Cardiac Society of Australia and New Zealand

CSANZ POSITION STATEMENT ON COVID-19
FROM THE PAEDIATRIC AND CONGENITAL COUNCIL

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At the time of writing, there have been nearly 4.4 million infections and 300,000 deaths worldwide related to COVID 19, an infection caused by SARS-CoV-2. Australia (currently 6,900 infections and 98 deaths) and New Zealand (1500 infections and 21 deaths) have thus far been less affected than other regions. Risk factors for more severe disease include older age and pre-existing cardiovascular disease. The purposes of this document are:

1) To review the mechanisms for cardiac involvement in COVID 19, specifically as they may impact patients with childhood and adult congenital heart disease (CHD).
2) To review the impact of SARS-CoV-2 infection in the paediatric population.
3) To review available data on the risks related to COVID 19 for childhood heart disease and adult CHD.
4) To provide guidance for childhood heart disease and adult CHD units in our region to re-organise services during the pandemic in order to protect a highly specialised workforce and yet continue to provide an essential service

Recommendations relevant to the care of children with heart disease and adults with CHD to mitigate the impact of COVID 19 are highlighted through the document.

Mechanisms for cardiovascular involvement in COVID 19

COVID 19 predominantly affects the lungs causing an interstitial pneumonitis and acute respiratory distress syndrome. However, multiple other organs including the cardiovascular system can become involved. Viral characteristics resulting in infection have been previously well reviewed [1]. Of particular note, SARS-CoV-2 binds to the angiotensin converting enzyme 2 (ACE 2) receptor to enter host cells. The ACE 2 receptor is highly expressed in the lungs and cardiovascular tissue. Several factors related to infection have the potential of impacting the

cardiovascular system including direct myocardial viral replication and damage, immune activation and cytokine storm, micro- and macro-vascular dysfunction and thrombosis. A number of specific cardiovascular manifestations of severe COVID 19 infection warrant mention:

1) COVID 19 and myocardial injury and heart failure

Myocardial injury associated with COVID 19 has been suggested from a number of case reports and series [2]. Myocardial injury has been accompanied by elevation of troponin and LV dysfunction. Not unexpectedly evidence of myocardial injury appears to be more prevalent in fatal versus non-fatal COVID 19 infection. These manifestations may relate to direct viral induced myocarditis and/or a broad systemic inflammatory response and supply/demand mismatch without acute athero-thrombosis (type 2 myocardial infarction).

2) COVID 19 and arrhythmia

Early reports from China suggested an association of severe COVID 19 infection with arrhythmia [3,4]. Factors that may promote arrhythmia with severe COVID 19 infection include metabolic derangement, myocarditis/myocardial inflammation and sympathetic activation.

3) COVID 19 and coagulation abnormalities

Coagulation abnormalities including DIC, systemic and arterial thrombosis and pulmonary thromboembolism have been reported in severe COVID 19 infection [5,6,7].

The impact of these effects of COVID 19 infection on patients with childhood or adult congenital heart disease, particularly those more at risk of ventricular dysfunction, arrhythmia and thrombosis, are as yet unknown.

The impact of SARS-CoV-2 infection in paediatric populations

SARS-CoV-2 has been reported to infect children, although current literature suggests both that paediatric patients make up only a small percentage of the total number of documented cases and the disease process tends to be less severe than reported in the adult population [8].

1) Demographics

Data from countries heavily impacted by the pandemic have consistently reported low percentages of children in the total numbers of confirmed cases. These range from 1% in China, Italy and Iran, up to 5% in the United States with 2.4% reported by the WHO-China Joint Mission on Coronavirus. Rates of paediatric infection in Australia are currently very low (currently 1% of cases in Qld, 3% in New Zealand, and 4% in NSW for example). The median age of reported paediatric cases is around 7 years, with no significant difference in sex distribution (around 60% boys).

2) Severity of Illness

The severity of the illness appears to be milder in the paediatric population than reported in adults [8, 9,10]. Of those children infected the illness was asymptomatic, mild or moderate in over 90% of cases. Mild symptoms (URTI) were the most commonly reported (around 50%) with moderate symptoms (fever, cough, pneumonia) reported in 40%. Severe symptoms, manifest

with hypoxia (saturations <92%) were present in around 2.5% of cases and critical symptoms with respiratory failure and end organ damage or ICU admission in 0.4% to 1.7%. Severe illness has been reported to be more likely in the younger age groups (<1yo = 10%; 1-5yo 7%; 6-15yo 4%; >16yo 3%). Fever was present at some time during the illness in 42% but was often less than 38 degrees (around 60%). Asymptomatic infection has been reported in varying numbers of paediatric patients, ranging from 4-16% of confirmed positive cases.

3) Mode of Infection

Of those children exposed to an index case with known or suspected SARS-CoV-2 infection, 12% subsequently tested positive. 90% of these cases were identified through contact tracing of a symptomatic adult as part of a family cluster. Small case series suggest the main source of infection in children is transmission from an adult family member, based on the infected children having developed symptoms after exposure to the index adult case [11].

4) Paediatric inflammatory multi-system syndrome temporally associated with SARS-CoV-2 (PIMS-TS)

Recently a small number of cases of a multi-system inflammatory syndrome associated with paediatric COVID 19 infection have been described [12]. This syndrome, marked by fever, inflammation and poor function in one or more organ, has features overlapping with Kawasaki disease (KD), toxic shock and macrophage activation syndromes. Transient ventricular dysfunction requiring intensive care admission, inotropic and/or ECMO support but with rapid recovery has recently been reported as part of PIMS-TS [13]. Children with these features warrant close review of clinical and inflammatory markers, echocardiography and standard supportive management. IVIG and aspirin could be considered if fulfilling criteria for KD.

Recommendation 1: Clinicians suspecting a case of paediatric multi-system inflammatory syndrome associated with COVID 19 should consult promptly with a paediatric infectious disease, rheumatology, cardiology and/or critical care physician.

Recommendation 2: A system of regional surveillance of COVID 19 associated paediatric multi-system inflammatory should be developed.

Cardiovascular Risk factors for severe COVID 19 infection

From an observational database of 169 hospitals in Asia, Europe and North America, the coexisting cardiovascular conditions independently associated with in-hospital mortality were coronary artery disease, heart failure and arrhythmia [14]. Additional risk factors for death were COPD and current smoking *but not the use of ACE inhibitors/ARB*. At present there is no evidence to support either a harmful effect of ACE inhibition in COVID 19 infection, and a recent brief report from the UK Clinical Practice Research Datalink suggests that there may be a dose related protective effect [15].

Recommendation 3: ACE inhibitors in children with heart disease and adults with CHD should be continued during the COVID 19 pandemic.

Very little data exists on the specific risks for severe COVID 19 infection in childhood heart disease and adults with CHD. In a description of 485 adult CHD cases with clinical COVID 19 infections from Italy 70% were asymptomatic, 20% had specific symptoms and 10% non-specific symptoms. No patients had severe disease and only 2 were hospitalised (The Sommerville Foundation Live Webinar; https://www.livemedia.com/achdcovid19). Risk factors for severe COVID 19 appeared to relate less to the underlying cardiac condition and more to other comorbidities. Nonetheless, using the precautionary principle, the following groups of patients could represent those at higher risk for severe COVID 19 infection: Fontan circulation or single ventricle palliation, chronic cyanosis, significant ventricular dysfunction, pulmonary hypertension, those with impaired immunity (22q11 deletion, asplenia) or other comorbidities (renal failure, lung disease). These "higher risk" groups are similar to those identified in a recent British Congenital Cardiac Association newsletter (https://www.bcca-uk.org/pages/news_box.asp?NewsID=19495710).

Maintaining Access to health care during the COVID 19 pandemic for patients with Childhood heart disease and adult CHD

Access to medical assessment and treatment for non-COVID conditions has been reduced during the pandemic. This is the case in all areas of medical care from primary health to the specialist hospital. Notwithstanding that some patients and families are reluctant to visit medical facilities for fear of infection, the major contributor is a reduction in service provision. This occurs so that resources can be diverted to the treatment of COVID-positive patients, and to reduce the risk of COVID-19 spread within the hospital environment through social distancing and other protective strategies. In addition the usual level of community supervision may be impacted either because there is a reluctance of healthcare workers to visit homes, or because local community health services have curtailed this kind of service. This has the potential to adversely impact the health and wellbeing of fragile patients and also the delivery of secondary rheumatic fever prevention and other community based interventions. Treatment may also be delayed because of minor respiratory symptoms which are especially common in children.

Recommendation 4: Paediatric Cardiology and Adult Congenital Cardiology Services should aim to ensure that adequate services are provided to facilitate telehealth consultations to minimise patient exposure related to travel, clinic and hospital visits when clinically appropriate. This type of consultation is especially relevant to those living remotely.

Recommendation 5: Those waiting and/or deferred for investigation and treatment will benefit from frequent review of acuity. While this can be aided by remote telemedicine assessment, it should be recognised that this is a risk mitigation rather than risk elimination strategy.

Recommendation 6: Clinicians and health services need to ensure, when possible, that patients who have congenital heart disease or childhood heart disease are not deprived of acceptable levels of care due to diversion of resources to COVID pathways. This is especially relevant for patients who are socially disadvantaged and/or live remotely where assessment may be beyond the expertise of local medical teams. Resources need to be ring-fenced so that time-critical investigation and treatment can proceed.

Recommendation 7: Specifically for children and adults with a past history of acute rheumatic fever and/or rheumatic heart disease, continued prophylaxis with 3-4 weekly benzyl penicillin injections remains critically important.

Paediatric cardiac units and adult congenital heart disease services in the region are dependent on small numbers of key personnel. In some instances – particularly cardiac surgery – absence of these personnel because of exposure to, or illness from, COVID 19 will have a profound operational impact. This is also the case for those staff with a less unique skill mix if they are absent in large numbers.

Recommendation 8: Patients and families should be screened prior to hospital admission or clinic visits to ensure that they do not have symptoms attributable to COVID 19 infection, have not had contact with someone who is infected, and are aware that if they develop these symptoms prior to the visit they should not attend. In accordance with local health department recommendations, consideration should be given to COVID testing of all admissions and clinic visits if community infection rates of COVID 19 are high.

Recommendation 9: PPE should be available and utilised as per local hospital protocols.

Reducing the risk of acquiring COVID 19 for patients with childhood and adult CHD

Although data are lacking, it is likely that older patients with complex congenital heart disease are at increased risk for COVID19 related complications.

As outlined above, if community COVID 19 rates are high enough to pose a significant risk, visits to clinics and hospitals for investigations, assessments and procedures should be delayed if deemed non-urgent. Consultations conducted via videoconferencing or telephone may suffice for stable patients. It is important that the risks for delaying investigation and treatment do not outweigh the potential risk for COVID 19 complications and patients should be encouraged to access appropriate care when needed. Parents, patients and families are likely to feel especially vulnerable during the pandemic and may need additional reassurance by clinical care teams.

Patients and family should be counselled about general measures such as hand hygiene, respiratory hygiene and social distancing according to current regional recommendations that may vary according to rates of community transmission. Low risk patients and their families should be encouraged to follow local guidelines to reduce the risk for infection including recommendations for work and school attendance. The decision to work or study from home for higher risk patients and family members may be more challenging and depends upon family resources, logistics, current community transmission rates and individual risk factors. Data regarding the efficacy of facial mask use in public are controversial. Physicians may consider recommending face covers in especially high risk patients and situations.

Recommendation 10: Appropriately timed influenza vaccine is especially important during the COVID 19 pandemic as co-infection may increase the risk for serious respiratory complications. Patients and family members over the age of 6 months of age should be encouraged to be vaccinated unless they have a contraindication.

Recommendation 11: Provision of up-to-date information to families and patients is important. This should be readily available electronically, updated regularly, and relevant to the local environment.

Summary

The COVID 19 pandemic has been and will continue to be a great challenge to healthcare systems across the globe. To date, little information is available to indicate that those with childhood heart disease and adult CHD are at a higher risk of severe COVID 19 infection. However, until further data is available, those patients with more severe forms of heart disease should pay particular attention to measures to avoid COVID 19 such as social distancing and hand hygiene. The small but highly specialised teams comprising the childhood and adult CHD workforce will require reorganisation to ensure continued high level service provision in the face of likely health worker infection. These services need to ensure that systems are in place to facilitate the continued timely provision of cardiac care to those patients who need it during the COVID 19 pandemic.

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