

COVID-19 and Long-Term Cardiovascular Risks: A Review

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Key points:

- Introduction
- Cardiovascular Complications Post-COVID-19
- Processes Responsible for Cardiovascular Consequences
- Clinical Implications and Management
- Nursing interventions

Introduction

The virus presented initial respiratory clinical features, but a certain visceral proclivity for the angiotensin-converting enzyme 2 (ACE2) receptor residing in cardiac and vascular tissues suggests some sort of multi-organ involvement. Early studies reported sudden cardiac problems during active infection, while others studied the longer-term effects on cardiovascular health, which are just beginning to see funding for research.^{1,2}

Cardiovascular Complications Post-COVID-19

• Myocardial Dysfunction and Fibrosis

A recent systematic review describing evidence of subclinical myocardial dysfunction in COVID-19 survivors. Cardiac MRI findings show persistence of inflammation and fibrosis in the myocardium months after recovery in those without any cardiovascular disorder history. These changes will lower left ventricular ejection fraction (LVEF) and cause right ventricular failure, potentially rendering the survivor at risk for heart failure. Myocardial fibrosis and inflammation are also concerning links to an increased risk of arrhythmias and progressive cardiac remodeling.¹

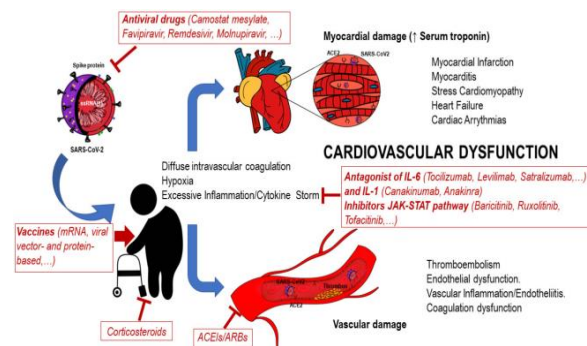


Figure 1: Impact of SARS-CoV-2 infection on cardiovascular system in older adults.⁸

• Elevated Risk of Myocardial Infarction and Stroke

Cohort studies from 2024 forward show that compared with uninfected groups, COVID survivors have about twice the risk of acute cardiovascular events, such as myocardial infarction (MI) and ischemic stroke, and that the greater risk persists for as long as three years after illness, particularly in patients who were hospitalized during the acute phase of COVID-19. Suggested mechanisms include persistent systemic inflammation and endothelial damage with a prothrombotic tendency that promotes faster atherosclerosis and unstable plaque.^{3,4}

- **Hypertension and Blood Pressure Dysregulation**

As several studies have shown, there is a striking increase in the occurrence of new hypertension among the COVID-19 survivors, regardless of their hospitalization. This means that possibly the virus or some inflammatory consequences affect normal influence on controlling blood pressure via vascular and renal systems. For instance, it's noted that patients with COVID-19 were more likely to develop hypertension at the end of 6 months compared with influenza patients, implying that there is a distinct pathogenic mechanism implicated with SARS-CoV-2.⁴

- **Endothelial Dysfunction and Vascular Changes**

Blood vessels are lined by the endothelial cells that show expression of ACE2 and are able to be directly infected by the SARS-CoV-2 virus. Endothelial injury, therefore, causes less vasodilation and induces inflammation and thrombosis. A study done in 2024 on young adults found persistent endothelial dysfunction and increased arterial stiffness months after the infection, determined through flow-mediated dilation and pulse wave velocity.

Interestingly, despite arterial stiffness appearing to worsen over time, systolic and diastolic blood pressure readings remained high, indicating persistent underlying vascular issues.⁵

- **Comparative Risk with Other Viral Infections**

As reported in one of the research articles, the incidence of newly appeared constant hypertension in COVID-19 patients affected individuals suffering from influenza. The results suggest that hospitalization COVID-19 patients have a lasting incidence of hypertension twice that of those with influenza, underlining the particular effect of SARS-CoV-2 on blood pressure control.⁷

Processes Responsible for Cardiovascular Consequences

Multifactorial pathogeneses have been implicated in the colloid buildup of cardiovascular structures by COVID-19.

Direct effects of the virus: Coronavirus gets into endothelial and myocardial cells by ACE2 receptor, and their cytotoxicity results in severe damage to these cells.

Immunological injury: There may be myocarditis and vasculitis due to excessive inflammatory responses and cytokine storms during acute infection.

Prothrombotic state:

COVID-19 is a hypercoagulable state that puts at risk the occurrence of micro or macrovascular thrombosis.

Autonomic Nervous System Dysfunction: Dysregulation may therefore give rise to arrhythmias and labile blood pressure.⁶

Clinical Implications and Management

Considering the aforementioned risks that patients survive after COVID-19 must have cardiac screening, which would be proactive on the part of the healthcare providers:

- Regular cardiac imaging (echocardiography, MRI) for symptomatic patients or those with a bona fide history of cardiac pathology.
- Troponins and Natriuretic peptides monitoring.
- Further assessment on blood pressure and vascular health overall.
- Lifestyle changes and medications to counteract problems of hypertension, dyslipidemia, and thrombotic risks.

These timely measures for the recognition and management of dependent cardiovascular complications would be able to reduce morbidity and better outcomes in the long run.¹

Nursing interventions

- Implement High-Quality Nursing Care for Acute Coronary Syndrome Patients

Cover wide-ranging nursing-which involves constantly observing the patient's cardiac data, providing health education awareness, and rendering apt psychosocial support.⁹

- Utilize Nurse-Led Interventions for Cardiovascular Disease Management

Create nurse-led clinics through which individualized care plans, medication management with regular follow-up, and direct interaction would be extended to their patients suffering from cardiovascular diseases.¹⁰

- Monitor and Address Oxygenation Needs in Severe COVID-19 Cases

Regularly assess the oxygen saturation levels and provide supplemental oxygen according to the need to maintain optimal oxygenation in hospitalized adults with severe COVID-19.¹¹

- Advocate for Cardiac Rehabilitation Programs

Any patient with cardiovascular complications in the recovery phase after COVID-19 should be referred for cardiac rehabilitation programs that emphasize exercise training, education, and counseling.⁹

- Leverage Telemedicine for Remote Patient Monitoring

Employ telemedicine in the provision of consistent follow-ups, remote consultations, and prompt intervention in the care of patients presenting with cardiovascular complications after post-COVID-19 conditions.¹⁰

- Educate Patients on Preventing Long-Term Cardiovascular Complications

Elaborate on the importance of vaccination, exercise, balanced nutrition, and taking medications as prescribed to avert any long-term cardiovascular problem following COVID-19.⁹

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