

Five years on post-COVID-19 pandemic: Importance of COVID-19 vaccination and the adult heart

Weien Chow¹ MMed (Internal Medicine)

At the time of writing this editorial, it has been more than 5 years since the COVID-19 pandemic. As healthcare professionals, we can vividly remember how the COVID-19 pandemic disrupted the economy, society and our daily lives. More importantly, the COVID-19 pandemic struck the elderly and immunosuppressed patients or medically vulnerable persons the hardest. Medically vulnerable persons include persons with chronic diseases of the heart, lungs, kidney, liver and other organ systems. The last editorial on COVID-19 published in the *Annals* in 2023 was an insight piece titled “COVID-19: The virus, vaccine and paediatric heart”, which highlighted the importance of vaccination and the paediatric heart.¹

It is therefore timely that in this issue of *Annals*, Wee et al. published their research on Omicron SARS-CoV-2 outcomes in vaccinated individuals with heart failure (HF) and ischaemic heart disease (IHD).² This study demonstrated an increased risk of COVID-19-related hospitalisation and severe COVID-19 infections among HF/IHD patients compared with matched population controls. COVID-19 vaccination boosters were shown to attenuate the risk of COVID-19-related hospitalisation and severe COVID-19 infections. Using national databases, 15,426 HF patients were matched to 41,221 controls without HF, and 110,442 IHD patients were matched to 223,843 controls without IHD. The authors clearly demonstrated the effect of how COVID-19 booster vaccinations on HF and IHD patients reduced the risk of SARS-CoV-2 infection and adverse COVID-19 outcomes. It was also notable that there was a high percentage (>80%) of HF/IHD patients boosted (received ≥ 3 vaccine doses). Risk of SARS-CoV-2 infection and severe COVID-19 was found to be significantly lower in boosted groups who received ≥ 3 doses; IHD: adjusted hazard ratio (aHR) (95% confidence interval [CI]) 0.27 (0.23–0.32); HF (95% CI): aHR 0.35 (0.28–0.43), versus HF/IHD patients who had only completed a 2-dose primary vaccination series. Risks of SARS-CoV-2 infection, hospitalisation and severe disease were also lower in the ≥ 4 -dose

group compared with the 3-dose group, though CIs for infection overlapped.² The authors recommended that individuals with recurrent admissions should be prioritised for vaccination/boosting. The American College of Cardiology had published a health policy statement on cardiovascular disease considerations for COVID-19 vaccine prioritisation, which remains a useful reference today.³ In addition, it was heartening to note that vaccination rate was very high among the elderly during the Omicron wave. Even though the study was conducted during the Omicron wave (more than 3 years ago), the findings and recommendations remain relevant. The study also highlighted the importance of national vaccination databases that can inform and reinforce healthcare policies.

Effectiveness of vaccine boosters. Cardiac damage and myocardial injury can be sustained during viral infection of cardiomyocytes, which can result in decompensated heart failure and cardiac arrhythmias among other mechanisms. It is well established that mRNA vaccines stimulate both humoral and cellular immune responses. After inoculation of more than 1 dose of most vaccines, the efficacy rate increases. Thus, efforts should be made to maximise the effectiveness of the vaccine, with more than 1 dose among the vulnerable population. In another similar study that assessed the effectiveness of AZD1222, BNT162b2 and CoronaVac vaccines against the Omicron variant, the study showed that the administration of the booster doses is 95.4% effective in curbing COVID-19 infection, compared to non-boosted vaccination (87.2%).⁴ The authors concluded that boosters are effective in increasing protection against COVID-19, including the Omicron variant.⁴

A new problem of vaccine hesitancy. However, despite the strong scientific evidence and benefits of COVID-19 vaccination, a more recent study post-COVID-19 pandemic showed that the uptake of COVID-19 vaccines in the post-pandemic era in the US is low, with only 22.3% of adults and 37.4% of those aged at least 65 years receiving the updated 2023–2024 COVID-19 vaccine.⁵ Based on a written note from Singapore’s Ministry of Health (MOH) to

The *Annals* is an open access journal, allowing non-commercial use under CC BY-NC-SA 4.0.

¹ Department of Cardiology, Changi General Hospital, Singapore

Correspondence: Assoc Prof Weien Chow, Department of Cardiology, Changi General Hospital, 2 Simei Street 3, Singapore 529889.

Email: chow.weien@singhealth.com.sg

Accepted: 17 May 2025

Published Online First: 20 May 2025

a parliamentary question on 2 July 2024, as of June 2024, only about 15% of seniors aged 60 and above, have received more than 4 doses of COVID-19 vaccinations in Singapore. In the written answer, MOH explained that many Singaporeans are reluctant to take further doses of COVID-19 vaccine, probably contributed by vaccine fatigue. This is in turn due to the perceptions that COVID-19 is no longer a severe disease, and there are side effects to taking the vaccines. This poses significant concern to medically vulnerable persons, especially those with chronic diseases of the heart. There are several interventions such as full funding of COVID-19 vaccinations, sending of phone text reminders and deployment of mobile vaccination teams, to encourage vaccination especially among seniors. However, it is difficult to go against the current public perception and bring about a high vaccine uptake. Unlike many Western countries, Asian countries may not have a strong vaccination culture among adults. While influenza and pneumococcal vaccination rates have gone up since the roll out of Healthier SG (a nationwide initiative promoting overall healthier living), there is a need to continue to encourage more Healthier SG clinics to come on board to provide COVID-19 vaccination. By leveraging the relationship between family physicians and residents, it is hoped that Singapore can maintain societal resilience against COVID-19, as it will be here to stay.⁶

Policies and incentives to address vaccine hesitancy and improve vaccination rates. As a physician, we continue to face resistance and vaccine hesitancy among our patients to undergo not only COVID-19 vaccination but also other forms of vaccination such as influenza vaccination.⁷ As part of the Healthier SG initiative, Singapore's MOH has incentivised the subsidy of COVID-19 and influenza vaccinations. This is based on the 2024/2025 recommendation of the Expert Committee for Immunisation.⁸ COVID-19 vaccination is especially applicable to individuals at increased risk of severe COVID-19, such as seniors and those who are medically vulnerable. Singapore Citizens, Permanent Residents, Long-Term Pass Holders, and certain Short-Term Pass Holders aged 6 months and above are eligible to receive the COVID-19 vaccines for free under the National Vaccination Programme. For eligible Healthier SGenrolled Singapore Citizens (1) aged 65 years old and above and (2) adults with certain medical conditions, individuals are able to get fully subsidised flu vaccinations at their enrolled Healthier SG clinic.

What has changed since the COVID-19 pandemic and what can we do? While the virus strain has changed, the need to protect medically vulnerable persons remains unchanged. COVID-19 vaccination

rate is at a much lower rate than before. As more evidence emerge, it can help to increase COVID-19 vaccination rates and address vaccine hesitancy. Recent studies have demonstrated the effectiveness of COVID-19 vaccination on the development of post-COVID-19 condition symptoms in children aged 5 to 17 years¹⁰ as well as in adults as shown in the Vaccine Effectiveness, Networking, and Universal Safety (VENUS) study.¹¹ Findings presented by studies such as VENUS may provide an additional nudge for individuals to undergo COVID-19 vaccination. There is however limited research and evidence on the effectiveness of COVID-19 vaccine hesitancy interventions. A multiprong approach is therefore needed to improve vaccine acceptance, contextualised to the specific local population. More implementation science studies should also be carried out to better understand the effectiveness of various interventions and strategies of the national vaccination programme. This will help in the assessment and formulation of effective healthcare policies.

Call for action. As we continue to reinforce the importance of vaccination to our patients, it is not a matter of if but when the next pandemic will occur. One thing is certain: we must continue to vaccinate our patients and our residents as part of Healthier SG, so that we do not need to relearn the lessons learnt. We must not let our guard down and the time to action is now. This is especially important as Singapore continues to experience new waves of COVID-19 infections presently.

Ethics statement

Not applicable.

Declaration

The author(s) declare they have no affiliations or financial involvement with any commercial organisation with a direct financial interest in the subject or materials discussed in the manuscript. This study did not receive any specific funding.

Keywords: boosters, COVID-19 pandemic, heart failure, ischaemic heart disease, vaccination

REFERENCES

1. Choo JTL. COVID-19: The virus, vaccine and paediatric heart. *Ann Acad Med Singap* 2023;52:495-6.
2. Wee LE, Loy EX, Lim JT, et al. Omicron SARS-CoV-2 outcomes in vaccinated individuals with heart failure and ischaemic heart disease. *Ann Acad Med Singap* 2025;54:Online First.
3. Driggin E, Maddox TM, Ferdinand KC, et al. ACC Health Policy Statement on Cardiovascular Disease Considerations for COVID-19 Vaccine Prioritization: A Report of the American College of Cardiology Solution Set Oversight Committee. *J Am Coll Cardiol* 2021;77:1938-48.

4. Wong MTJ, Dhaliwal SS, Balakrishnan V, et al. Effectiveness of Booster Vaccinations on the Control of COVID-19 during the Spread of Omicron Variant in Malaysia. *Int J Environ Res Public Health* 2023;20:1647.
5. Centers for Disease Control and Prevention. COVID Data Tracker. COVID-19 update for the United States. <https://covid.cdc.gov/covid-data-tracker/#datatracker-home>. Accessed 17 April 2025.
6. Ministry of Health, Singapore. Status of COVID-19 Vaccination Among Singaporeans and Reasons for Not Taking Additional Booster Shots. 2 July 2024. Notice Paper No. 2844. Notice of Question for Written Answer for the sitting of Parliament on 2 July 2024. <https://www.moh.gov.sg/newsroom/status-of-covid-19-vaccination-among-singaporeans-and-reasons-for-not-taking-additional-booster-shots>. Accessed 17 April 2025.
7. Subramaniam M, Abdin E, Shafie S, et al. Sociodemographic and psychosocial factors associated with vaccine hesitancy - results from a longitudinal study in Singapore. *Hum Vaccin Immunother* 2023;19:2235964.
8. Ministry of Health, Singapore. Update to COVID-19 Vaccination recommendations and rollout of updated Jn.1 vaccines. 25 October 2024. <https://www.moh.gov.sg/newsroom/update-to-covid-19-vaccination-recommendations-and-rollout-of-updated-jn-1-vaccines>. Accessed 17 April 2025.
9. Yousaf AR, Mak J, Gwynn L, et al. COVID-19 Vaccination and Odds of Post-COVID-19 Condition Symptoms in Children Aged 5 to 17 Years. *JAMA Netw Open* 2025;8:e2459672.
10. Kim SA, Maeda M, Murata F, et al. Effect of COVID-19 vaccination on the risk of developing post-COVID conditions: The VENUS study. *Vaccine* 2025;43:126497.