

# Cardiovascular disease in the COVID-19 pandemic: risk and risk reduction

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The current issue of *EHJ Supplements* is dedicated to the consequences of the COVID-19 pandemic on population health, on the world economy, and on cardiovascular medicine and cardiovascular care. Various articles address the increased risk (in-hospital or out-of-hospital) for patients with cardiovascular disease at the time of the COVID-19 pandemic; but at the same time, other articles focus on potential solutions to mitigate the risk by providing improved assessment of cardiovascular risk or therapeutic options.

Tarricone and Rognoni<sup>1</sup> discuss the health-economic consequences of the COVID-19 pandemic. The authors underscore the tremendous magnitude of this pandemic, reiterating that at the end of September 2020, COVID-19 had infected more than 28 million individuals worldwide, with 70% in Western economies (the top five countries including Spain, England, France, Italy, and Germany). Moreover, the total number of registered COVID-related deaths included 917 417 worldwide and 225 494 in Europe.

In addition, the authors discuss the major economic consequences of COVID-19-related lockdown in many countries—as the authors state: ‘...bringing the economic activity to a near-standstill. The resulting economic damage is already conspicuous and consists of the largest economic shock the world has experienced in decades...’—highlighting the difficult balance between the lockdown required to limit the spread of disease, and avoiding the consequent economic crisis.

Subsequently, the authors describe the main lessons learned from this pandemic, including:

- Identification of areas of improvement for healthcare systems
- Empowering primary and community care
- Psychological effects of the pandemic on healthcare personnel

- The need for investing in digital health
- Design of clinical studies to generate evidence

Calò *et al.*<sup>2</sup> focus on the rapid introduction and implementation of digital health and remote monitoring in cardiovascular medicine. Although both concepts were introduced years ago in cardiology, broad clinical implementation was triggered by the lockdown as a consequence of the COVID-19 pandemic, when most outpatient care was switched from ‘in-person’ clinical visits to virtual visits by audio (telephone) or video consultation. Moreover, telemedicine (including remote diagnosis, monitoring, and treatment of patients) and digital health (the application of technologies to support management of disease) enabled ‘virtual/remote’ patient care, to avoid personal hospital visits in-person when many patients with COVID-19 were hospitalized.

Next, the impact of the COVID-19 virus on various specific cardiovascular diseases is addressed.

Banning *et al.*<sup>3</sup> describe the effects of COVID-19 on the diagnosis and treatment of patients presenting with acute coronary syndromes. The authors describe in great detail the effect of patient instructions ‘to stay away from hospitals unless it was absolutely necessary’ in order to avoid infection with COVID-19 in the hospital. Overall, seven articles reported a significant reduction in patients presenting with STEMI (ranging from 20% to 50%) and an even greater decline in patients presenting with NSTEMI. In addition, the number of patients presenting late after STEMI increased three-fold. Finally, the authors reported a 43% reduction (as compared to the pre-COVID-19 period) in rates of primary percutaneous coronary intervention for STEMI. Moreover, late presentations were associated an increase in late complications (e.g. ventricular septal rupture or acute ischaemic mitral regurgitation).<sup>4</sup>

Recently, Sokolski *et al.*<sup>5</sup> reported similar findings in the *American Journal of Medicine*. The authors specifically evaluated whether the COVID-19 pandemic was associated

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with changes in the pattern of admissions for acute cardiac events across 15 European centres from 12 countries. For each centre, all consecutive acute admissions to the Emergency and Cardiology departments were noted throughout a 1-month period during the COVID-19 pandemic, and compared with consecutive acute admissions to the Emergency and Cardiology departments throughout the same month in 2019. Cardiology admissions were grouped in four major categories: acute coronary syndrome, acute heart failure, arrhythmia, and pulmonary embolism and data collected from 54 331 patients. Nine centres also provided data on 50 384 acute admissions to the Emergency Department. In total, 20 226 patients visited the emergency room in 2020, compared with 30 158 in 2019 although risk of death was higher in 2020 (odds ratio 4.1).

All 15 participating centres provided data on acute Cardiology admissions: in 2020, 3007 patients were admitted compared to 4452 in 2019. Specifically, in 2020 (at the time of the COVID-19 pandemic), less patients were admitted with acute coronary syndromes, acute heart failure, and arrhythmias. However, more patients were admitted with pulmonary embolism compared to 2019. In 2020, there were less admissions with unstable angina, NSTEMI and STEMI. These observations confirm that patients with cardiovascular disease visited the Emergency Department less often, as the article in this Supplement suggests.<sup>3</sup>

Children with congenital heart disease are another high-risk group at the time of COVID-19. Müller *et al.*<sup>6</sup> express concern regarding the increased risk of children with congenital heart diseases (e.g. Kawasaki syndrome) when infected with the COVID-19 virus, which may increase the likelihood of further cardiovascular involvement and subsequent risk.

Finally, it should be emphasized that 0.5–2% of patients with COVID-19 infection will suffer a stroke.<sup>7</sup> These strokes are often severe with unfavourable prognosis. Most patients suffer from occlusion of large brain-supplying arteries resulting from COVID-19 induced coagulation disorders.

The remaining articles in this Supplement address the topic of high-risk patients with cardiovascular disease who need specific hospital care. More precisely, those with heart failure, valvular heart disease, and atrial fibrillation. These patients need specific care and/or procedures, but are at elevated risk for hospital visits at the time of the COVID-19 pandemic [and also now, in the fall of 2020, as a second wave (or surge) of infection emerges].

Although heart failure is a disease characterized by frequent need for hospitalization, admission of these vulnerable patients should be avoided where possible in the time of COVID-19. In search of solutions, various authors address different applications of monitoring and telemedicine to reduce the need for hospitalization and outpatient clinic attendance. Bayes-Genis *et al.*<sup>8</sup> highlight the use of the CardioMEMS system to monitor pulmonary artery pressure in heart failure patients, which can prevent/reduce the need for hospitalization. In the COVID-19 period, the CardioMEMS system appears to be a highly valuable means of pulmonary artery pressure monitoring in combination with virtual patient assessment: during 2020, increasing

use of the CardioMEMS system in heart failure patients was associated with a reduced number of hospital admissions.

In addition, left ventricular assist devices (LVADs) may further support patients with severe heart failure. Bories and Abi Akar<sup>9</sup> present a case series of severe heart failure patients who were successfully treated with an LVAD (HeartMate 3<sup>TM</sup>) as a bridge to transplantation or destination therapy during the COVID-19 pandemic and lockdown period in France. The different case reports illustrate how the use of LVADs in severe heart failure patients largely prevented further hospitalization in these fragile, high-risk individuals.

Patients with valvular heart disease (aortic stenosis, mitral regurgitation, tricuspid regurgitation) are another vulnerable group at the time of COVID-19. Lurz *et al.*<sup>10</sup> and Adamo *et al.*<sup>11</sup> indicate that careful consideration concerning diagnostics, monitoring, follow-up, and treatment is needed. Risk stratification requires assessment of the risk of delaying the procedure vs. the risk of COVID-19 exposure during in-hospital work-up (including extensive imaging with echocardiography and computed tomography) and the procedure itself. The authors describe a careful algorithm addressing these factors to facilitate the decision-making process. Again, assessment can often be undertaken by telemedicine/virtual visits, including the Heart-Team discussion (to determine the mode of intervention) and subsequent consultations with the surgeon or interventional cardiologist. This process significantly reduces the overall patient 'COVID-19 risk' during the pandemic.

Patients with atrial fibrillation at high risk for thromboembolism who are under consideration for left atrial appendage occlusion are another group at elevated risk during the COVID-19 pandemic. Waiting for the procedure exposes the patient to prolonged risk of systemic embolism, but hospitalization for the procedure carries risk of COVID-19 exposure. Freixa *et al.*<sup>12</sup> describe an elegant approach to achieve a less invasive procedure, which includes outpatient pre-procedural computed tomography to provide excellent 3D images and subsequent guidance of the procedure with intra-cardiac echocardiography or microtransoesophageal echocardiography (without need for general anaesthesia), thereby shortening duration of the in-hospital stay—another novel approach that may reduce the risk of COVID-19 exposure, whilst also minimising the risk of the procedure.

In conclusion, the COVID-19 pandemic is associated with significant risks in patients with cardiovascular disease. The articles in this Supplement highlight ways in which clinicians can adopt new care pathways and technologies to mitigate these risks using a variety of approaches.

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