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SARS-CoV-2 or COVID-19

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SARS-CoV-2 or 'COVID-19'

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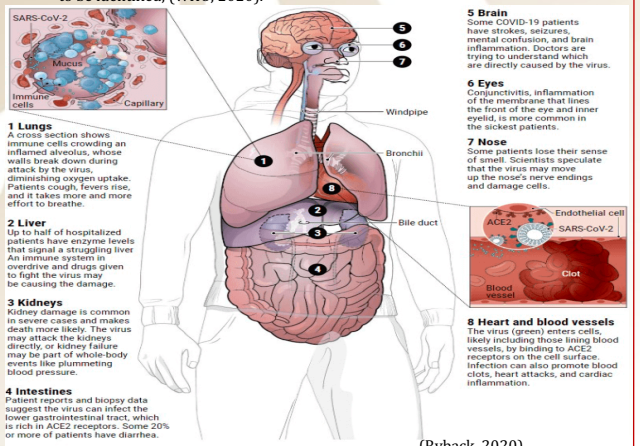
Introduction

- The novel corona virus of 2019, commonly referred to as *COVID-19* or *COVID*, was first reported in the Wuhan province of China in November of 2019 and rapidly spread throughout the world to be declared a global pandemic by the World Health Organization (WHO) by March of 2020, (CDC, 2020b).
- *COVID* belongs to a common family of viruses labelled as corona viruses and the official name of the *COVID* virus is Severe Acute Respiratory Distress Syndrome Corona Virus 2 or SARS-CoV-2, (Ahmed et al., 2020).
- Most cases (80%) are mild and those affected have been able to recover at home without needing hospital care or treatment, (WHO, 2020).
- The more severe cases exhibit an excessive and diffuse inflammatory response called a 'cytokine storm' which can lead to multi-system organ failure (MSOF) and even death, (Hellinger et al., 2020; Picchianti et al., 2020).
- *COVID* continues to show unpredictable virulence, and the long-term effects of those with severe *COVID* infections are still yet to be identified, (WHO, 2020).



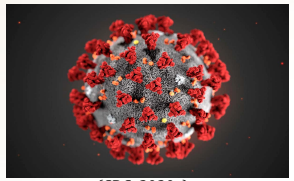
(Ryback, 2020).

Pathophysiology

- *COVID* belongs to the corona virus (CoV) family which is a large family of single-stranded RNA viruses that can be isolated from various animal species, and for reasons still unknown, can cross the species barrier, causing illness in humans ranging from the common cold to more severe illnesses, (Cascella et al., 2020).
- CoV viruses have shown to be the primary pathogen responsible for recent respiratory disease outbreaks across the world such as the SARS outbreak that originated from Asia in 2003, and the MERS outbreak that originated in Saudi Arabia in 2012, (Cascella et al., 2020; CDC, 2017; CDC, 2019).
- *COVID-19* is theorized to have originated in bats but has yet to be determined.
- *COVID* is transmitted similarly to the flu and rhinovirus, through small, heavy respiratory droplets from the nose and mouth expelled by coughing and sneezing, (Cascella et al., 2020; WHO, 2020).
- Aerosol transmission can occur in closed spaces, such as when performing procedures like intubation and bronchoscopies, (Cascella et al., 2020).
- Respiratory droplets containing *COVID* fall quickly to the ground and can be found on hard surfaces such as plastic and metals for up to 2-3 days, (Cascella et al., 2020; WHO, 2020).
- Incubation period ranges from 3-7 days on average, with a median of approximately 5 days and up to 14 days, (Cascella et al., 2020).
- *COVID* shows a unique affinity for targeting endothelial cells through angiotensin converting enzyme-2 (ACE-2) receptors, which can be found on tissues throughout the human body, using the main point of entry as the lungs and including other areas such as the brain, heart, GI tract, kidneys and vasculature system, (Ahmed et al., 2020; Gamboa et al., 2020; Hellinger et al., 2020; Matsushita et al., 2020; Samanta et al., 2020; Sardu et al., 2020; Stiwicki et al., 2020).
- Serious cases of *COVID* appear to stimulate an excessive immune reaction, activating a cytokine-mediated immune response leading to what is termed a *cytokine storm*, which activates multiple pro-inflammatory cytokines causing diffuse tissue damage and dysfunctional coagulation leading to MSOF and sometimes even death, (Cascella et al., 2020; Hellinger et al., 2020; Picchianti et al., 2020).
- Most notable cytokines identified so far are interleukin-6 (IL-6)-which is linked to the observed high fevers and MSOF, D-dimer, C-reactive proteins, Ferritin, TNF-a and multiple other interleukins, (Cascella et al., 2020; Matsushita et al., 2020).
- This diffuse inflammatory process produces a hypercoagulable state causing many micro-emboli that contribute to MSOF seen in severe *COVID* cases, and clots have been discovered in almost every organ on post-mortem autopsies of *COVID* patients, (Rapkiewicza et al., 2020; Sardu et al., 2020).

Significance of Pathophysiology

- With the lungs and respiratory tract as the main point of entry for, *COVID* the inflammatory process can produce varying levels of pneumonia, and a severe inflammatory response can lead to life threatening Acute Respiratory Distress Syndrome (ARDS), requiring mechanical intubation and extremely aggressive pulmonary measures to keep the body and vital organs adequately oxygenated until recovery is obtained, (Cascella et al., 2020; Stawicki et al., 2020).
- Chest imaging such as x-ray and CT scans tend to show diffuse, bilateral, ground-glass opacities despite a diagnosis of pneumonia, (Cascella et al., 2020; Stawicki et al., 2020).
- Severe infections can lead to sepsis and shock, contributing to an even higher coagulable state, (Cascella et al., 2020).
- Due to *COVID*'s nature to attack endothelial cells, inflammation can cause injury to many other organs, most notably the brain, heart, GI tract, kidneys and vascular system.
- Brain effects include encephalitis, viral meningitis, Guillain-Barre Syndrome and acute cerebral vascular disease and strokes, (Ahmed, et al., 2020).



(CDC, 2020a).

- Cardiac effects include myocardial injury (MI), heart failure and arrythmia's, which are seen mostly in the ICU setting versus the non-ICU setting and can lead to mixed forms of shock and increase the risk of venous thromboembolism (VTE) (Matsushita et al., 2020).
- Effects on the GI tract can vary widely and be as mild as diarrhea as a result of the inflammation in the colon to hepatic encephalopathy or hepatitis as a result of liver dysfunction or failure, (Gamboa et al, 2020; Hellinger et al., 2020; Samanta et al., 2020).
- Acute Kidney Injury (AKI) remains one of the most common and severe complications seen with *COVID*, often requiring the use of continuous renal replacement therapy (CRRT) to replace the normal kidney function until recovery is established, and AKI contributes to a higher rate of mortality with *COVID*, (Sardu et al., 2020).
- One of the most profound effects of *COVID* is the formation of a hyper-coagulable state and rate of micro-venous-thromboses or clots, despite full anti-coagulation with medicine and clots have been found throughout the body, including the brain, heart, liver and kidneys, on those patients whom a post-mortem autopsy was performed, (Matsushita et al., 2020; Rapkiewicza et al., 2020; Sardu et al., 2020).

Signs & Symptoms

MOST COMMONLY SEEN

- Fevers
- Chills
- Shortness of breath or difficulty breathing
- Dry Cough
- Fatigue, (CDC, 2020d; WHO, 2020)

MILD AND LESS COMMONLY SEEN

- Aches/Pains
- Nasal congestion
- Headaches
- Conjunctivitis
- Sore throat
- Diarrhea
- Loss of taste and/or smell
- Rash on skin
- Discoloration of fingers and/or toes
- Nausea
- Vomiting, (CDC, 2020d; WHO, 2020).

Treatment

There is no current cure or vaccine to prevent *COVID*-19.

Prevention of *COVID*-19 is the primary focus and includes measures such as frequent hand hygiene, social distancing, and avoiding touching your face and mouth, (Cascella et al., 2020; WHO, 2020).

Most cases (~80%) are able to recover on their own at home, but the small population that requires medical attention receive supportive care such as supplemental oxygen and other aggressive measures used in shock states and organ failure, (Cascella et al., 2020; Stawicki et al., 2020; WHO, 2020).

Currently, there are many controversial treatments being researched:

- Corticosteroids such as Dexamethasone has shown to decrease death by 1/3 in recent RCT's.
- Ant-virals such as Remdesivir
- Anti-viral/Immunomodulators' such as Chloroquine, Hydroxychloroquine along with macrobids like Azithromycin have been used to help decrease viral load.
- Serotherapy such as *convalescent plasma* which is donated by patients who have recovered from *COVID*-19 and contains protective anti-viral antibodies for *COVID*.
- Inflammatory inhibitors to block the activation of macrophages and T-cells to help prevent/manage cytokine storm, (Cascella et al., 2020; Picchianti et al., 2020; Stawicki et al., 2020).

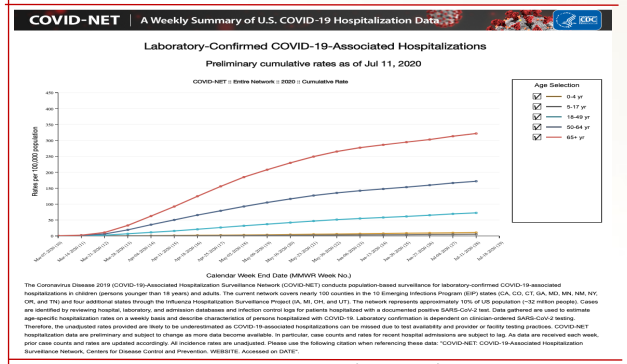
Conclusion

The ramifications and total effects of *COVID*-19 are still yet to be determined, and more data and research is needed to fully understand the impact that this virus will have on the world.

The long-term effects from surviving this virus are still unknown, and as more information is obtained, new medical practices and treatment strategies will evolve.

Implications for Nursing

Nurses are the frontline staff delivering direct patient care in times of pandemics and are frequently at risk of exposure due to the closeness in which nurses and patients must be in, in order to provide care. Despite a feeling of professional obligation to care for people during a pandemic, nurses may feel concerns over the personal risks this entails, such as the personal risk of infection, transferring infection to family members and risks from logistical issues associated with insufficient personal protective equipment (PPE) and rapid and frequent policy changes to accommodate the fluctuating circumstances throughout a pandemic, (Fernandez et al., 2020). Once nurses perceive their personal risk too high, they may decide to leave the workforce, creating a staffing shortage, contributing to the heightened levels of stress in those staff that decide to stay at the bedside, (Fernandez et al., 2020). Frontline staff involved in pandemics experience stress associated with being separated from their family, heavier workloads, staffing shortages, continuous policy changes and moral and ethical dilemmas not usually present outside of pandemic situations, (Fernandez et al., 2020). Nurses must not only balance their own personal stress and fears associated with the pandemic, but also experience dealing with stress from their co-workers and family members of patients that project their own fears and frustrations during a pandemic, (Fernandez et al., 2020). Nurses must also deal with the rapidly evolving and changing policies and guidelines that may create confusion and again increase the nurse's sense of personal risk during a pandemic, (Fernandez et al., 2020). Nurse's tend to be resilient and rely on each other to help each other out in times of need, expressing experiences comparable to those of being on a battlefield, (Fernandez et al., 2020). Multi-faceted approaches should be utilized, such as providing clear and concise information about the contagion and policy changes, maintaining appropriate PPE, providing time for nurses to step away from work to focus on necessary family obligations and promoting or providing opportunities for nurses to focus on their physical and mental health during a pandemic, so that stress, fatigue and burn-out can be prevented to help avoid a critical loss of nursing in the workforce during a pandemic, (Fernandez et al., 2020).



(CDC, 2020c)

References

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