Received: 12 January 2022 | Accepted: 12 January 2022

DOI: 10.1111/nicc.12756

GUEST EDITORIAL

BACCN Nursing in Critical Care WILEY

The impact of Covid-19 on cardiovascular health

1 | INTRODUCTION

When the editors asked me to produce an editorial that focussed on the current cardiac-related issues in intensive care nursing, I pondered for some time about the content of the paper and how I might move the debate beyond Coronavirus Disease 2019 (Covid-19). Unfortunately, whilst many, if not most of the critical care workforce is physically, psychologically and emotionally tired of the effects of the pandemic, viral mutation, an unwillingness or inability for some to receive the vaccines mean that we are likely to see Covid-19 patients in critical care units for some time. Moreover, the number of people attending hospital with Acute Coronary Syndrome (ACS),[1–5] heart failure,[6] arrhythmia[7] and those requiring emergency cardiac surgery[8] dramatically reduced during the pandemic. Consequently, it is likely that some of these patients will suffer the long-term effects of missed treatment and require critical care nursing at some point in the future. It, therefore, still seems appropriate to consider the cardiac ramifications of Covid-19 and its implications for the critical care nurse.

1.1 | Covid-19

Covid-19 is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first identified in Wuhan, China in 2019. SARS-CoV-2 is unlike the coronavirus that causes the common cold but similar to the zoonotic SARS coronavirus that transfers from animals to humans, including the SARS coronavirus reported in 2002[9] and the Middle Eastern Respiratory Coronavirus Syndrome (MERS) reported in 2012.[10] SARS and MERS, SARS-COV-2 is believed to have originated in bats and was transmitted to humans via an intermediate host thought in this case to be a pangolin.[11]

SARS-CoV-2 enters the cell by binding to angiotensin-converting enzyme 2 (ACE2) receptors[12,13] in the heart, vascular endothelium, intestinal epithelium, kidneys and in the lungs.[14] Whilst much of the early research understandably focussed on the respiratory impact of the infection, the systemic effects are now more clearly understood.

1.2 | Cardiovascular disease as a risk factor

Cardiovascular disease (CVD) is both a predictor of increased mortality and can occur as a consequence of contracting Covid-19. Figliozzi and colleagues[15] reported in their meta-analysis, a threefold increased composite risk of death and worsened Covid-19 outcome for those with a previous CVD history. These poor outcomes are likely to be related to a combination of pathology and underlying CVD risk factors, including diabetes,[16] hypertension[15,17,18] and obesity19 which have been found to negatively impact clinical outcome. Whilst much has been written about the risk of thrombo-embolic events associated with Covid-19, less focus appears to have been placed on additional cardiovascular complications, which are discussed in this editorial.

1.3 | Acute myocardial injury

Acute myocardial injury, evidenced by raised Troponin levels, is believed to occur in 9–40%[20] of hospitalized patients and has been shown to be a negative prognostic indicator,[21–23] including increased admission to intensive care and death.[24,25] The mechanism in which SARS-Cov-2 induces myocardial injury is unclear but may include the alteration of the ACE2 signalling pathways,[26,27] the effect of a cytokine storm associated with systemic inflammation[22,23] and/or additional myocardial workload resulting from respiratory failure and hypoxia. Irrespective of the underlying pathology, myocardial injury leads to increased risk of cardiovascular complications, including, myocarditis, arrhythmia, heart failure and ACS.[28]

1.4 | Myocarditis

Early case reports suggested that myocarditis was a common complication of Covid-19.[29,30] These results were unsurprising given that in one Canadian study 35% of patients who died during the 2002 SARS outbreak were found to have evidence of the virus within their hearts.[31] However, the task force for the management of Covid-19 of the European Society of Cardiology[28] have suggested that a definitive diagnosis of myocarditis can only be made following examination of endomyocardial biopsies and, as such, the evidence that myocarditis is a common complication of Covid-19 is yet to be convincingly demonstrated.

1.5 | Arrhythmia

Tachy and brady arrhythmias are common in patients with Covid-19. One study from China reported 16.7% of hospitalized patients experienced arrhythmias, which increased to 44% in those requiring intensive care management. However, the authors failed to report the type of arrhythmia. More recent studies[32,33] have reported arrhythmia prevalence of between 7 and 25% with atrial fibrillation accounting

for 5–15% of all reported arrhythmia. Both papers report a correlation between arrhythmia and disease severity with Peltzer and colleagues[32] also reporting a correlation between arrhythmia and 30-day mortality. Whilst arrhythmia prevalence is not uncommon in hospitalized Covid-19 patients, this frequency increases in those requiring intensive care. In one observational study of 113 intensive care patients in Germany,[34] the authors report that 44.2% of patients experienced sustained atrial arrhythmia, the most common of which (35%) was atrial fibrillation. Sustained ventricular tachycardia, ventricular fibrillation or Torsade's de Pointes were observed in 4 patients (3.5%), whilst 10 patients (8.9%) experienced second or third-degree atrioventricular block. A second cohort study,[35] including 155 patients from seven intensive care units in Denmark found that 57 patients (37%) experienced an arrhythmia with 55 (33%) of these patients experiencing atrial fibrillation–flutter. Arrhythmia appeared to increase 30-day mortality (39% vs. 61%). However, this finding was not statistically significant, possibly due to the small sample size. Management of arrhythmia, especially those incorrectly perceived as benign, may not be prioritized in a critically ill patient but the short-term physiological impact on cardiac output and the longer-term risk, for example, stroke in atrial fibrillation should not be underestimated. Cardiac arrhythmias are a red flag and should be treated immediately in line with the relevant European Society of Cardiology Guidelines.

1.6 | Heart failure

Heart failure-related admissions reduced significantly during the height of the Covid-19 pandemic in 2020[36] with patients presenting with more advanced signs of decompensation[37] and an increased level of brain natriuretic peptide both of which are associated with higher mortality.[38] Some have speculated that patients may have delayed seeking help for fear of contracting Covid-19; however, in our recent work,[39] we found that patients with CVD delayed seeking help during the pandemic as they were often unable to interpret their symptoms. When faced with public health messaging, which suggested that people should only attend hospital if the situation was life-threatening, they chose to stay at home.

The prevalence of chronic heart failure (CHF) as a comorbid condition in the Covid-19 population has been reported as 3–21%[40] with CHF associated with an increased risk of mortality[41,42] and need for mechanical ventilation.[43] In addition to those that present with CHF, between 2 and 23% of patients will develop acute heart failure because of the infection. The large variation in prevalence between studies is probably related to the diverse methods of data collection rather than variations in populations. For example, Zhou et al.[21] report prevalence of heart failure as an outcome but do not record the number of patients with CHF on admission. It is therefore feasible that some of the 23% of patients reported as suffering from heart failure in this study were suffering from chronic heart failure and that increased metabolic demand exposed subclinical heart failure. It is clear from the combined data that up to one-fifth of Covid-19 patients will experience heart failure during their illness and the presence of heart failure increases a patient's need for critical care management. Whilst the most severe cases will require mechanical ventilation and system support to maintain organ perfusion, it is essential that fundamental heart failure treatment is included in their management plan. Whilst during the early days of the pandemic, there was a belief that ACE inhibitors might lead to up-regulation of the ACE2 receptors, therefore, increasing risk, there is no evidence that this occurs, and ACE inhibitors along with other evidence-based therapies should form part of routine heart failure management as per European Society of cardiology guidelines.[44]

1.7 | Acute coronary syndrome

Reductions in hospital attendance for ACS during social containment mandates during 2020[1–5] may result in an increasing number of patients presenting with undiagnosed heart failure. Moreover, increased myocardial workload with subsequent oxygen supply and demand imbalance, in combination with atherosclerotic plaque destabilisation may increase a person's risk of suffering an ACS[45] as a consequence of Covid-19 infection. Whilst ensuring the use of personal protective equipment to protect staff from cross infection, patient management should not vary from current guidelines, which are designed to restore coronary blood flow as soon as possible.

1.8 | Congenital heart disease

Adults with congenital heart disease (CHD) are assumed to be at greater risk from Covid-19 due to residual haemodynamic lesions such as valve disorders, reduced left ventricular function and arrhythmia.[46] However, recent evidence obtained from 58 CHD centres, including 1044 Covid-19 positive patients suggests that CHD mortality rates are no greater than the wider population.[47] Nevertheless, it might be unwise to treat those with CHD as a homogenous group with evidence that those with worse physiological state, such as cyanosis and pulmonary hypertension, renal insufficiency and previous heart failure, are at greater risk.[47] The latest European guidelines[21] suggest early admission to hospital and an intensive care management plan to be discussed with a CHD specialist in all those except the lowest risk.

2 | CONCLUSION

Patients with CVD are at greater risk of dying of Covid-19 and are more likely to require intensive care nursing. Critically ill patients with Covid-19 often suffer cardiovascular complications that require immediate and ongoing management. As the incidence of Covid-19 increases once more, it is essential that nurses recognize the influence of comorbid heart disease on clinical outcome so that we can prevent or manage their potential complications and reduce subsequent morbidity and mortality.

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