

Health system, public health, and economic implications of managing COVID-19 from a cardiovascular perspective

Background

The COVID-19 outbreak continues to spread internationally. After initial outbreaks have been suppressed for now in China and South Korea, the virus continues to spread at an alarming rate throughout Europe.¹ At the time of writing, a quarter of the world is in some form of lockdown. We consider not just the short-term effects of COVID-19, but also medium to long-term effects. We conclude that the health system and economic impacts of COVID-19 may be exacerbated by lost opportunities for primary and secondary prevention. We suggest that in order to mitigate against this risk, public health messages are developed which are co-beneficial to protect against COVID-19 and the primary and secondary prevention of cardiovascular disease.

Health system impact

In the short term, the capacity issues created by COVID-19 will affect quality of care, leaving patients more vulnerable to complications of cardiovascular disease. At times of increased demand, access to critical care services will be rationed. The ability to initiate treatments even for cardiovascular emergencies such as an ST-segment elevation myocardial infarction (STEMI) may be limited due to risks to staff, workforce pressures, and the need for prolonged post-procedural cleaning in potential cases of COVID-19. Guidelines may be adjusted to include less effective treatments. In China, guidelines for acute coronary syndrome shifted away from percutaneous coronary intervention (PCI) in all patients, regardless of COVID-19 status.² Such deviations from optimal care will lead to increases in cardiovascular mortality and morbidity. Strategic planning is needed to maintain the provision of best-practice emergency care for as long as is possible. This includes ensuring a safe environment within the cardiac catheterization lab, the provision of adequate personal protective equipment, and only transferring patients between hospitals when necessary.

Until we develop an exit strategy, modelling indicates that COVID-19 will go through cycles of acceleration, suppression, and re-emergence for up to 12 months.³ At times of increased demand, non-essential elective and semi-elective procedures will be postponed. The Centers for Medicare & Medicaid Services (CMS) in the USA has already issued guidance recommending that hospitals consider postponing elective angioplasty during the COVID-19 pandemic.⁴ It is possible that patients on waiting lists will develop otherwise avoidable complications that will increase the demand on healthcare services in the future. Proactive forward planning is needed to capitalize upon

periods of relative suppression of COVID-19 to clear waiting lists. Prioritization must be given to those with the highest clinical need.

Public health impact

In the medium to long term, the lifestyle and mental health consequences of COVID-19 may increase the burden of cardiovascular disease. First, social distancing measures promote sedentary behaviour, and sudden shifts in lifestyle may lead to unhealthy diets. As social distancing measures may exist for several months, this will limit opportunities for the primary and secondary prevention of cardiovascular disease. Sedentary behaviour can have relatively fast-onset effects due to sudden changes in insulin sensitivity. Just 3 days of inactivity is associated with significantly higher post-prandial glucose concentrations.⁵ Secondly, the uncertainty and lifestyles changes associated with COVID-19 cause significant stress and anxiety. Social distancing measures, in particular, may lead to worsening depression and loneliness. Stressful and sudden events, such as natural disasters, have been shown to be associated with increased incidence of cardiovascular events.⁶ Stress and anxiety have also been shown to have an adverse effect on blood pressure and glycaemic control,^{7,8} and compliance with medications.⁹ Thirdly, social distancing and increased demand for healthcare services due to COVID-19 will limit opportunities for appointments with cardiologists and primary care physicians responsible for the screening and management of modifiable cardiovascular risk factors. This may have minimal effects in the short term, but in the medium to long term this will increase demand on healthcare services.

Economic impact

To combat COVID-19, healthcare systems require immediate injections of public funds to purchase equipment, pay extra staff, and build temporary hospitals. In addition, competition for resources such as ventilators and personal protective equipment is increasing prices. To compensate for increased government borrowing and because of the wider economic impact of COVID-19, there is a danger that a new period of austerity will begin post-pandemic. This will depend upon the unique context in each country. Many countries are beginning to understand that prolonged austerity has left their healthcare systems vulnerable to major shocks such as this pandemic. However, the ability to maintain health spending growth is also dependent on the state of each country's economy post-pandemic.

COVID-19 will also lead to long-lasting economic effects on health systems by increasing future demand for healthcare services: (i) because of the necessary resources needed to clear the backlog of postponed elective and semi-elective procedures; (ii) due to the increased burden of disease driven by negative lifestyle changes and poorer mental health; and (iii) because of many lost opportunities for primary and secondary prevention of cardiovascular disease which are known to be cost-effective. A systematic review of interventions to prevent and control diabetes found that many interventions including screening, treatment of hypertension, treatment of diabetes-related complications, or educational programmes were not just cost-effective, but often cost-saving.¹⁰ Case-finding strategies for the primary prevention of cardiovascular disease in high-risk individuals has also been found to be cost-effective.¹¹ Cardiac rehabilitation is also known as a cost-effective strategy for secondary prevention of cardiovascular disease.¹²

Public health responses

One way to reduce the total health impact of COVID-19 is to develop public health messages which are co-beneficial for protecting against COVID-19 and encouraging the primary and secondary prevention of cardiovascular disease. This will also minimize the economic impact of COVID-19 on health systems.

Smoking cessation

First, aside from its beneficial cardiovascular effects, public health messages should emphasize how smoking increases the risk of poorer outcomes if infected by COVID-19. A systematic review suggests that smokers are more likely to require critical care admission and have higher mortality rates.¹³ This is particularly important in countries such as China, where almost half of men smoke.¹⁴ Smokers may also be at increased risk of being infected with COVID-19. It has been shown that smoking increases the rate of transmission of respiratory syncytial virus.¹⁵ Health shocks are known to increase the likelihood of successfully quitting smoking.¹⁶ Therefore, COVID-19 presents a significant opportunity to promote smoking cessation.

Promoting healthy lifestyles

Secondly, to prevent sedentary behaviour, regular exercise and healthy diets should be promoted. Public health messages should emphasize how regular exercise can improve respiratory capacity, protect mental health, and maintain a healthy weight. Obesity is a known risk factor for admission to critical care and mortality in patients with COVID-19.¹⁷ Knowing this might encourage some patients to lose weight or

engage with weight management programmes which can be coordinated remotely through apps. For secondary prevention, a systematic review revealed no difference in effectiveness between home-based vs. supervised cardiac rehabilitation.¹⁸ Therefore, there is no rationale to restrict access to cardiac rehabilitation services by patients during the COVID-19 pandemic. If anything, provision must be maintained to protect against avoidable hospital readmissions.

Cardiovascular risk factor control

Thirdly, the screening and management of cardiovascular risk factors should continue during the COVID-19 pandemic. If not, this will only increase demand for healthcare services in the future. Both diabetes and hypertension have been associated with an increased risk of being diagnosed with COVID-19,¹⁹ and poor glycaemic and blood pressure control is known to affect immunity generally. Optimizing cardiovascular risk factors may therefore protect against more severe COVID-19 infections. To achieve this, technology needs to be used in innovative ways. In many countries, primary care and cardiology services are being delivered remotely through teleconsultations.²⁰ In the face of prolonged disruption to services, pragmatic approaches to the screening of patients are needed. For example, certain medical devices and smartphone apps could be used to screen for arrhythmias.²¹ These changes could trigger a fundamental shift in how we practice. To ensure this feeds into wider digital health system development, ideally evaluation mechanisms must be embedded into routine practice.

Conclusions

It is clear that COVID-19 will have a substantial economic impact on healthcare systems. The acute pressure of managing the pandemic is already responsible for a significant financial burden. However, lost opportunities for the primary and secondary prevention of cardiovascular disease will only exacerbate this by increasing future demand for healthcare services. To mitigate against this risk, we argue that a comprehensive strategy to combat COVID-19 must include promoting public health messages which are co-beneficial for protecting against COVID-19 and the primary and secondary prevention of cardiovascular disease.

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References

References are available as [supplementary material](#) at *European Heart Journal* online.



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