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Emergency Nursing Care of Patients With Novel Coronavirus Disease 2019

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Contribution to Emergency Nursing Practice

- The current literature on COVID-19 is rapidly developing.
- This article contributes a review of the current knowledge and application of the science on COVID-19.
- Key implications for emergency nursing practice are that coronavirus disease can lead to hyperacute and refractory respiratory failure in a minority of patients, with the elderly and those with diabetes, heart, or lung comorbidities at most risk.

Abstract

Novel coronavirus disease 2019 is the disease caused by the novel coronavirus originally from Wuhan, China. Its pathophysiology is poorly understood, but it is known to be contagious and deadly. Multiple symptoms and complications from the disease have been described, with the most common complaints being respiratory. Nursing care of patients with novel coronavirus disease 2019 is largely supportive, but it should include a strong focus on mitigating the spread of infection to staff, other patients, and the community.

Key words: Coronavirus disease; Coronavirus; COVID-19; Emergency nursing; Severe acute respiratory syndrome

Introduction

The novel coronavirus disease 2019 (COVID-19) is a respiratory viral disease that has rapidly spread worldwide. It is associated with an international pandemic, largely because of its rapid spread, its high mortality, and the lack of a cure or vaccine. Given its rapid spread, it is likely that emergency nurses will encounter patients with known or suspected COVID-19. This article is a review of COVID-19, specifically directed at the emergency nursing care of these patients.

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Biology

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a positive-sense RNA virus and is the cause of COVID-19. Coronaviruses are common causes of mild respiratory illnesses in children and adults. Several novel strains or mutations of coronaviruses in the past decades have arisen, namely severe acute respiratory syndrome (SARS) of 2003[1] and Middle Eastern respiratory syndrome of 2012.[2] These novel strains are often associated with high mortality and virulence. These previous strains did not reach the international spread that COVID-19 has; thus they did not cause such widespread destruction nor reach pandemic status.

The novel coronavirus poses "spike proteins" that bind to the angiotensin converting enzyme (ACE) 2 receptor, which is found on endothelial cells including those in the lung, blood vessels, and gastrointestinal tract. The action of these spike proteins is thought to be the major cause of disease in COVID-19. In addition to respiratory disease, vascular issues such as clotting and gastrointestinal issues such as vomiting and diarrhea have been reported in patients who are positive for COVID-19. Furthermore, stool samples have been shown to test positive for viral RNA and could be contagious.

This virus is known to be spread by means of large respiratory droplets, similar to other respiratory viruses.[3] The evidence for indirect transmission is growing,[4] and there is ongoing debate about whether the virus undergoes "aerosol"

transmission.[5] Typical breathing, sneezing, and coughing may cause some aerosolization of viral particles, but the data on whether this occurs and whether these particles are infectious continue. Most authorities would agree that "aerosol-generating procedures" (eg, intubation, bag mask ventilation, and bronchoscopy) put health care workers at risk of aerosol spread of infection. Research on the risk of transmission with noninvasive ventilation (eg, continuous positive airway pressure [CPAP], bilevel positive airway pressure [BiPAP], and high-flow nasal cannula [HFNC]) is ongoing.

It is generally accepted now that fomites (ie, objects or surfaces) can carry viral particles for many days: 3 hours in the air, 4 hours on copper, 24 hours on cardboard, and 2 days to 3 days on plastic and stainless steel.[5] Scientists in Wuhan found high numbers of viral particles in the restrooms, as well as near air vents and on the floor and the shoes of health care workers.[5,6] Another finding was that blood can also carry viral RNA in patients who are symptomatic, are asymptomatic, or have recovered from COVID-19.[7-9]

History and Spread

Most authoritative sources believe that COVID-19 began in Wuhan, China. There is ongoing debate and research into its exact origin in Wuhan.[10] Nonetheless, the first case identified was reported on December 31, 2019; however, contact tracing and viral analysis has shown the potential for cases as far back as November 2019.[6,11] The World Health Organization raised COVID-19 to "highest risk" on February 28, 2020[12] and declared it as a pandemic on March 11, 2020.[13] In the United States, travel restrictions were initiated on January 23, 2020[14] and a national emergency in the US was declared on March 13, 2020. This led to nearly all states to implement some level of social distancing recommendations and nonessential business closures.

Risk Factors

Risk factors for contracting the disease remain largely unexplored. Younger patients seem to have a better prognosis, with most children relatively unaffected, and older patients have mortality rates as high as 15% (208/1,408) in one study.[15] Although most children are largely unaffected by primary infection, there have been recent reports of delayed severe immunologic complications in children, termed multisystem inflammatory syndrome in children (MIS-C).[16] Obesity is another major predictor of poor prognosis, more so than many other "diagnosed" medical conditions.[17] High blood pressure, diabetes, heart disease, and lung disease are also predictors of poor prognosis.[18] Heart disease seems to confer more risk than lung disease.[18] In addition, smoking has been shown to be a minor risk factor in several studies.[19]

The Centers for Disease Control and Prevention (CDC) continues to advocate that patients who are immunocompromised are also at an increased risk of severe disease,[20] though there is not great evidence to support this.[21] It makes intuitive sense to take extra caution with patients who are immunocompromised. Similarly, patients with cancer, both those with active disease and those in remission, are shown to be at a risk of poor prognosis (ie, intubation and intensive care).[22]

Pregnancy is another high-risk situation, mainly because of the unknown risk to the mother and the fetus/newborn with an underdeveloped immune system. In addition, many patients who are pregnant are asymptomatic and found on routine screening.[23] Pregnant women can, rarely, become critically ill. There is no known risk of transmission of the virus across the placenta or in breastmilk; however, research is ongoing.[24] For example, recent pathologic examination of the placentae of 16 mothers who were positive for COVID-19 showed increased vascular damage, but none of these children tested positive for COVID-19.[25] A report of babies born to mothers known to have COVID-19 showed that 3 of the 33 babies were positive.[26] Two developed pneumonia, and one had a critical course that was likely owing to prematurity and not COVID-19. Therefore, CDC recommends that providers and facilities consider "temporarily isolating" babies from their mothers if the mother is known to have COVID-19.[27]

The use of medications such as nonsteroidal anti-inflammatory drugs (eg, ibuprofen, naproxen, aspirin), ACE inhibitors (eg, lisinopril, captopril), and angiotensin receptor blockers (eg, olmesartan, valsartan) has been suggested to be associated with a poor prognosis.[28] No data support this, and it is largely a theoretical risk owing to the fact that COVID-19 binds to the ACE2 receptor. Consensus is that patients with chronic illnesses should continue their medications, specifically their antihypertensive medications.[29]

Congregate settings have emerged as niduses of outbreaks,[30] particularly nursing homes,[31,32] but also homeless shelters[33] and jails.[34,35] Once a congregate setting is identified to have more than 1 COVID-19 infection, all patients from that facility should be considered "exposed" and treated as such.

Presentation

Most patients who present for medical care will have flu-like symptoms (fever 42%-91%, cough 50%-86%, fatigue 51%-70%, myalgias 35.4%, and shortness of breath

30%).[18,36-38] Other flu-like symptoms of sore throat, headache, and stuffy nose are also known but less common.[37] Cough seems to be the most common first symptom.[36] As few as 44% of patients will have a documented fever on arrival, with 80% to 90% developing a fever during hospitalization.[39] Subjective fevers appear to be a more common presentation.

Some more rare presentations of COVID-19 have been observed. Diarrhea seems to be a rare but known presenting symptom,[7,40] but up to 70% of patients will develop some gastrointestinal symptoms (nausea, vomiting, diarrhea, anorexia, abdominal pain, gastrointestinal bleeding).[41] Loss of smell (anosmia) and loss of taste (ageusia) are also known presentations of COVID-19.[42]

The viral incubation (time from exposure to symptoms) is typically 2-14 days.[36,43] Most patients will have contact with a person who is known or potentially positive for COVID-19, but as the disease incidence grows in certain areas, community spread can be presumed. That is, in areas with a high incidence (eg, New York City), all patients can be presumed to have had contact with a person with COVID-19.

For patients who develop severe illness, the need for hospitalization typically peaks around day 2-7 of symptoms, approximately day 10 after exposure.[38,44] After admission, the small percentage of patients who develop critical illness will do so remarkably rapidly.[39] Most commonly, patients go from minimal oxygen support to intubation within 24 hours.

Personal Protective Equipment and Staff Safety

The first and foremost role of the nurse is to protect themselves from contracting or transmitting COVID-19. Adequate personal protective equipment (PPE) should be provided to all health care workers, especially emergency nurses. Even when caring for patients who are critically ill, it is important to protect one's self and take the time to don the appropriate PPE, despite instincts to want to render aid immediately. Education and training around appropriate donning (putting on) and doffing (removing) of PPE is essential, as these are times when health care workers are at a high risk of accidental contamination.

Patients with known or suspected COVID-19 should be placed under appropriate isolation precautions on arrival. Ideally, all patients with COVID-19 would be seen in negative pressure rooms with health care workers wearing airborne precautions (ie, an N95 mask or powered air-purifying respirator [PAPR]). This has proven to be impossible in most areas because of the limited number of these resources. In general, airborne precautions are required for patients with known COVID-19 undergoing aerosolizing procedures, such as cardiopulmonary resuscitation or intubation. Other PPE requirements will be based on local incidence, resources, and local and national guidance. Nurses should review their hospital's policy on what level and type of PPE are required for which risk-level patients. Many hospitals have begun reusing previously single-use PPE, as noted by CDC.[45] CDC has also released a recommendation regarding mask sterilization,[46] which many hospitals are now trialing. Mask sterilization is a process of cleaning and reusing what were previously single-use masks.

Inadequate PPE, the reuse of PPE, and mask sterilization can cause great anxiety for nursing staff as they are concerned for their health and safety. Transparency regarding PPE supply and clear communication regarding reuse and storage of PPE are important for hospital leadership.

In patients with known or suspected COVID-19, both the number of people in the room and the time spent in the room should be minimized. Therefore, several hospitals have placed visitor restrictions. However, despite this, many hospitals have added innovative uses of technology for patients to communicate with family and friends. An example of this would be tablet devices and use of online meeting or communication applications. In addition, many nursing and medical schools have removed students/learners from clinical experiences to reduce exposure and PPE use. Nurses should focus on clustering care as much as possible to limit their time in the room and the number of times they enter and exit rooms. To further cluster care, patients should be given a way to communicate with their care team that does not involve entering the room; this may include a call bell system, a room phone, or a tablet device. It is important to communicate clear expectations for clustered care to patients, as patients may already feel isolated, but nurses also need to protect themselves from unnecessary exposure. Another way to lessen anxiety and loneliness of patients is to have identifiers on PPE. For example, a disposable name tag or permanent names on face shields.

In the emergency department, nurses often encounter patients who are critically ill. The instinct of many emergency nurses, in particular, is to run toward a patient who is critically ill and initiate assessment and care. It is important that nurses and other health care workers take a couple extra seconds to apply appropriate PPE before any resuscitation. This is supported by interim guidance from the American Heart Association.[47] Nurses must care for themselves to be healthy and available to care for future patients.

The proper donning and doffing takes additional time and often requires an additional staff member to assist with

doffing or act as a runner to grab additional supplies or medications and send laboratory tests. Our hospital encourages a "spotter," particularly during doffing, so any violations of sterility can immediately be identified and remedied. We also use erasable markers to write messages to team members outside the room on glass doors.

The transport of patients will also need to be protocolized. This will need to be from triage to rooms and within the hospital. For in-hospital transport, careful consideration should be given to the number of staff needed, patient and staff PPE, and routes and elevators. Multiple staff will likely be needed for transport.

Triage and Primary Assessment

The primary initial evaluation of patients includes an adequate screening program. What this includes will vary depending on burden of disease in a specific area. Many triage screening tools for COVID-19 initially started with travel or known contact screening. More recently, areas with a larger number of patients have switched to a symptom-based screening system. Screening should include questions regarding known contacts but also places of residence, bearing in mind that many congregate settings have been causes of rapid community spread. Any patient with fever or respiratory symptoms should be wearing a mask or face cover of some sort. Ideally, a surgical mask, but even cloth masks, are acceptable in areas that are short on PPE for health care workers. Ambulance arrivals will also need to be screened for COVID-19. Clear communication with prehospital staff before arrival and a standardized plan for transport for high- and low-risk patients are needed. For example, we ask that high-risk patients on CPAP or BiPAP be taken off of these temporarily while they are being transported through the hallway from an ambulance to a room. Our high-risk respiratory distress patients are then brought directly to a negative pressure room, ideally with the necessary supplies and staff in the appropriate PPE at bedside. These few rooms have a large amount of supplies right outside of the room, but supplies in the room are limited to those needed or expected to be needed for an individual patient.

Nurses will need to prioritize patients who are critically ill. Many patients will hold off on presenting to the emergency department until they are in respiratory distress and possibly require resuscitation or emergent intubation. General appearance and vital signs will be the primary drivers in this assessment. Respiratory rate and pulse oximeter readings will be altered in most patients who are critically ill. Given the risk of rapid decline, patients who are ill-appearing should be expedited for resuscitation and physician evaluation. Note that there is a phenomenon in COVID-19 known as the "happy hypoxic" patient or "silent hypoxemia."[48] These patients appear clinically well but have true saturations as low as 40% to 60%.

Some patients with mild symptoms may present and not need aggressive ED care. There are limited treatment options for patients who do not need hospitalization. Home care and quarantine are often sufficient. Some emergency departments are offering testing for COVID-19, others go through the state's Department of Health. There are also drive-up options for patients who are well. These well patients will often be young, healthy patients with normal vital signs. Sometimes they can be sent to "fast track" areas of the emergency department. Other emergency departments have set up tents or their own drive-through options for limited testing. Bear in mind that obtaining a nasal swab is considered an "aerosolizing procedure" and would need full aerosol PPE (N95 or powered air-purifying respirator) and preferably be done outside for well patients. Good swabbing technique is needed as detailed in later text.

Given the risk of rapid decline, patients with known or suspected COVID-19 who will be in the emergency department for an extended period of time should be placed on continuous monitoring and pulse oximetry. Further assessment of patients in the emergency department should include duration of symptoms and risk factors as mentioned previously. Lung auscultation is controversial, as stethoscopes can be fomites that carry disease. Some providers have advocated to forego lung auscultation in patients with suspected COVID-19 who will be having imaging.[49] In general, patients with COVID-19 have bilateral findings on examination. Skin findings (rashes and "COVID toes")[50,51] and neurologic findings (altered mental status, dizziness, headache, and loss of taste/smell)[52] can also be found.

Diagnostic Testing

The most common test for active infection in symptomatic patients is a nasal swab polymerase chain reaction. This is an aerosolizing procedure, which requires appropriate PPE to obtain. Obtaining this test appropriately based on the manufacturer's specification can yield improved sensitivity for detecting small amounts of virus. A refresher or training

TABLE
Laboratory values in coronavirus disease 2019[58,59,106-108]

Laboratory value	Direction in COVID-19	Meaning
White blood cell count	Any direction	If elevated, may point to bacterial source
Platelets	Low	Can be seen in many viral infections
Lymphocytes	Low	Can be seen in many viral infections
Liver functions (AST, ALT)	Mildly elevated	Can be seen in many viral infections
Procalcitonin	Low, Normal	If elevated, suggests bacterial source
Lactate dehydrogenase	Mildly elevated	Likely owing to mild liver injury
C-reactive Protein	Mildly elevated	Inflammatory marker, very elevated suggests poor prognosis or bacterial source
D-dimer	Elevated	Elevation suggests poor prognosis and may suggest thromboembolism
Ferritin	Elevated	Inflammatory marker, but very elevated thought to be more specific for COVID-19 and may suggest poor prognosis
Interleukin 6	Elevated	Elevated suggests very poor prognosis and may be an early indicator of ARDS

ARDS, acute respiratory distress syndrome; AST, aspartate transaminase; ALT, alanine transaminase; COVID-19, coronavirus disease.

session for correct nasopharyngeal swabbing technique could be beneficial to ensure the appropriate technique among nurses to obtain accurate tests and ensure the quality of sample collection remains high. This technique includes inserting the swab to an adequate depth and for an adequate amount of time (normally 30 seconds). If done correctly, this test should be slightly uncomfortable for patients and may cause them to withdraw their head, sneeze, tear, or cough. There are many different tests approved by the Food and Drug Administration, but most of these tests have limited clinical data on their accuracy.[53] Sensitivity is as low as 65% to 70%, and repeat testing for patients who are high risk may be needed.[54,55] There is no practical human data on test specificity, though it is thought to be highly specific.[56]

Most patients will obtain a chest X-ray. This can show signs of viral pneumonia and severe illness. The most common finding on a chest X-ray is peripheral opacity, but other findings are possible such as focal pneumonia or pleural effusion. A chest computed tomography (CT) scan can be very sensitive for finding signs of COVID-19, even more sensitive than nasal swabs.[54] However, using computed tomography for patients with COVID-19 presents another contamination risk and is not universally used because of this. The use of point-of-care ultrasound by emergency physicians has been proposed to alleviate these concerns[49,57] but is not yet widely adopted, likely owing to similar concerns of contamination. Many patients will have shortness of breath and may need an electrocardiogram to evaluate for cardiac injury or other causes of shortness of breath.

There are a variety of laboratory tests that are associated with the diagnosis and the prognosis of COVID-19 (Table). A blood count may often show a normal white blood cell (WBC) count with low lymphocyte count. However, an elevated WBC and a low WBC can also be seen. Platelets may be normal or low.[58] Small elevations in liver functions such as aspartate transaminase (AST) and alanine transaminase (ALT) can be seen. Lactate dehydrogenase (LDH) is also often elevated, thought to be due to injury to the liver.[59] There are typically marked elevations in ferritin and inflammatory markers such as C-reactive protein.[58] D-dimer is often elevated in severe disease and may or may not be associated with deep venous thrombosis or pulmonary embolism.[59] Troponin elevation is associated with myocarditis and poor prognosis.[60,61] To help evaluate for bacterial sources of critical illness, blood cultures are often obtained. Procalcitonin is sometimes obtained as well, as it is often normal in COVID-19 and elevated in bacterial infections. Other cytokine tests have been studied, such as interleukin-6, and have been shown to be good prognostic indicators but are not widely available.[62]

Regardless, a process to obtain and transport blood samples to the clinical laboratory is needed. Each laboratory or hospital may have different requirements. We initially did not use our pneumatic tube system and had samples walked to the laboratory, but we have since started using the tube system. The nurse obtains the sample in the room and then deposits the labeled samples in a specimen collection bag outside the room, held by a gloved, "clean" assistant. The assistant then cleans their hands, changes gloves, and then places the samples in the specimen bag into another bag and into the tube system.

Prevention and Treatment

There is no specific treatment for COVID-19. The treatment is largely supportive. Much of the treatment can be done at home. This includes incentive spirometry or breathing exercises, rest, and adequate fluid intake. Quarantining or isolating at home to prevent spread is of the utmost importance. Patients should be strongly encouraged to avoid going out in public. Food and medications should be delivered, if possible. Patients should distance themselves as far as possible from others (at least 6 feet), and they should wear a mask at all times when they must be around others. Hand washing should be strongly encouraged. Proning is used for intubated intensive care patients with acute respiratory distress syndrome (ARDS), but elective proning has been implemented earlier in a patient's disease course. This has not shown benefit in patients not needing hospitalization, but it might be suggested for home care.[63]

Given the low sensitivity of the nasal swab, patients should be specifically informed that a negative test does not mean that they do not have COVID-19, and they should still quarantine until symptoms have resolved. Length of isolation is of debate. CDC recommends patients stay isolated for 7 days after symptoms start and 3 days after symptoms resolve.[64] The World Health Organization, in contrast, recommends that patients stay isolated for 14 days after symptoms resolve.[65] Quarantining for patients without symptoms but contact with a patient known to have COVID-19 can be as long as 14 days for health care workers[64] but has been relaxed for other essential employees in endemic areas.[66] Most patients will no longer be carrying the virus 2 to 3 days after symptoms resolve,[67,68] but a small percentage can carry the virus for several weeks.[58] Patients should be instructed to adequately disinfect their house when the quarantine is complete, including restrooms and floors.

Patients may require hospitalization, mainly for respiratory support. They should remain in appropriate isolation precautions. Supplemental oxygen is the most common respiratory support needed. Proning should be implemented early, as it appears to symptomatically improve patients.[63] Initially, authorities recommended early intubation of patients with increasing oxygen demands (above 6 liters per minute nasal cannula).[69] This was due to the fear of using noninvasive ventilation, which has a risk of aerosolizing viral particles, and the thought that patients needing this level of respiratory support would need intubation in the near future anyway. More recently, some have argued for CPAP/BiPAP or HFNC to delay or prevent intubation.[70] Providers in endemic areas have noted, owing to low supply of ventilators, that avoiding intubation for even 1 day frees up much needed resources. Furthermore, recent data have shown a low risk of aerosol transmission when using HFNC.[71] This low risk can be further enhanced by ensuring that the patient is wearing a surgical mask over the cannula and applying viral filters onto BiPAP for CPAP circuits (and ventilators). These procedures are considered aerosol-generating and should be performed with the appropriate PPE and isolation. In addition, for invasive and noninvasive ventilation, as with all care, the number of providers in the room should be limited. For example, 1 physician is at the head of the bed for intubation and 1 respiratory therapist and 1 nurse are at the foot of the bed to assist and approach the bed only when needed.

Many of these patients progress to severe ARDS and need intubation. The presentation of ARDS in these patients has been described as atypical.[72] Ventilator settings should be low tidal volume to avoid lung injury.[73] The ideal level of positive end-expiratory pressure (PEEP), though, continues to be debated, even among experts.[73] Patients with ARDS are frequently given steroids. Steroid treatment was initially associated with increased mortality in some observational studies with COVID-19 and was avoided; however, recent prospective data have shown steroids to be beneficial to patients requiring supplemental oxygen or intubation.[74] In addition to elective proning of nonintubated patients, proning is used in many intubated patients on the basis of arterial blood gas findings. Proning intubated patients requires a team and a checklist to avoid complications, such as line removal or pressure injuries. Aggressive intravenous fluid resuscitation is generally avoided in patients with COVID-19 to avoid further hypoxemia associated with even mild pulmonary edema.

Given that there is a delay in results from testing for COVID-19, many patients are placed on empiric antibiotics in case a bacterial source is causing their critical illness. Indeed, bacterial superinfection is often found in critical patients who die with COVID-19.

There are more than 100 ongoing studies of more than 20 potential treatments for COVID-19 registered in clinicaltrials.gov. Many of these have biological methods by which they may work or are laboratory studies,[75,76] but there are very few human studies. Perhaps the most well-known drugs are either chloroquine or hydroxychloroquine (Plaquenil). These are both antimalarial drugs. Chloroquine is generally less tolerated than hydroxychloroquine owing to worse adverse effects. Hydroxychloroquine is also used to treat autoimmune diseases such as lupus and rheumatoid arthritis. There is no overwhelming evidence that this drug works for COVID-19 in human trials. The most common adverse effect with this drug is QT prolongation, which can rarely lead to fatal arrhythmia.[77,78] These patients may be on several

other drugs with this effect, such as azithromycin or propofol. Patients receiving hydroxychloroquine for COVID-19 should be on cardiac monitor and have regular checks of their QT interval. Other adverse effects include hypoglycemia, seizures, and irreversible eye damage (retinopathy).[79] Several trials have been stopped early because of worsened outcomes or no benefit with chloroquine or hydroxychloroquine treatment.[80,81]

Remdesivir is an antiviral drug that was studied for dengue fever and is under investigation for COVID-19.[82] No high-quality human studies have been published. Unlike hydroxychloroquine, remdesivir does not have a Food and Drug Administration–approved indication and is only available for compassionate use or in clinical trials. Adverse effects of this drug include mostly liver enzyme elevation. Another antiviral drug lopinavir/ritonavir (Kaletra) has also been studied. A large randomized controlled trial showed no benefit, so this drug has largely been abandoned.[83]

Convalescent plasma is a treatment that has garnered much attention for the treatment of patients who are critically ill with COVID-19.[84] Convalescent plasma has been around since the 19th century and was used for infections before antibiotics. It was also trialed in previous viral outbreaks.[85,86] In this treatment, the blood plasma of patients who have recovered from COVID-19 is tested for antibodies. If antibodies are present, the blood product is drawn and stored and then matched from donor to recipient. The thought is that this plasma gives the recipient patient antibodies to combat the virus. The case series of the first 5 patients showed improvement results.[87] As noted previously, quality research on this treatment is ongoing.

Several vitamins, minerals, and supplements are also being investigated. Zinc has been shown to have antiviral properties and reduce symptoms in other viral respiratory illnesses.[88,89] Intravenous vitamin C is an antioxidant that has controversial evidence in septic shock and is being studied for COVID-19.[90] Vitamin D and melatonin have also been hypothesized to be helpful and are also being studied.[91,92]

Complications

Many complications have been reported in patients with COVID-19. Certainly, rapid respiratory decline is the most common.

Large and small venous and arterial blood clots have been reported, as has coagulopathy.[93,94] Patients have microthrombi found on autopsy[95] but also have overt deep vein thrombosis and pulmonary emboli.[96] Nurses should be mindful to carefully evaluate for signs of clotting, such as unilateral swelling or redness. Arterial clots have also been reported, including strokes,[94] therefore neurologic, vascular, and skin assessments are also important. Anticoagulation therapy, mostly with heparin, is rapidly becoming a universal treatment in these cases. Sometimes, elevations in D-dimer are used to determine the dosing of anticoagulation (prophylactic, half dose, and full dose).

Patients have been reported to have a high incidence of propofol infusion syndrome.[97] Intubated patients on propofol rapidly develop high triglycerides. This can cause pancreatitis and exacerbate clotting owing to the viscosity of blood. This can sometimes be seen clinically when obtaining blood samples that appear to be fat-laden. In this situation, propofol must be immediately stopped, and an alternative sedative must be chosen.

Patients with critical illness will often progress to multiorgan system failure. At this point, prognosis is extremely poor and most of the patients with multiorgan system failure will die. Patients may have renal failure requiring dialysis or renal replacement therapy. Others will experience cardiomyopathy and may need extracorporeal membrane oxygenation.[98,99] Patients survive to extubation and then, days later, develop fatal cardiomyopathy, thought to be due to myocarditis. Patients who require intensive care often have prolonged stays on the ventilator and in the intensive care unit.[100] Given the intense resources required for these interventions, the high mortality, the risk of spread to health care workers, and the fact that many hospital systems in endemic areas are overwhelmed with resource limitations, there has been discussion of rationing care[101,102] and universal do-not-resuscitate orders in some areas.[103-105] Nursing care must include engaging the care team, patient, and patient's family in excellent communication about palliative care options, advanced directives, and end-of-life desires for the patient and family.

Other Notes

It is important to remember that just because this pandemic is rampant in many areas, not all patients presenting with respiratory symptoms will have COVID-19. Although many emergency departments have drastically decreased volumes, patients will continue to have bacterial pneumonia, heart failure, heart attacks, and other viral illnesses. The care of these patients must not be compromised nor forgotten with the current focus on COVID-19.

Furthermore, nurses must be mindful of caring for themselves. The stress of working in the environment of

COVID-19 can take a toll on a nurse's health. There are increased demands on the job, risk of transmitting the virus home, and limited health care resources that may need to be rationed. Rest, exercise, and other self-care activities are of utmost importance at times such as these. Although the term used in official communication is "social distancing" a more accurate term would be "physical distancing." Social interaction is very important to continue. Interaction with colleagues at work helps provide social connection; however, nurses need to be mindful to check on each other and keep communication with friends and family active.

Conclusion

COVID-19 is an international pandemic with many implications for nursing care in the emergency department. The first priority of any nurse should be to protect themselves with the appropriate PPE. The research on COVID-19 is preliminary and speculative, including most treatments. Health care resources may be overwhelmed at times, which may require alterations in previous policies and protocols. Many patients with COVID-19 will be asymptomatic or minimally symptomatic and can isolate and care for themselves at home. The elderly and those with other medical conditions are most at risk for severe illness and respiratory distress. Nursing care should focus on limiting the exposure and spread of the virus. The remainder of care is largely supportive. This may include early proning, supplemental oxygen, or intubation.

Author Disclosures

Conflicts of interest: none to report.

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