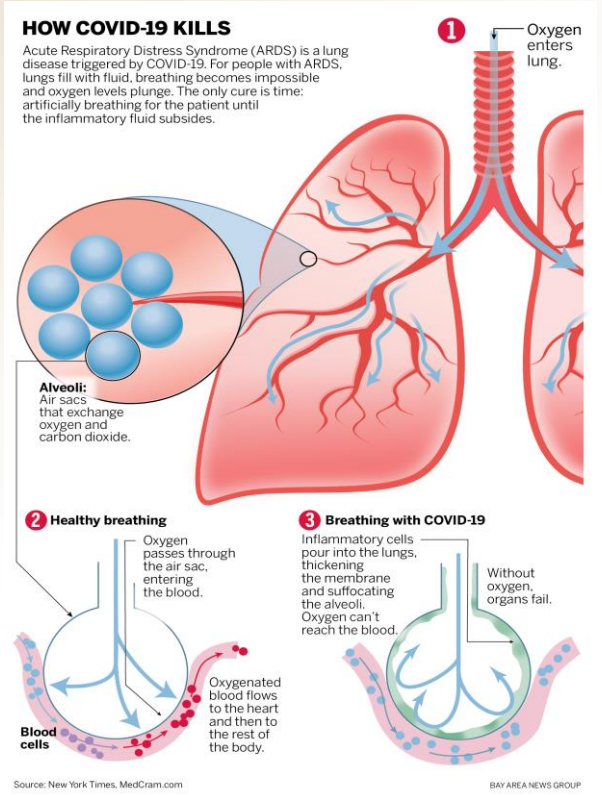

Figure 2. (The Mercury News, 2020)

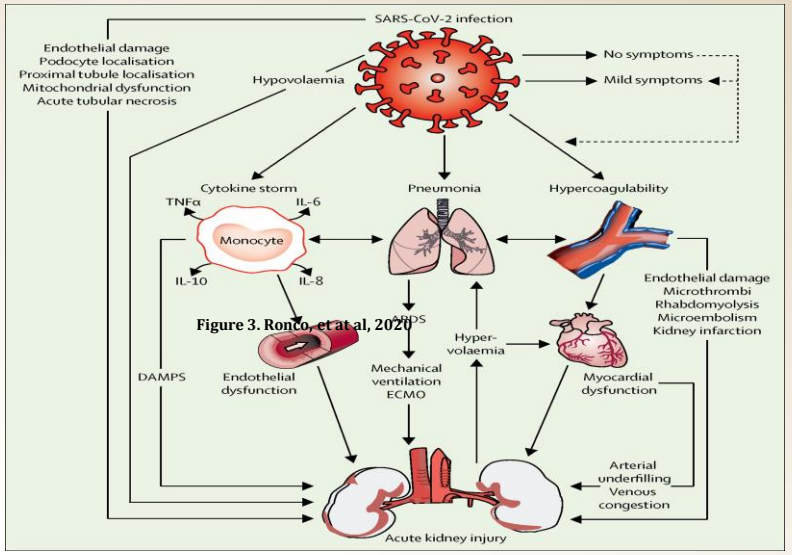

Figure 3. Ronco, et at al, 2020

Figure 3. (Ranco et al, 2020)

Nursing Implications

- Currently there is not a cure or vaccination for COVID-19. Several medications have been tested and have shown to improve symptoms in some instances, but not all
- If a patient requires hospitalization for COVID-19, they need to be admitted to a negative airflow room (Liang & Acharya, 2020)
- The best protection against COVID-19 is regular hand hygiene, social distancing, and for medical staff-wearing proper PPE when caring for this patient group (Shahid et al, 2020)
- Care should be clustered, and exposure should be minimized
- If a patient needs to be transported throughout the hospital, they should wear a mask until returned to negative airflow room (Kooraki et al, 2020)
- Patients are experiencing sadness and isolation as caregivers are afraid to go near them, family visitation is not allowed unless the patient is at the end of life, and patient's must always remain in their room with doors shut (Dhavale et al., 2020)

Conclusion

COVID-19 is a novel virus that has spread throughout individuals worldwide and has been declared a national pandemic. COVID-19 is spread through respiratory droplets from symptomatic as well as asymptomatic human carriers. COVID-19 impairs breathing and can inflict complications that effect and damage multiple organs and can result in death. Individuals, businesses, and educational systems have undergone major change in operations to fight against the spread of COVID-19. Hand hygiene, social distancing and proper use of PPE are the best defenses against COVID-19. If patients require hospitalization, they must be placed in an isolation room and can struggle with being isolated from being able to leave their room or see family. Currently, there is not a cure for COVID-19, but research, testing, and trials are being conducted to learn about COVID-19 and to discover treatment that could minimize the effects or cure COVID-19.

References

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