

# The impact of COVID-19 on the provision of cardiac surgical services

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## Abstract

The global pandemic caused by COVID-19 has had a significant global impact on healthcare systems. One implication of this pandemic is the cancellation of elective cardiac surgeries and the centralization of services. As a result, hospitals in Europe, North America, and the United Kingdom have had to alter the services offered to patients to be able to cope with service provision for COVID infected patients. Data should be collected during this period to provide a good insight following the lockdown period to understand the implication of such service alteration. Future research should also focus on the effects on long-term mortality and morbidity as well as financial implications on hospitals as a result of these changes.

## KEYWORDS

cardiac surgery, COVID-19, service provision

## 1 | INTRODUCTION

The coronavirus disease 2019 (COVID-19), which is caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has led to a public health crisis of global proportion and a pandemic has been declared by the World Health Organization (WHO) on 21st March 2020. According to the WHO data, there are more than 3 million confirmed cases and over 240 000 deaths globally.

The outbreak began in late December 2019 in the city of Wuhan, Hubei province, China. Patients presented with pneumonia of unknown cause and were epidemiologically linked to the Huanan Seafood Market. After samples of bronchoalveolar-lavage fluid were analyzed the virus was isolated and viral genome sequencing was performed to report the novel of CoV (2019-nCoV) virus.<sup>1</sup> It is phylogenetically associated with the genus betacoronavirus which also includes other coronaviruses such as SARS-CoV which emerged in 2008.

This outbreak has had a major impact on healthcare systems worldwide, necessitating the need for unprecedented adaptations by healthcare systems across the globe. We will focus on the impact COVID-19 is having on the provision of cardiac surgery United Kingdom (UK).

## 2 | UK EXPERIENCE

In the UK, the government introduced emergency legislation for a UK wide lockdown on 23rd March 2020 in an attempt to contain the spread of the virus, following examples from other countries. During the lockdown period, the activities of cardiac surgery have been significantly affected.

With the exponential increases in COVID-19 cases seen, and the dramatic burden this has had on the healthcare system, intensive care resources have needed to be reallocated to deal with the accelerating burden that COVID-19 poses. As a result, this pandemic has resulted in a shortage of ventilators, intensive care beds, personal protective equipment, and staff in the workforce of the healthcare system. Cardiac surgery, which is heavily dependent on intensive care resources, has undergone dramatic changes with services becoming centralized in an attempt to continue to provide a cardiac surgical service during these unprecedented times, similar to that in Italy.

Daily multidisciplinary team meetings are being performed to identify patients that need surgical intervention either as urgent or emergency cases with particular attention being given to COVID testing (including swabs and routine COVID CT scan of the thorax).

Patients on elective waiting lists with pathology deemed unsuitable to be delayed by 2 to 3 months are also being prioritized.

Most of Cardiac Surgery Units in the UK have restructured their workforce to meet the demand for COVID-19 patients. This varies from one unit to another; in certain areas, the cardiac surgery teams are redeployed to intensive care units to release the general intensive care team to look after COVID-19 patients dedicatedly, while in other units the surgical team have volunteered to help with COVID-19 patients in larger units or other cities.

Most of the units of the UK have noted a sharp drop in their surgical activities and only operate at a centralized unit for emergency cases or urgent cases with unsuitable or critical anatomy. The centralization is often done to one major unit with a referral being sent across from the entire region, and therefore, maximizing the resources and management of emergency cases while the rest of hospital are dedicating to managing COVID-19 patients. During this lockdown period (between 23rd March - 4th of May), there is a reduction in our cardiac surgery activities by 83% in cardiac index cases.

### 3 | GLOBAL IMPACT OF COVID-19 ON CARDIAC SURGERY

The literature has highlighted two significant issues concerning COVID-19 and cardiovascular disease, in that 15% of patients with COVID have established cardiovascular comorbidities, and emerging evidence shows that preexisting cardiac disease is an important risk factor for developing more severe infection.<sup>2,3</sup> Another concern is that preexisting coronary artery disease and patients with risk factors for atherosclerotic disease are at an increased risk of developing acute coronary syndromes during acute infection, which has been established in previous epidemiologic and clinical studies.<sup>4-7</sup>

The cardiac surgical patient population is more susceptible to developing severe complications related to COVID-19 infection. The pathophysiological effects of COVID-19 are slowly being unraveled and have been shown to induce multiple cytokines and chemokines that result in vascular inflammation, plaque instability, and myocardial inflammation.<sup>8</sup> This poses an increased risk in terms of the postoperative period of patients undergoing cardiac surgery, which is characterized by a proinflammatory state.

In terms of the effect this has had in Europe, if we look at Italy which is one of the worst affected countries, they reported that 12.8% and 20.2% COVID-19 related mortality occurred in the age group of 70 to 79 and over 80s respectively,<sup>9</sup> which represents the patient demographics often necessitating cardiac surgery. The strain on healthcare resources is also well established despite efforts to increase hospital and intensive care capacity, with over 64% of hospital beds and 88% of intensive beds allocated to treat COVID-19 patients.<sup>10</sup> Italy has also canceled elective surgery and has made dedicated cardiac centers, for example, the Lombardy region has had 16 of the 20 cardiac centers discontinue the activity and centralized to the remaining four centers in a “Hub and Spoke” model. With the

“Hub” centers responsible to provide urgent and emergency cardiac services, with sharing of surgical teams across the 20 hospitals to facilitate shift organization, allowing teams from different centers to be on call.<sup>11</sup>

Canada has also had to adapt, by prioritizing and delaying elective cases. The cardiac surgeons, together with members of the heart team, have also had to reconsider best management strategies for these patients. They have proposed strategies to utilize the use of virtual clinics to follow-up patients and have attempted to maintain areas for cardiac surgery separate from COVID-19 where feasible.<sup>12</sup>

## 4 | FUTURE RESEARCH

Studies have already established that patients with cardiovascular disease are at an increased risk of developing severe COVID-19 infection.<sup>2</sup> Studies in China, the epicenter of the COVID-19 outbreak, have also demonstrated the relationship between myocardial injury due to COVID-19 and high mortality.<sup>13,14</sup>

In the UK there are several studies, that are in the data collection stage, which are focused on different aspects of how COVID-19 has impacted cardiac surgery and its surgical resources. COVIDSurg is an international database that has started in Birmingham, UK, and registered as a clinical trial (NCT04323644) focusing on collecting data on COVID-19 patients that are undergoing surgery and its due to complete by September 2020. We hope that such data will provide an insight into patient cohorts in this pandemic era. Furthermore, there is a need for an international registry to focus on cardiac and aortic surgeries specifically and analyze the outcomes, service provisions, and financial impact of COVID-19 on cardiac surgery in the UK.

The underlying mechanisms of how COVID-19 causes myocardial injury are ongoing, with an accelerated number of pharmacological management options entering clinical trials in an attempt to provide answers in how to best manage this condition.<sup>15-17</sup> With delays across a wide array of cardiac pathologies, the selection of treatment strategies may also have been affected, by opting for angiographic intervention due to the lower associated intensive care utilization, despite the proven surgical benefit in certain subgroups of patients. Further research is needed to determine the impact COVID-19 has had on patients with cardiovascular disease who have been delayed and the impact on their long-term mortality and morbidity, with the financial implications also warranting further analysis.

With the second wave of COVID-19 expected by many health experts to be worse, the light at the end of the tunnel is not yet visible. We must be prepared for things to become worse before they become better and be prepared to deal with the difficult ethical decisions that this may entail.

## 5 | CONCLUSION

The COVID-19 pandemic is a rapidly evolving global healthcare crisis with unprecedented legislation implemented by governments.

Colossal efforts have been taken by the scientific community to understand the disease progression, ascertain the best medical therapy, and develop a vaccine.

The impact that COVID-19 has had in the current climate is laid bare for all to see, however, the future remains blurry as to what the true cost of COVID-19 will be on cardiac surgery; on the patients experiencing a delay in treatment, the backlog of surgical cases, the financial implications and effects on surgical training going forward for years to come.

## CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

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