COVID-19: The Rising Cost of Cardiac Surgery and Disease

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Abstract

The coronavirus disease 19 (COVID-19) pandemic has resulted in widespread economic, health and social disruptions. The delivery of cardiovascular care has been stifled during the pandemic in order to adhere to infection control measures as a way of protecting patients and the workforce at large. This cautious approach has been protective since individuals with COVID-19 and cardiovascular disease are anticipated to have poorer outcomes and an increased risk of death. The combination of postponing elective cardiovascular surgeries, reduced acute care and long-term cardiac damage directly resulting from COVID-19 will likely have increased the demand for cardiac care, particularly from patients presenting with more severe symptoms. The combination of increased demand and inhibited supply will likely result in huge backlog of unmet patients' needs. The novelty, virulence and infectivity of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused substantial morbidity and mortality which have necessitated modifications to the UK government's healthcare strategy.

Without improving cost efficiency, the UK's ageing population will likely need an increasing spend on cardiac surgery simply to maintain the same level of service. However, the government's short-term increase in spending is unsustainable especially in the face of ongoing economic uncertainty. This means that the long-term impact of COVID-19 will only increase the need to find innovative ways of delivering equivalent or superior cardiac care at a reduced unit cost.

Introduction

The first quarter of 2020 saw National Health Service (NHS) surgeons enjoying their last few months of normality before all nonurgent elective operations were abruptly adjourned in April 2020 (1). The global spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has disrupted and pressurised an already over-stretched NHS. This pressure is reflected in the data with the United Kingdom (UK) performing poorly against its European neighbours on key parameters such as beds per population (2.5 per 1000) and doctors per population (3.0 per 1000) (2) which has stifled healthcare provisions for non-COVID patients. (3) Doctors' concerns have been laid bare in a survey by the British Medical Association (BMA) (4) where thousands of doctors reported to the BMA that prioritising care for those with COVID-19 has had a severe impact on the treatment and care available for patients with other illnesses. This means that the NHS is not only battling the extent of the virulence of SARS-CoV-2 but also the case fatalities and negative outcomes. As the NHS begins the crucial job of restarting non-COVID services, it is faced with a huge backlog of unmet patient needs, with patients now facing longer waiting times. Currently, more than 4 million patients are waiting for routine procedures and this is likely to rise sharply to 10 million by the end of the year. (5) This challenge will be made harder as healthcare services will be operating at a reduced capacity in order to adhere to infection control measures. The novelty, virulence and infectivity of COVID-19 prompted a Nation-wide lockdown in March 2020 which has resulted in widespread economic, health and social disruptions. This article will survey the UK governments economic response and what this means for the future of healthcare provisions in the UK and appraise the challenges faced by cardiac surgeons and

patients.

An Economic Overview

The Nation-wide lockdown aimed at suppressing SARS-CoV-2 has caused significant harm to the UK economy, causing a contraction of over 20% of gross domestic product (GDP) in Q2 2020 (6). The government, in attempting to mitigate the economic impact, launched the largest public stimulus program in the Post-War period (7). The combination of increased public spending, reduced tax revenue and a contraction in GDP has pushed the UK's debt to GDP ratio to a more than a 50 year high (8). In less than a year, the 8 years of fiscal retrenching under the Coalition and Conservative governments have been undone.

The impact of the pandemic on future NHS funding is ambiguous. In the short term, there could well be an increase in spending as the public mood becomes more conscious of the importance of healthcare spending and a well-functioning NHS. However, with the Chancellor Rishi Sunak already speaking of the need for 'hard decisions' (9), it seems likely that the significantly worse position of the UK's government finances might cause NHS spending to grow at a slower pace than it might otherwise. As the NHS covers 24% of government spending (10), it would be challenging for any chancellor to reduce spending without impacting the health service.

Without improving cost efficiency, the UK's aging population will likely need an increasing spend on cardiac surgery simply to maintain the same level of service. This means that the

long-term impact of COVID-19 will only increase the need to find innovative ways of delivering equivalent or superior cardiac care at a reduced unit cost.

Immediate impacts of COVID-19

The presence of Sustained Transmission guidance from the government's infection, prevention and control (IPC) protocol (11) has had significant impact on the delivery of cardiac care. Many non-urgent electives have been postponed in an effort to reduce the burden on the health service and to avoid nosocomial infections, especially given that patients requiring cardiac care are likely to have a significantly higher Infection Fatality Rate than others (12). Patients with coronary artery disease are at an increased risk of mortality and morbidity resulting from a COVID-19 infection because they share high-risk co-morbidities such as hypertension, diabetes and obesity which are associated with poorer outcomes. In addition to this, patients undergoing more invasive cardiac surgery will need to spend more time in intensive care units (ICU) than those undergoing percutaneous coronary intervention (PCI). Guo et al collected and analysed swabs taken in different hospital locations in order to better understand the virus' transmission capabilities and routes and subsequently reported a greater infection risk of SARS-Cov-2 in ITU than general wards. (13) To protect patients, doctors may steer decision-making prioritising less invasive therapies.

In the wake of the pandemic, the risk of nosocomial infection to the surgical workforce via the intraoperative generation of fomites has led to changes in surgical practices. Standard procedural activities such as the opening of pressurised cavities and orifices such as the

thorax in a coronary artery bypass graft (CABG) is now considered high risk. This is likely to impact the choice of intervention offered by clinicians and chosen by patients. (14)

In addition to this, patient concern has significantly reduced the numbers presenting at hospitals with myocardial infarctions or strokes. (15) A paper by Solomon et al reported that the weekly rates of hospitalisation from myocardial infarction dropped by 48% during the pandemic. (16) Delayed presentation may advance pathology which will reduce the efficacy of the treatment offered. This may also force surgeons to carry out elective operations as emergency cases which carry a greater risk and inferior result.

As the cost base of theatres and staff is largely fixed, the immediate effect of this lower capacity is to drive up unit costs of cardiac care, though it is currently too early to know the direct cost impact.

Long term effects of COVID-19

Emerging evidence also suggests that there is a significant role for cardiology in the treatment of COVID-19 patients; while SARS-CoV-2 is primarily a respiratory virus, it has been linked to an increased risk of myocardial infarction, myocarditis and heart failure. While the pathophysiology is still being researched, it has been theorised that SARS-CoV-2 may possibly accelerate inorganic calcium deposit destabilisation resulting in endothelial cell dysfunction and subsequently, cardiac pathology. (17) Additionally, contracting the virus may weaken the immune system (18) which may make patients vulnerable to superimposed

bacterial infections which could threaten recovery, increase the risk graft infection and interfere with pulmonary gas exchange. (19)

In addition to this, reducing the activity in cardiothoracic surgery significantly will have long term impacts on the development of the field within the UK; trainees will see delayed progression as a result of reduced operative exposure, cancelation of examinations and teaching and redeployment to medicine and critical care. Cardiothoracic surgeons, in particular, possess generic skills which can be easily transferred to ITU making them prime candidates for redeployment. (20) There is also a risk of long-term staffing issues with the government and Trust's detailing strict guidelines to self-isolate from the onset of new COVID-19 symptoms or in cases of direct contact with COVID-19 positive individuals. This has the potential to wipe out entire teams which would negatively impact the workload of remaining staff members and staff morale overall. (21)

To reduce footfall in hospitals, it is advised that only urgent cases should be seen in-person otherwise patients should be reviewed in a virtual clinic. (20) This is where patients' notes and results are reviewed by the doctor in absentia and clinical decisions are relayed to the remote patient. (22) The efficacy of video consultations has not been extensively researched however, there are obvious limitations such as not being able to examine the patient, inability to measure real-time basic observations such as heart rate and blood pressure and connectivity issues which all reduce the amount of information available to capture. Remote consultations do not work for everyone – especially patients with language barriers and cognitive impairment. This is likely to lead to missed opportunities and delayed presentations in the long-term.

Furthermore, clinical research has seen significant delays due to the challenges of monitoring and recruiting study participants whilst conforming to social distancing guidelines. (23)

The combination of postponing elective cardiovascular surgeries, reduced acute care and long-term cardiac damage directly resulting from COVID-19 will likely cause increased demand for cardiac care, particularly from patients presenting with more severe symptoms. There is robust evidence that COVID-19 has bottle-necked the supply of cardiac care; for example, a recent survey has shown that 36% of primary PCI centres have needed to close during the pandemic. (24) The combination of increased demand and inhibited supply means that it will likely take a number of years for cardiology to recover from the impact of the pandemic.

Conclusion

The rapidly evolving COVID-19 pandemic has meant that we are yet to understand its true impact; however, emerging economic and scientific data has proven that the pandemic poses an unprecedented threat to the economy and the quality of healthcare provisions. Changes in clinical practice and patient behaviour during the pandemic will have harmed patient outcomes through: increased risk of cardiac pathology, delayed treatments and due to inferior treatments being carried out to mitigate the risks of performing aerosol generating procedures (e.g., undertaking PCI rather than CABG in multivessel disease). (25) Reduced effectiveness of treatment combined with increased running costs is likely to have

driven down the cost-effectiveness of cardiac care during the COVID-19 pandemic. In order to mitigate this, healthcare professions and policymakers alike are tasked with finding innovative ways of delivering equivalent or superior cardiac care at a reduced unit cost.

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