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# Cardiovascular and Logistic Issues Associated With COVID-19 Pandemic



A. Robert Denniss, MD, FRACP<sup>a,b\*</sup>, Clara K. Chow, PhD, FRACP<sup>b,c</sup>,  
Leonard Kritharides, PhD, FRACP<sup>d,e</sup>

<sup>a</sup>Editor-in-Chief, Heart, Lung and Circulation, Sydney, NSW, Australia

<sup>b</sup>Department of Cardiology, Westmead Hospital, Sydney, NSW, Australia

<sup>c</sup>President-Elect, CSANZ

<sup>d</sup>Department of Cardiology, Concord Hospital, Sydney, NSW, Australia

<sup>e</sup>President, CSANZ

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first detected in China in December 2019 when it was found to cause coronavirus disease (COVID-19)-related pneumonia and pneumonitis. By March 2020, COVID-19 had been declared a pandemic. By late March 2020 there had been a worldwide mortality of 4.4%, with 19,000 deaths in 430,000 infected individuals in 170 countries [1], although there has been variation in the indications for testing from country to country, accounting for some of the variation in mortality between countries, besides other factors such as differing demographics.

Patients have typically had a fever, and commonly a cough, dyspnoea, fatigue, sore throat and myalgia. While respiratory symptoms have usually predominated, some patients have presented with chest pain or chest tightness, and palpitations [2–5]. Confirmation of the diagnosis involves use of specimen collection for coronavirus ribonucleic acid detection, usually from nasopharyngeal swabs (standard), viral isolation and culture (in limited accredited laboratories) and detection of serum antibodies [6].

While most patients have only mild infections, cardiac complications of COVID-19, defined as elevated troponin levels, occur in 20–30% of patients, and typically occur in older patients, especially those over 70 years of age, and are more likely in patients with hypertension, pre-existing coronary artery disease, heart failure and diabetes [4,5]. Mortality of up to 70% has been reported in patients with a combination of elevated troponin and pre-existing coronary artery disease [5]. Besides increased troponin, markers of inflammation and ventricular dysfunction, such as C-reactive protein and NT-proBNP, are also elevated and indicate unfavourable prognosis [5].

Acute coronary events can occur not only in patients with pre-existing coronary artery disease but also in those without significant coronary disease as it is well known that there are increased myocardial demands and consequent demand ischaemia triggered by severe infection and pneumonia [7], as was also observed with Middle East respiratory syndrome-related

coronavirus (MERS-CoV) [8]. Cytokine release in association with severe systemic inflammation can also potentially cause atherosclerotic plaque instability and rupture, and myocarditis can occur, as was also noted with MERS-CoV [2,3,8,9]. Heart failure and arrhythmias have also been described [2].

With the numbers of new patients having plateaued in China, about 3 months after COVID-19 started, the numbers of infected patients are still increasing in the western world and possibly in the developing world, with public health measures having been introduced much later than in China, including hand sanitisation, social distancing, isolation of at-risk individuals, limiting travel, shutting down of crowded venues and also lockdown, preserving only essential services. These public health measures are designed to delay or stop the spread of virus.

Public health measures, and the need to protect health care workers from exposure to COVID-19 by appropriate triage following hospital presentations, and selective use of finite resources of personal protective equipment (PPE) have resulted in modifications to standard care protocols, especially with the risk of both droplet and aerosol spread of the virus. Decisions are also being made in health services on how to redirect resources to COVID-19 while preserving essential services. The need to test high risk patients for COVID-19, and to minimise non-invasive tests, apart from electrocardiographs and limited transthoracic echocardiograms, and also the need to minimise invasive procedures, unless there is a suspected ST elevation myocardial infarction (STEMI) or haemodynamic instability, has meant departure from the previously set norms of care [10]. In addition, most elective invasive procedures are being deferred, while there is also discussion regarding using thrombolysis for some STEMI patients rather than proceeding with primary percutaneous intervention (PPCI) [10].

These measures can also potentially compromise rapid triage of non-COVID-19 patients with cardiac issues, and the time to definitive treatment of STEMI patients by PPCI has been increased, at

\*Corresponding author at: Department of Cardiology, Westmead Hospital, Corner Hawkesbury, Darcy Roads, Westmead, Australia., Email: [Robert.Denniss@health.nsw.gov.au](mailto:Robert.Denniss@health.nsw.gov.au)

least in early experience in Hong Kong [11]. There is a lower threshold for intubation of patients with hypoxaemia and haemodynamic decompensation, as non-invasive ventilation must not be used, as it carries the risk of transmission of aerosolised virus.

As SARS-CoV-2 infects host cells through angiotensin converting enzyme (ACE)2 receptors there has also been some concern about the safety and efficacy of continued use of ACE-inhibitors and angiotensin receptor blockers in patients being treated for hypertension or heart failure. At this time there is no definite evidence for harm, so these medications should be continued [12].

The negative impact of COVID-19 on the physical and mental health of health workers has already been apparent internationally. Besides isolating and quarantining populations at risk of COVID-19, there needs to be meticulous care in hospitals to use hand-washing, PPE and other protective clothing, while also minimising clustering and unnecessary interpersonal exposure, so as to reduce the risk of transmission of the infected virus between hospitalised patients and health care workers, and vice versa, and also between patients and between health care workers. Much clinic work has been converted to telehealth and remote assessments. Increased professional virtual networks have been created to support health workers grapple with large amounts of new information and a changing environment.

Models of care have been formulated to improve efficiency of in-person patient assessments, with rostering of “dirty” and “clean” teams of clinicians (with and without direct exposure to patients who potentially have COVID-19), so there is back-up should some staff be exposed to COVID-19 without full PPE, and need to go in to quarantine. Emergency department, intensive care unit (ICU) and anaesthetics staff have become the front line in assessing and treating patients, but cardiologists have also needed to do procedures including transoesophageal echocardiograms and invasive procedures in the cardiac catheterisation laboratories, having had to make crucial decisions as to which patients should have these procedures which are associated with higher risk of exposing cardiology staff to viral infection.

Concerns have been raised regarding the need for teams of clinicians to make the difficult decisions as to whether to intubate some patients or to simply palliate them if they are in ICU with multi-organ failure, as there have been issues with a shortage of ventilators, as has occurred in Italy [13].

While much attention has been directed at treating patients with, or at high risk of COVID-19, there is also concern that many health professionals are at high risk of being infected. In Australia, these are defined as health workers with one or other of the following criteria: age greater than 70 years, Indigenous and aged greater than 50 years, pregnant, parent of child aged less than one year, immune compromised, and chronic condition associated with increased risk of COVID-19 [14].

At this time of rapidly changing clinical circumstances, the Cardiac Society of Australia and New Zealand (CSANZ) has been proactive in looking at evidence from national and overseas centres tackling COVID-19 issues. Consensus advice and guidance for Australasian practice – which can be modified for use by local hospitals – is being formulated in a series of “living documents”. These Statements are being posted, and updated as needed, on the CSANZ website (<https://www.csanz.edu.au/covid-19/>); and will also be fast-tracked to publication by *Heart, Lung and Circulation* [15–20].

Topics covered to date include interventional cardiology service delivery [15], echocardiography protocols [16], management of

cardiac electrophysiology and cardiac implantable electronic devices [17], acute heart failure and screening the critically ill [19], and rural and remote services during the COVID-19 pandemic, and other statements tackling emerging issues are being developed as needed.

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