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Progress in Prevention

Coronavirus Disease (COVID-19)

Implications for Cardiovascular and Socially At-risk Populations

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The novel coronavirus disease (COVID-19) emerged in December 2019 and, in less than 3 months, evolved to a worldwide pandemic.[1–3] This virus has spread rapidly, leading to an unprecedented global crisis that shows no signs of abating in the near future. As of Wednesday, April 1, 2020, there were more than 911 308 cases and more than 45 000 deaths reported globally.[4] Confirmed cases in the United States were at 206 207 with more than 4542 deaths.[4] Statistical models predict that more than 260 000 hospital beds will be used in the United States by the end of April 2020.[5] The impact of COVID-19 on our daily lives, work, families, and overall operations is unprecedented in modern times, and the situation continues to change on a day-to-day basis. In addition to constantly evolving information, there are misconceptions among the public about the pathology, etiology, transmission, treatment, and risks associated with COVID-19.

COVID-19 is an infectious respiratory disease caused by the newly discovered pathogen, SARS-CoV-2, a novel RNA-dependent RNA polymerase betacoronavirus that is thought to derive from bats.[6] The incubation period for COVID-19 is thought to be within 14 days of exposure, and transmission occurs from human-to-human contact.[6] The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes.[1]

Our understanding of the pathobiology and clinical presentation of the virus, and risk factors for morbidity and mortality seen with COVID-19, although limited, is rapidly increasing (see Table 1). Up to 25% of those infected are asymptomatic. This creates challenges to prevention efforts because these asymptomatic carriers are often unaware of their COVID-19 status. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people and those with underlying medical problems such as cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness.[3,7] Clinical presentation of severe cases of COVID-19 is characterized by hypoxia, dyspnea, and greater than 50% of lung involvement on imaging. In critical cases, people infected with COVID-19 will experience acute respiratory distress syndrome, multiple-organ failure, shock, and death.[8] At this time, there are no specific vaccines or treatments for COVID-19.[9] The best way to prevent and slow transmission is to be well informed about the COVID-19 virus, the disease it causes, and how it spreads. The World Health Organization and Centers for Disease Control and Prevention (CDC) are reliable public information sources.[10]

Early data suggest that those with COVID-19 and hypertension or cardiovascular disease have a mortality rate of 2 to 3 times higher than the general COVID-19 population, suggesting that they are highly susceptible to more severe effects of the disease.[11] More than 40% of patients hospitalized with COVID-19 in China had an underlying cardiovascular disease.[12] Furthermore, early reports of profound myocarditis and fatal dysrhythmias suggest a deleterious

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TABLE 1 Potential Cardiovascular Complications From COVID-19 Infection

How does COVID-19 infection impact those with an underlying cardiovascular disease?

- The COVID-19 virus mainly targets the lungs and can affect the heart, making it work harder to carry oxygenated blood throughout the body, which increases the risk for heart attack and rapid-onset heart failure.
- COVID-19 infection could exacerbate symptoms of heart failure.
- Viral illnesses are known to destabilize plaques that can develop into blockages in arteries, putting one at an increased risk for a heart attack.
- Patients who are older in age and have comorbid cardiovascular risk factors and those with weakened immune systems who are infected with COVID-19 are at the highest risk for developing serious complications, including death.
- Previous coronaviruses similar to COVID-19 (SARS and MERS) have been linked to inflammation of the heart muscle, which increases the risk for heart attack, myocarditis, and rapid-onset heart failure.

impact of COVID-19 on the cardiovascular systems.[12–14] Acute and chronic cardiovascular complications of pneumonia, which is common with COVID-19, result from various mechanisms, including ischemia, systemic inflammation, and pathogen-mediated damage.[7,15] Chronic cardiovascular conditions may become exacerbated in the setting of viral infection as a consequence of imbalance between an infection-induced increase in metabolic demand and reduced cardiac reserve.[15] Patients with coronary artery disease and heart failure may be at a particular risk as a result of coronary plaque rupture secondary to virally induced systemic inflammation, and rigorous use of plaque stabilizing agents (aspirin, statins, β-blockers, and angiotensin-converting enzyme [ACE] inhibitors) has been suggested as a possible therapeutic strategy.[15] Procoagulant effects of systemic inflammation may increase the likelihood of stent thrombosis, and assessment of platelet function and intensified antiplatelet therapy should be considered in those with a history of previous coronary intervention.[15] It is not clear yet whether heightened systemic inflammatory and procoagulant activity persist after resolution of the COVID-19 infection. In addition, there has been conjecture that ACE inhibitors and angiotensin receptor blockers, ubiquitously used in cardiovascular patients, may increase a patient's susceptibility to the virus.[16] However, currently, the American College of Cardiology and American Heart Association have recommended against preemptively stopping or starting an ACE inhibitor or angiotensin receptor blocker in the setting of COVID-19.[3,10,17] With more than 100 million Americans having some form of cardiovascular disease, there is an urgency to increase awareness among healthcare providers of the potential impact of COVID-19 in this high-risk population.

The CDC released general preventive measures for COVID-19 infection; however, socially at-risk persons and those with underlying cardiovascular and chronic conditions bear the burden of an elevated risk for developing severe complications and death.[9,18] By April 1, 2020, general preventive measures including recommendations for frequent handwashing, social distancing, and curfews or stay-at-home orders have been sanctioned. Hospitals and healthcare systems across the United States have suspended elective surgeries, procedures, and inpatient visits, changing the way people seek and receive healthcare. Facilitated by new legislation, many healthcare providers now offer telemedicine and use mobile health technologies, in efforts to limit exposure to both patients and healthcare providers.[19] These options provide protection and ongoing care for many high-risk individuals but are not feasible for all.

The American Heart Association is advising intensified caution to those with underlying heart conditions including persons with diabetes and those with cardiovascular, chronic lung, and kidney conditions.[9] Additional recommendations from the Heart Failure Society of America and American College of Cardiology are noted (see Table 2).[9,10,17] Evidence to guide clinical decision making is being generated at an extraordinary pace. Hypervigilance and close attention to guidelines are needed during this critical time.

There is substantial concern that socially at-risk persons and those with cardiovascular conditions could experience delays in seeking healthcare as a result of self-isolation, low health and digital literacy, or lack of a primary care medical home.[19] Furthermore, persons who already have limited access to healthcare could be further compromised, specifically those who are ethnic minorities, have a low income, and experience food insecurity and housing instability, with lack of social support and transportation. The increase in self-isolation due to COVID-19, particularly among older persons, may also accelerate risks for cardiovascular, neurocognitive, and mental health problems.[18,20] In addition, there are concerns that this public health crisis may exacerbate discrimination, racism, and stigma because of widespread disinformation across social media and other outlets.[7] Assessment of health disparities after COVID-19 is warranted to fully understand the burden this pandemic has on at-risk populations, including children who have been removed from the school environment as a preventive measure.

All aspects of healthcare delivery are affected by this pandemic.[18] The sudden and rapid advancement of COVID-19 has created an unanticipated risk to healthcare providers. Beyond transmission and contraction of the disease, frontline healthcare providers are at a higher risk

TABLE 2 Considerations for Those With Cardiovascular Disease and Other Chronic Conditions

To maintain optimal cardiovascular health during the COVID-19 pandemic:

- Frequent and consistent hand washing, avoid touching your face, and keeping home surfaces clean.
- Stock up on medications, renew refills or obtain a 90-day supply (if health plan allows), and ensure sufficient supply for an extended time.
- Create a list of emergency contacts and keep this information in an easy-to-find place.
- Consider using delivery services for medication, groceries, and other essential services, if available.
- Take stock of food and beverages, following recommended diet as closely as possible and recognizing that many nonperishable canned foods are high in sodium.
- Remain active at home, as much as possible, by continuing any at-home exercises one can physically tolerate such as walking, jogging in place, and stretching.
- Individuals who believe they have been exposed are advised to self-isolate (quarantine) for 14 days to monitor symptoms.
- Avoid crowds and travel, and limit contact with others (social distancing).
- Follow local and state guidance regarding shelter in-place strategies to stay at home and avoid exposure.

Additional considerations specific to those with an underlying cardiovascular disease:

- Stay up-to-date with vaccinations such as flu and pneumonia.
- Manage stress by taking a few minutes each day to meditate, contact family and friends to stay socially connected, and improve sleep hygiene.
- Consider electronic consulting (telehealth) phone, videoconferencing, or messaging options for "visits" with healthcare providers.
- Continue taking angiotensin-converting enzyme inhibitors or angiotensin receptor blocker medications as prescribed for heart failure, hypertension, or ischemic heart disease.
- Contact health provider immediately if experiencing fever or sore throat, and call 911 if experiencing shortness of breath or warning signs of a heart attack or stroke.
- In the presence of COVID-19 infection, consider need for intensified antiplatelet therapy in those with a history of previous coronary intervention.

for experiencing anxiety, depression, and insomnia, due to burnout and compassion fatigue.[8] The accelerating demands for hospital beds, personal protective equipment, and lifesaving apparatus such as ventilators and continuous renal replacement machines have introduced new financial burdens for otherwise high-resource health systems in the United States. Although there is close daily monitoring of the ongoing global battle against COVID-19, examination of this pandemic's impact on healthcare workers and healthcare delivery systems is warranted.[18] Because of many states enforcing stay-at-home orders, healthcare providers are challenged with changing modes of practice for uncertain lengths of time. Healthcare settings across the nation are expeditiously transitioning from in-person to telehealth visits to retain access to healthcare for those with chronic conditions. Moreover, telehealth visits can be used to reduce visits to the emergency departments for nonurgent matters, a timely intervention to preserve emergency services for those with severe symptoms. If there is a silver lining, it may be the acceleration of the adoption of and expanded reimbursement for telehealth, broadening the reach and increasing the efficiency of chronic disease care.[21] Efforts to sustain these care improvements will be critical after the rapid spread phase of the pandemic.

The COVID-19 pandemic is expected to persist for months. We must become familiar with reliable sources of information such as the World Health Organization and CDC.[9] The multitude of ongoing studies and clinical experience with individuals with COVID-19 will provide us with much needed data to illuminate our understanding of the virus, its impact, and the potential effect of individual risk factors and medications. It is unclear at this time how the COVID-19 will further impact the physical or mental health of individuals after recovery or overall health disparities among socially at-risk populations. As information about COVID-19 is rapidly evolving, it is imperative that healthcare providers reinforce the general prevention guidelines in addition to recommendations for persons with cardiovascular disease by the American Heart Association, Heart Failure Society of America, and American College of Cardiology.[9]

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