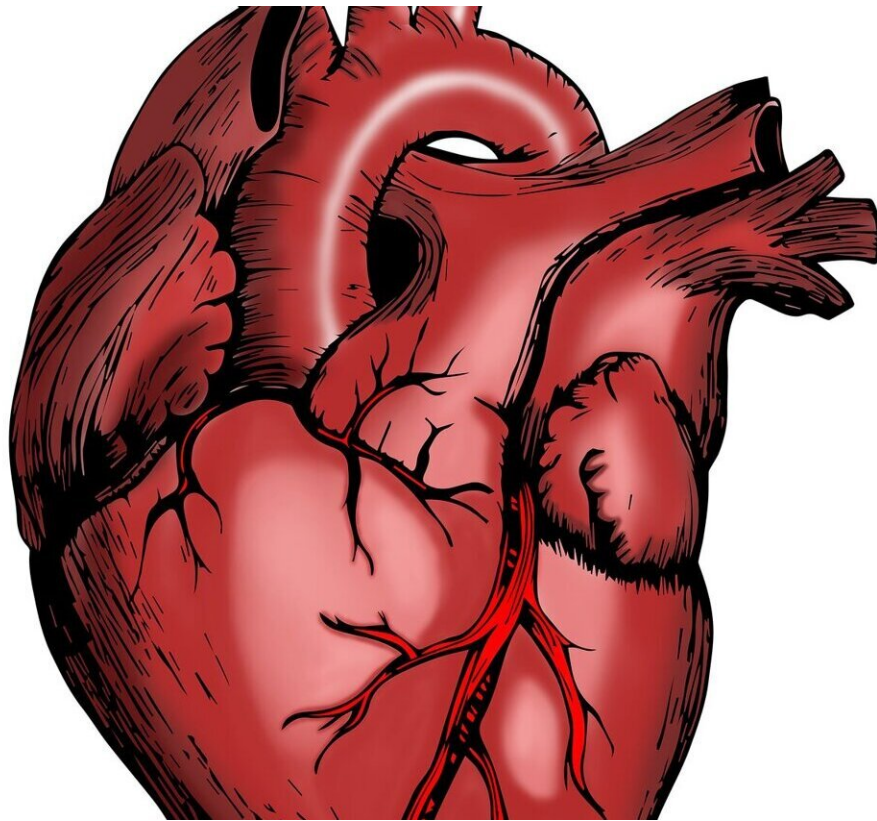


Heart inflammation found in one in eight patients after hospitalization with COVID-19

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One in eight people who were hospitalized with COVID-19 between May 2020 and March 2021 were later diagnosed with myocarditis, or heart inflammation, according to major new research into the clinical

long-term effects of COVID-19.

The largest study of its kind to date was led by the University of Glasgow in collaboration with NHS Greater Glasgow and Clyde (NHS GGC), and followed for one year, in real time, 159 patients after they were hospitalized with COVID-19. The results, which show that patients hospitalized with COVID-19 between May 2020 and March 2021 have a number of ongoing [health conditions](#), are published in *Nature Medicine*.

The study also looked at why some patients suffer long-term ill [health](#) after hospitalization with COVID-19. Until now it has been speculated that previous underlying health conditions may be linked to the severity of post-COVID long-term effects. However, this new landmark study suggests that it is the severity of the COVID-19 infection itself which is most closely correlated to the severity of a patient's long-COVID symptoms, rather than pre-existing [health problems](#).

The CISCO-19 (Cardiac Imaging in SARS Coronavirus disease-19) study, which was funded in May 2020 as part of a Scottish Government Chief Scientist Office Rapid Research Response aimed at increasing the understanding of the coronavirus pandemic, followed patients in real time after hospitalization with COVID-19 and compared their health to those in a control group of individuals of similar age, sex and medical background. Assessments included blood tests, and CT and MRI scans of multiple organs, including the heart, kidneys and lungs, as well as measuring patients' own opinions on their own ongoing health via questionnaires. Clinical outcomes including survival, hospital readmission and referral to outpatient clinics were also assessed. The study is ongoing, supported by NHS GGC, and will continue to follow up with patients at 18 months and 5 years post hospitalization.

Hospitalization with COVID-19 was found to cause a number of long-term health problems. Researchers found 1 in 8 patients hospitalized

with COVID-19 have heart inflammation, while inflammation across the body and damage to the other organs such as the kidneys was also common. These problems clustered in individuals pointing to the overall severity of COVID-19 as being the main driver of illness. Exercise capacity and health related quality of life were markedly impaired initially after discharge from hospital and remained reduced one to two months after discharge—this was especially the case in patients with [heart inflammation](#).

During a period of 450 days after discharge from hospital, one in seven patients died or were readmitted to hospital, and two in three patients required NHS outpatient care.

Patients were given questionnaires on the same day they underwent blood tests and scans, before they had been given clinical results, in order to gain a true understanding of how they were feeling post hospitalization. From these questionnaires, having been hospitalized with COVID-19 was associated with a worse health-related quality of life as well as with anxiety and depression.

Professor Colin Berry, principle investigator of the CISCO-19 study and professor of Cardiology and Imaging at the University of Glasgow, said: "COVID-19 is a multi-system disease, and our study shows that injury on the heart, lungs and kidneys can be seen after initial hospitalization in scans and blood tests. These results bridge a vital knowledge gap between our current understanding of post-COVID-19 syndromes, such as Long COVID, and objective evidence of ongoing disease.

"One of the most important findings of the CISCO study is that it is the severity of a patient's COVID-19 infection—not their underlying health conditions—that is most closely correlated with the severity of any ongoing health outcomes post discharge. We found that previously healthy patients, without any underlying health conditions, were

suffering with severe health outcomes, including myocarditis, post hospitalization.

"The reasons for this are unclear, but it may be that a healthy person who is hospitalized with COVID-19 is likely to have a worse COVID infection than someone with underlying health conditions who is hospitalized. More work needs to be done here to understand the risks, and also on how we can better support patients who have ongoing health outcomes after being hospitalized with COVID-19."

Long COVID has been found to predominately affect females. CISCO found that female sex was associated with myocarditis, which in turn was linked with lower mental and physical well-being. Researchers believe these findings provide some answers that could explain the physical limitations experienced by some female patients post COVID-19 hospitalization.

Considering clinical translation into healthcare, the results highlight the need for focused use of medical tests, new therapy development and rehabilitation. The results also highlight the importance of avoiding severe COVID-19 such as by vaccination.

Professor Julie Brittenden, Director of Research and Innovation at NHSGGC, said: "NHSGGC is pleased to have played an important role in this study, which has further enhanced our understanding of the long term effects of COVID-19 in patients who required to be hospitalized.

"I would like to thank all of our patients who have taken part in this study, as well as the wider research teams who continue to work to improve knowledge, develop treatment options and improve outcomes of patients with COVID-19 "

Professor David Crossman, Chief Scientist (Health) for Scotland at the

time the study was funded, said: "This study provides important insight into the longer-term effects of COVID-19 infection, and will help inform approaches to treatment going forward. The Chief Scientist Office is pleased to have funded this research as part of the £5 million Rapid Research in COVID-19 program."

The CISCO study focuses on people hospitalized with COVID-19, however other studies looking at community COVID infections—infections not severe enough to result in hospitalization—have reported more encouraging data on long term health recovery. Patients in this study were enrolled during the first and second waves of the pandemic, until March 2021, and as a result they were mainly unvaccinated.

Among the [patients](#) enrolled in the study, risk factors for heart disease were common, including overweight or obesity, high blood pressure and pre-diabetes or diabetes.

Staff from several hospitals in the West of Scotland supported the project, including the Queen Elizabeth University Hospital and the Royal Infirmary in Glasgow, the Royal Alexandra Hospital in Paisley, Hairmyres Hospital in NHS Lanarkshire and the NHS Golden Jubilee in Clydebank.

Dr. Kenneth Mangion, clinical lecturer in cardiology at the University of Glasgow, and co-senior author, said: "We are grateful for the support from the Chief Scientist Office, NHS GG&C, NHS R&D. We are also grateful to all co-investigators, clinicians, research nursing staff, scientists, lab technicians radiographers, who have all worked together to help deliver this project."

The study, "Multisystem, cardio-renal investigation of post-COVID illness," is published in *Nature Medicine*.

More information: "Multisystem, cardio-renal investigation of post-COVID illness," *Nature Medicine* (2022).

Provided by University of Glasgow

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