

## Evidence check

16 July 2020

Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

## Cardiac stress testing

### Rapid review question

Is there evidence that cardiac stress testing is an aerosol generating procedure and what risk to healthcare workers does it carry?

### In brief

- Lists of aerosol generating procedures do not generally include cardiac stress testing .(1-3) Some guides specify that cardiac stress testing is not an aerosol generating procedure, while another states that the risk is unknown.(4-6)
- A nuclear cardiology service in Singapore identified exercise stress testing for myocardial perfusion imaging as a high-risk procedure for droplet production in the time of COVID-19. As such, treadmill exercise stress was discouraged over pharmacological stress, and medical and nursing staff who attended to suspect patients were required to don N95 masks with appropriate personal protective equipment (PPE).(7)
- During the COVID-19 pandemic, pharmacologic stress tests are preferred over exercise stress testing due to the risk of droplet production.(7, 8)
- A consensus statement from various peak bodies in Australia and New Zealand, including the National Heart Foundation, note that certain cardiac investigations, including stress testing, pose significant viral transmission risk.(9)
- A statement from the American Society of Echocardiography states stress testing on patients with COVID-19 may lead to exposure due to deep breathing and/or coughing during exercise and that these tests should generally be deferred or converted to a pharmacological stress echocardiography.(10) The British Society of Echocardiography notes a paucity of data with regard to the aerosol generating potential of exercise-based stress echocardiography, however the consensus opinion among UK experts is that it may be.(11)
- Infection control considerations for cardiac stress testing during COVID-19 include general infection control guidance as well as: patient screening, PPE, and room decontamination, including consideration of the turnaround time and percentage of airborne virus remaining in the room.(11)

## Limitations

There is a paucity of evidence on the risk to healthcare workers from administering cardiac stress testing. Most guidelines referred to the potential virus transmission risks of cardiac stress testing to healthcare workers in theory, and no articles were identified that examined this risk specifically. The management pathway following a positive cardiac stress test is not described in this review, although some of the included advice states that stress echocardiograms should only be performed if they are expected to provide clinical benefit. (10) While some guidance on infection control for exercise stress testing during COVID-19 includes: face protection such as a visor, physical distance such as standing six feet away from the patient, and a plexiglass shield at the front desk, physical barriers during stress testing were not explicitly described in the literature. (8, 11)

## Background

Cardiac exercise stress testing usually involves the patient walking on a treadmill, although it can also involve a stationary bike or the administration of drugs that mimic the effect of exercise. The main reason for cardiac stress testing is the risk stratification of known or possible coronary artery disease. An electrocardiogram is used to monitor heart activity during the test, and there may be much interaction with a healthcare professional in an enclosed space when administering the test. An alternate to exercise stress test is pharmacological stress test, which mimics the heart's response to increasing levels of exercise. (12)

Guidance recommends adhering to infection control protocols when performing exercise stress testing. The Australian National Health and Medical Research Council infection control guidelines recommend standard and transmission based precautions, including hand hygiene, appropriate use of PPE, environmental controls (e.g. cleaning), and respiratory hygiene and cough etiquette and standard precautions of infection control. (13) General principles for infection prevention and control to prevent or limit transmission of COVID-19 from the Clinical Excellence Commission including early recognition of patients with confirmed or suspected COVID-19, physical distancing, respiratory hygiene and cough etiquette, surgical masks worn by patients with COVID-19, the application of standard infection control precautions for all patients at all times and the implementation of transmission-based precautions. (14)

## Methods (Appendix 1)

PubMed was searched on the 25 May 2020 and Google was searched on the 24 June 2020.

## Results

**Table 1: Cardiac stress testing risk to healthcare workers**

Source	Summary
<b>Peer reviewed sources</b>	
<p><a href="#">Adapting to a novel disruptive threat: nuclear cardiology service in the time of the coronavirus (COVID-19) outbreak 2020 (SARS reboot)</a></p> <p>Loke KSH, et al. 2020 (7)</p>	<ul style="list-style-type: none"> <li>• Segregation of risk groups and conduct of myocardial perfusion imaging. Exercise stress testing for myocardial perfusion imaging was identified as a high-risk procedure for droplet production. As such, treadmill exercise stress was discouraged over pharmacological stress and medical and nursing staff who attended to suspect patients were required to don N95 masks with appropriate PPE.</li> </ul>
<p><a href="#">Cardiovascular disease and COVID-19: Australian/New Zealand consensus statement</a></p> <p>Zaman S, et al. 2020 (9)</p>	<ul style="list-style-type: none"> <li>• Key considerations in management of imaging and stress testing. Certain cardiac investigations such as stress testing and transesophageal echo pose significant viral transmission risk.</li> <li>• There is a considerable risk of SARS-CoV-2 infection for healthcare workers. Healthcare services need to ensure adequate protection with appropriate PPE in the care of COVID-19 patients.</li> </ul>
<p><a href="#">Protecting patients and healthcare personnel from COVID-19: considerations for practice and outpatient care in cardiology</a></p> <p>Dörr R. 2020 (8)</p>	<ul style="list-style-type: none"> <li>• Transesophageal echocardiography should be avoided and only performed on patients with indications in which the procedure is absolutely indispensable.</li> <li>• Electrocardiography leads should be avoided with transthoracic echocardiography. Because of increasing evidence that virus transmission may also be caused by respiratory air and aerosolisation, all cardiopulmonary stress tests (spiroergometry, exercise electrocardiogram, exercise stress echocardiography) should be avoided or postponed.</li> <li>• Pharmacological stress testing should be preferred if stress testing is absolutely required.</li> <li>• Provide PPE for all medical staff members. There should be a sufficient supply of PPE (gloves, N95 masks, gowns, caps, goggles and face shields) for all members of the medical staff. A plexiglass shield should be in place at the front desk to protect against droplet infection.</li> </ul>

Source	Summary
<b>Grey literature</b>	
<p><a href="#">COVID-19: aerosol generation from coughs and sneezes</a> Public Health Ontario. 2020 (4)</p>	<ul style="list-style-type: none"> <li>• According to the Provincial Infectious Diseases Advisory Committee cardiac stress tests have been reviewed and deemed not to be classified as aerosol generating medical procedures, based on the evidence.</li> <li>• Others procedure are also listed in the full document</li> </ul>
<p><a href="#">COVID-19 personal protective equipment (PPE) matrix and infection control recommendations</a> South Australia Dept for Health and Wellbeing. 2020 (6)</p>	<ul style="list-style-type: none"> <li>• Certain procedures and equipment may produce an aerosol, but the risk of infection is unknown, these procedures include, but are not limited to laparoscopic surgery, colonoscopy, transoesophageal echocardiogram, spirometry, chest physiotherapy, exercise stress testing, nitrous oxide delivery in labour and electroconvulsive therapy. Strategies to reduce the risk of aerosol generation should be undertaken.</li> </ul>
<p><a href="#">Restoration of a stress echocardiography service during the COVID-19 pandemic</a> British Society of Echocardiography. 2020 (11)</p>	<ul style="list-style-type: none"> <li>• There is a paucity of data with regard to the aerosol generating potential of an exercise-based stress echo (treadmill or cycling) but the consensus opinion amongst stress echo experts in the UK is that it may be. The infection prevention considerations can be divided into three groups: patient screening, PPE and timing (using data of the percentage of airborne virus remaining in the room after a defined time).</li> <li>• Dobutamine stress echo should be undertaken in the same way as pre-COVID-19 except for the following additional considerations.                         <ul style="list-style-type: none"> <li>○ Minimise the number of personnel in the room to essential staff, that is a minimum of two trained members.</li> <li>○ Standard PPE should be worn throughout the procedure (apron, glove, fluid resistant surgical mask and visor).</li> <li>○ Due to the small risk of a cardiac arrest, every member of the team should have a fit-tested FFP3 mask available in the room.</li> <li>○ Whenever possible and practical, staff within the room should stay six feet away from the patient. This should be feasible intermittently throughout the test.</li> <li>○ Longer appointment times will be required as the patient should be fully recovered within the room rather than sit in a holding area after the test. The experience from departments who have started the service suggests 75mins appointment times are sufficient.</li> </ul> </li> </ul>

Source	Summary
<p><a href="#">ASE statement on protection of patients and echocardiography service providers during the 2019 novel coronavirus outbreak</a></p> <p>American Society of Echocardiography. 2020 (10)</p>	<ul style="list-style-type: none"> <li>• Treadmill or bicycle stress echo tests on patients with COVID-19 may lead to exposure due to deep breathing and/or coughing during exercise. These tests should generally be deferred or converted to a pharmacological stress echo.</li> <li>• A surgical face mask for patients is recommended for those who are symptomatic, under going surface echo examination provided institutional resources allow this.</li> <li>• The type of PPE to be used on specific cases will depend on local institutional policy and resources.</li> </ul>
<p><a href="#">What are the occupational medicine guidelines for treadmill exercise testing in light of the COVID-19 pandemic?</a></p> <p>Hartenbaum, et al. 2020 (15)</p>	<ul style="list-style-type: none"> <li>• One article suggested that pharmacologic stress tests would be preferred during the COVID-19 pandemic over exercise stress testing due to the risk of droplet production. A shorter time required for pharmacologic testing was also noted as a benefit.</li> <li>• Although there may be a concern with droplet production during exercise, with appropriate distancing, the use of face covering by the examinee, and appropriate respiratory PPE by the examiner, this could mostly be addressed.</li> <li>• Ventilation of the room and time before reoccupying along with cleaning of equipment and surfaces may present real challenges. Facilities performing exercise stress testing should consider their current number of air changes/per hour in determining if it is safe to provide the service under those conditions.</li> <li>• Pharmacologic stress tests have a much lower sensitivity than exercise stress testing, however the specificity and positive predictive value is higher.</li> </ul>
<p><a href="#">COVID-19 and aerosol generating medical procedures (AGMP)</a></p> <p>Saskatchewan Health Authority. 2020 (5)</p>	<ul style="list-style-type: none"> <li>• Cardiac stress test included on the list as 'Not an aerosol generating medical procedure'.</li> </ul>

## Appendix 1: Methods

### PubMed search

**Search 1** – (((("exercise test"[MeSH Terms] OR "Stress Test"[Title/Abstract] OR "exercise test"[Title/abstract]) AND (cardi\*[title/abstract] OR heart[MeSH Terms] OR heart[title/abstract]))) AND ((2019-nCoV[title/abstract] or nCoV\*[title/abstract] or covid-19[title/abstract] or covid19[title/abstract] OR "covid 19"[title/abstract] OR "coronavirus"[MeSH Terms] OR "coronavirus"[title/abstract] OR sars-cov-2[title/abstract] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept])) – 0 hits

**Search 2** – (((("exercise test"[MeSH Terms] OR "Stress Test"[Title/Abstract] OR "exercise test"[Title/abstract]) AND (cardi\*[title/abstract] OR heart[MeSH Terms] OR heart[title/abstract]))) AND (("aerosol"[Title/Abstract] OR "droplet"[Title/Abstract] OR "airborne infection"[Title/Abstract] OR "air dispersion"[title/abstract] OR "disease transmission"[title/abstract] OR "virus transmission"[title/abstract] OR "hospital infection"[title/abstract] OR "nosocomial infection"[title/abstract])) – 29 hits (nothing relevant)

### Google search

**Search 3** – cardiac stress test infection aerosol

**Search 4** - cardiac stress testing aerosol generating

**Search 5** - cardiac stress testing COVID-19

## References

1. Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. *PLoS One*. 2012;7(4):e35797.
2. Health Protection Surveillance Centre. Use of PPE to support infection prevention and control practice when performing aerosol generating procedures on confirmed or clinically suspected COVID-19 cases in a pandemic situation. Health Protection Surveillance Centre 2020 May 26.
3. World Health Organization. Infection prevention and control of epidemic- and pandemic-prone acute respiratory infections in health care. World Health Organization Apr 2014.
4. Public Health Ontario. COVID-19: aerosol generation from coughs and sneezes. Public Health Ontario 10 Apr 2020.
5. Saskatchewan Health Authority. COVID-19 and aerosol generating medical procedures (AGMP). Saskatchewan Health Authority; 2020.
6. South Australia Dept for Health and Wellbeing. COVID-19 personal protective equipment (PPE) matrix and infection control recommendations. Department for Health and Wellbeing, Government of South Australia; 2020.
7. Loke KSH, Tham WY, Bharadwaj P, Keng FYJ, Huang Z, Idu MB, et al. Adapting to a novel disruptive threat: nuclear cardiology service in the time of the coronavirus (COVID-19) outbreak 2020 (SARS reboot). *J Nucl Cardiol*. 2020:1-5.
8. Dörr R. Protecting patients and healthcare personnel from COVID-19: considerations for practice and outpatient care in cardiology. *Herz*. 2020;45(4):319-20.

9. Zaman S MA, Jennings G, Schaich M, Inglis S, Arnold R, et al. Cardiovascular disease and COVID-19: Australian/New Zealand consensus statement. The Medical Journal of Australia Published online: 3 April 2020. 2020.
10. American Society of Echocardiography. ASE statement on protection of patients and echocardiography service providers during the 2019 novel coronavirus outbreak. American Society of Echocardiography; 2020.
11. British Society of Echocardiography. Restoration of a stress echocardiography service during the COVID-19 pandemic. British Society of Echocardiography; 2020.
12. McLellan A, Prior D. Cardiac stress testing - stress electrocardiography and stress echocardiography. Aust Fam Physician. 2012;41(3):119-22.
13. National Health and Medical Research Council. Australian guidelines for the prevention and control of infection in healthcare. NHMRC; 2019.
14. Clinical Excellence Commission. Infection prevention and control: management of COVID-19 in healthcare settings. Ver.3.2. CEC; 2020.
15. Hartenbaum NP, Hudson TW. What are the occupational medicine guidelines for treadmill exercise testing in light of the COVID-19 pandemic? : American College of Occupational and Environmental Medicine; 2020 Jun 7.