Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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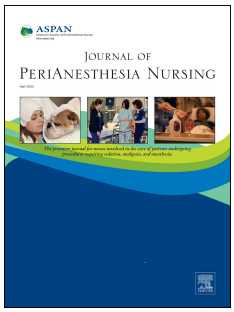

Covid-19: Impact on Perianesthesia Nursing Areas

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Covid-19: Impact on Perianesthesia Nursing Areas

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Covid-19 is an acronym for Corona (Co) Virus (Vi) Disease (D) and the year that the novel virus was detected in humans, 2019. The official name for this virus is SARS-CoV-2, as it is capable of causing severe acute respiratory syndrome (SARS) with early signs ranging from no symptoms to fever and dry cough. While the first cases in China were reported on December 31, 2019, it was not declared a pandemic by the World Health Organization until March 11, 2020 (WHO; www.who.int). At the time of publication, there have been confirmed reports of Covid-19 on every continent except Antarctica. This is, however, a rapidly evolving health emergency, so readers are advised to regularly follow credible sources of information to stay abreast of current recommendations (www.cdc.gov; www.who.int). The purpose of this article is twofold: to describe coronaviruses and discuss the impact of emerging biologic threats on perianesthesia nursing areas.

Coronaviruses

Human coronaviruses, which are named corona (from the Latin for crown) for their appearance under electron microscopy, were first discovered by Tyrrell and Bynoe in 1965[1]. There are four main sub-groupings of coronaviruses, known as alpha, beta, gamma, and delta[2]. The alpha and beta viruses only infect mammals and the gamma and delta viruses infect birds, but some can also infect mammals. Coronaviruses cause a significant amount of disease in animals, such as dogs, cats, rats, mice, rabbits, pigs, horses, cows, camels, bats, snakes, and chickens[3-5]. Before 2019, there were only six known coronaviruses that could infect humans, including the viruses responsible for SARS (SARS-CoV, the beta coronavirus that caused the severe acute respiratory syndrome outbreak in 2002) and MERS (MERS-

CoV, the beta coronavirus that caused the middle east respiratory syndrome outbreak in 2012). Prior to the SARS and MERS outbreaks, coronaviruses were thought to cause variations of the common cold, with mild, self-limiting respiratory symptoms. SARS-CoV-2 or Covid-19 is the seventh known coronavirus that can infect humans and is particularly dangerous for three primary reasons: contagion rate, lack of immunity in any country, and degree of pathogenicity. A fourth factor, healthcare infrastructure and surge capacity, will be discussed under impact to perianesthesia areas.

The word virus comes from Latin and means "dangerous substance". Coronaviruses, like other viruses, cannot live without a host cell. Once inside a host cell, the virus uses the host cell to produce more viruses. The scale of any outbreak depends on how quickly and easily the pathogen is transmitted. This rate is called the basic reproduction number or R_0 and is an estimate of how many healthy people one contagious person will infect. While the science is still evolving, it is believed that the Covid-19 R_0 is between 2 and 4. This means that without effective containment measures, an infected person can infect between two and four other individuals. Covid-19, thus, is believed to be more contagious than both the seasonal flu (R_0 1.3) and SARS (R_0 3.0).

The coronavirus is a medium-sized RNA enveloped virus and is spread by droplets and direct contact, and in a small study was also shown to remain airborne for hours[6]. Additionally, the coronavirus is hardier than non-enveloped viruses and can remain infectious on inanimate surfaces for up to 9 days[7]. Unfortunately, many who are infected are showing subclinical signs and symptoms or are completely asymptomatic, causing unintentional spread of the disease through communities. An additional complication is that the incubation period for Covid-19 is believed to range from 2 to 14 days, and patients may still shed virus for as long as 15 to 30 days after the onset of the infection[8]. In North America, Covid-19 is spreading in communities while there are still flu and common colds circulating, as well as seasonal allergies, making this disease, especially for those with mild symptoms, hard to detect. There have also been many challenges with widespread testing, making confirmation of infection difficult

and, in some cases, impossible. Finally, because this virus is new to humans, there is no immunity to the disease. As the virus spreads through the population, the number of humans left to infect decreases. The growth rate of an outbreak in progress is described by its effective reproduction number or R_E. Once R_E falls below 1, the virus will stop spreading, which is also known as suppression[9]. It is expected that as many as 80% will eventually contract the disease, but the goal in suppressing the virus is to flatten the epidemiological curve of Covid-19, thus relieving the dangerous overcrowding and strain of the healthcare system.

Covid-19 primarily infects epithelial cells within the lung and can be classified as an infectious inflammatory disease. While there have been many descriptions of illness ranging from no symptoms to severe symptoms, it is clear that this virus is capable of producing great pathogenicity. In a patient with a severe case of Covid-19, an acute respiratory distress syndrome (ARDS) picture can rapidly evolve, requiring endotracheal intubation and life-sustaining interventions with mechanical ventilation. ARDS is an acute inflammatory lung injury that is due, in part, to activation of circulating neutrophils that migrate to the lungs and release the content of their cytoplasmic granules. This release at the cellular level is called the respiratory burst and is designed to kill microorganisms, but unfortunately this burst also damages the capillary walls in the lungs, leading to the production of an inflammatory exudate. The exudate leads to fibrin accumulation, which causes structural remodeling and pulmonary fibrosis in survivors[10].

Patients with severe cases of Covid-19 may also experience septic shock symptoms, such as massive inflammation and systemic vasodilation, due to an overwhelming response to the pro-inflammatory cytokines that are released with a large viral load[3]. Patients with severe disease tend to deteriorate rapidly and require critical care interventions, such as lung-protective ventilation, conservative fluid strategies, periodic proning, and extracorporeal membrane oxygenation for refractory hypoxemia[11]. The fatality rate varies widely depending on the type of patient (e.g., age, comorbidities, BMI, and the

number of involved organs). The strain of virus is also important, as coronaviruses are capable of rapid mutation and recombination[12]. At the time of publication, there was no definitive treatment or approved vaccine, although there are hundreds of clinical trials underway and many prophylactic vaccines in the research and development pipeline.

Impact of Emerging Biologic Threats on Perianesthesia Areas

Emerging biologic threats, such as Covid-19, have already impacted perianesthesia areas. In many centers, elective surgeries have been cancelled to spare resources and to utilize the operating rooms (ORs) and pre- and post-anesthesia care units (PACUs) for overflow patients requiring mechanical ventilation and/or monitored care. Preoperative and PACU nurses are being asked to care for unfamiliar patient populations, often working short-staffed and on overtime. Additionally, nurses are working with inadequate amounts and types of personal protective equipment (PPE), as well as coping with the fear and anxiety of contracting the illness themselves and passing the disease on to friends and family. This issue of *Journal of Perianesthesia Nursing* has two articles devoted to the true heroes of this pandemic and highlighting the extraordinary care that perianesthesia staff are delivering under suboptimal and frightening times.

This pandemic has caused chaos and disruption at every level, including the large numbers of patients with symptoms of Covid-19 that need treatment. Virtually, all healthcare facilities have policies and procedures in place for infection control practices and specific operational plans for handling a large influx of potentially infectious patients in the event of a significant outbreak, however, this pandemic has tested our systems. Surge capacity refers to the flexibility within a healthcare facility to accommodate a large number of patients. ORs and PACUs are often designated surge areas within a healthcare facility, because of their physical layout: ORs and PACUs have oxygen and gas hookups, suction, monitoring capabilities, and anesthesia circuits that can be transformed into ventilators. Additionally, many PACUs are staffed with nurses who have critical care background/training and/or are currently ACLS certified.

However, having a critical care background does not mean that the PACU nurse feels competent and capable of caring for a surge patient.

Perianesthesia nurse leaders should ensure that staff has the proper education and training to care for surge patients, including how to don and doff PPE and how to safely care for an unfamiliar patient population (and the associated devices and therapies). Clear emergency policies and standards of care need to be created, especially if altered staffing models are used (such as a two-tiered nursing approach in caring for critically ill patients in surge areas with non-critical care nurses) or if nurses are deployed to other settings or units, to ensure that staff are competent and protected within their new scope of altered practice.

Unfortunately, it is anticipated that global outbreaks will only increase in frequency. As the human population grows and encroaches upon more remote areas, it is expected that the risk of zoonotic infections (disease spread from an animal vector to a human) will increase[13]. Additional factors that may contribute to an increase in global outbreaks include: globalization, urbanization, agricultural intensification, consumerism of exotic/rare foods and plants, and increased human consumption of animal proteins leading to deforestation and destruction of buffer zones between wildlife areas and inhabited human areas. As the science continues to evolve and as this pandemic wanes, there will be many debriefings and analyses of lessons learned. We must all participate in these sessions and give voice to our concerns, as there is a great likelihood that we will face another outbreak at some point and we must be better prepared. The consolidation and contraction of the healthcare sector has led to a lean workforce, just in time supplies, and fewer hospital beds and surge capacity overall. This pandemic has demonstrated the fragility of our health and healthcare system but has thankfully also highlighted our collective humanity.

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