



ACC Clinical Bulletin

Cardiac Implications of Novel Coronavirus (COVID-19)

Background on Coronavirus Epidemic^{i,ii,xii}

- COVID-19 was first reported in late December 2019, originating in Wuhan, China
- COVID-19 is a betacoronavirus, like SARS and MERS, presenting as viral pneumonia with a wide range of acuity
- As of February 28, there are 83,863 confirmed cases and 2,867 confirmed deaths across 61 countries; COVID-19 appears to have greater infectivity and a lower-case fatality rate when compared to SARS and MERS
- Although the overall mortality rate remains low, published reports from China may indicate elevated mortality risk for diabetics, hypertensives, patients with underlying cardiovascular disease, and the elderly
- While the majority of COVID-19 cases remain in mainland China, sustained transmission in multiple countries increases the likelihood of a worldwide pandemic
- The US Centers for Disease Control (CDC) expects community spread in the United States; for complete up-to-date guidance, please visit <https://www.cdc.gov/coronavirus/2019-ncov>

Early Cardiac Implications From Case Reports on COVID-19

- Early case reports suggest patients with underlying conditions are at higher risk for complications or mortality from COVID-19; up to 50% of hospitalized patients have a chronic medical illness, 80% of which are cardiovascular or cerebrovascularⁱⁱⁱ
- In the most recent large-scale reporting from China CDC, 25% of patients with complete medical histories have comorbidities, the majority of which are cardiovascular- or diabetes-related; while lower than initial reports, 53% of all COVID-19 confirmed patients in the study were missing documentation of underlying conditions^{xii}
- Overall the case mortality rate remains low at 2.3%; however, the mortality rate jumps to 6% in hypertensives, 7.3% in diabetics, 10.5% in patients with cardiovascular disease, and 14.8% for patients ≥ 80 years of age^{xii}
- Notably, the case mortality rate for underlying cardiovascular disease (10.5%) is greater than in patients with underlying chronic respiratory disease (6.3%)



- In a detailed case report on 138 hospitalized COVID-19 patients:^{iv}
 - 19.6% of patients developed acute respiratory distress syndrome
 - 16.7% of patients developed arrhythmia
 - 7.2% developed acute cardiac injury
 - 8.7% of patients developed shock
 - 3.6% developed acute kidney injury
 - Rates of complication were universally higher for ICU patients
- The first reported death was a 61-year-old male, with a long history of smoking, who succumbed to acute respiratory distress, heart failure, and cardiac arrest
- Early, unpublished first-hand reports suggest at least some patients develop myocarditis

Potential Cardiac Implications From Analog Viral Respiratory Pandemics

- **Influenza analog:** In all influenza pandemics other than the 1918 flu, cardiovascular events surpassed all other causes of mortality, including superimposed pneumonia^v
- **General viral analog:** Viral illness is a well-known destabilizing factor in chronic cardiovascular disease, a general consequence of the imbalance between infection-induced increased metabolic demand and reduced cardiac reserve. The viral infection along with superimposed pneumonia will directly and indirectly affect the cardiovascular system^{vi}
 - Both coronary artery disease and heart failure patients are at increased risk of acute events or exacerbation; viral illness can potentially destabilize coronary plaques through several mechanisms including systemic inflammatory responses which have been recently documented with COVID-19
 - Multiple co-morbidities (DM, obesity, HTN, COPD, CKD) further increase risk
- **SARS/MERS analog:** Although published literature on CV implications of SARS/MERS is limited, in the absence of more detailed reporting on COVID-19, it may prove instructive
 - 60% of MERS cases had one or more pre-existing comorbidity, resulting in a poorer prognosis; expert guidance suggests patients with diabetes, CVD, or renal disease should be prioritized for treatment^{vii}
 - Both SARS and MERS have been linked to acute myocarditis, acute myocardial infarction, and rapid-onset heart failure
 - In one early published report, 2 out of the 5 deaths were attributed to MI^{viii,ix}
 - These data should be interpreted cautiously—indicative of the increased CV risk in coronavirus patients, but not generalizable to broader outcomes



- Reversible, sub-clinical diastolic LV impairment in acute SARS even among those without underlying cardiac disease appears common, likely the result of systemic inflammatory immune response and is not unique to SARS; however, lower EF upon admission was predictive of later mechanical ventilation ^x
- In one study of cardiovascular complications of SARS in 121 patients:^{xi}
 - 71.9% of patients developed persistent tachycardia, including 40% with continued tachycardia during outpatient follow-up
 - 50.4% of patients developed sustained asymptomatic hypotension during hospitalization; one patient required inotropic support
 - 14.9% of patients developed transient bradycardia
 - 10.7% of patients developed transient cardiomegaly, without signs or symptoms of heart failure
 - One patient experienced transient paroxysmal AF, with spontaneous resolution
 - Cardiovascular complications appeared statistically uncorrelated with oxygen desaturation or ICU admission

Clinical Guidance Given Current COVID-19 Uncertainty

- COVID-19 is spread through droplets and can live for substantial periods outside the body; containment and prevention using standard public health and personal strategies for preventing the spread of communicable disease remains the priority
- In geographies with active COVID-19 transmission, it is reasonable to advise patients with underlying cardiovascular disease of the potential increased risk and to encourage additional, reasonable precautions
- Older adults are less likely to present with fever, thus close assessment for other symptoms such as cough or shortness of breath is warranted
- Some experts have suggested that the rigorous use of guideline-directed, plaque stabilizing agents could offer additional protection to CVD patients during a widespread outbreak (statins, beta blockers, ACE inhibitors, ASA)^y; however, such therapies should be tailored to individual patients
- It is important for patients with CVD to remain current with vaccinations, including the pneumococcal vaccine given the increased risk of secondary bacterial infection; it would also be prudent to receive influenza vaccination to prevent another source of fever which could be initially confused with coronavirus infection
- It may be reasonable to triage COVID-19 patients according to the presence of underlying cardiovascular, respiratory, renal, and other chronic diseases for prioritized treatment
- Providers are cautioned that classic symptoms and presentation of AMI may be overshadowed in the context of coronavirus, resulting in underdiagnosis



- For CVD patients in geographies without widespread COVID-19 emphasis should remain on the threat from influenza, the importance of vaccination and frequent handwashing, and continued adherence to all guideline-directed therapy for underlying chronic conditions
- Hospital and medical personal in the United States should be prepared to implement CDC guidance on personal protective equipment (PPE)
- COVID-19 is a fast-moving epidemic with an uncertain clinical profile; providers should be prepared for guidance to shift as more information becomes available

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