

Respiratory Protection Against Airborne Infectious Diseases Clinical Guideline

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Respiratory Protection Clinical Guideline

1. Introduction

This document provides information and guidance to workers and employers regarding respiratory protection against airborne infectious diseases. It promotes the adoption of a risk management approach to a respiratory protection program based on the risk of exposure to infectious airborne pathogens, especially those with high morbidity/mortality.

It does not provide guidance for the use of powered air-purifying respirators (PAPR), chemical or cytotoxic exposures, laser plumes or for SA dental settings.

2. Background

The use of respirators should be considered as the last line of defence in the hierarchy of infection prevention measures, including: immunisation, hand hygiene, environmental measures (including sufficient ambient ventilation), single rooms, and early recognition of infectious status.¹ In the majority of situations where respiratory protection is required, a single use face mask (minimum level 2 barrier) is recommended. However, for a small number of pathogens that are transmissible via the airborne route or where aerosol-generating procedures (AGP) are undertaken a higher level of protection will be required.

A correctly fitted P2/N95 disposable respirator should be used when:

- > attending to patients with confirmed or suspected highly infectious airborne diseases
- > performing aerosol generating procedures on patients with a known or suspected respiratory infection or other disease transmitted via the airborne route.^{1;2}

In order for a P2/N95 respirator to provide maximum protection it is essential that the wearer be properly fitted and trained in its safe use.³ A risk management approach should be applied to ensure that workers working in high risk areas are fit tested and know how to perform a fit check. Refer to the Risk assessment for P2/N95 respirator fit testing section on page 7.

Note: Influenza does not require the routine wearing of a P2/N95 respirator EXCEPT in the context of a pandemic of a novel virus, in which case refer to current pandemic guidelines for performing AGPs.

For further information on mask selection refer to the SA Health *Personal Protective Equipment (PPE) Selection Policy Guideline*.

3. Definitions

Aerosol means: a mist composed of very small, lightweight particles that can remain suspended in the air for long periods of time and can travel long distances. These particles can penetrate the respiratory system and are generally <5 microns in diameter.¹

Aerosol-Generating Procedures (AGP) means: procedures that are more likely to generate higher concentrations of infectious respiratory aerosols than coughing, sneezing or breathing. For the purpose of this guideline, the following are classified as AGPs: bronchoscopy, collection of lower respiratory tract specimens (including use of hypertonic saline nebulisation for collection of respiratory specimens), endotracheal intubation and open airway suctioning of lower airways.

Note: The administration of nebulised medication, acquisition of nasopharyngeal swabs and use of high flow oxygen may be considered aerosol-generating procedures. However, there is little evidence for transmission by this route.⁴ During nebulisation, the aerosol derives from a non-

patient source (the fluid in the nebuliser chamber) and does not carry patient-derived viral particles. Standard and droplet precautions are required for these procedures but they should be undertaken in a separate area to minimise risk. It is preferable that nebulised medication delivery be avoided and medication delivered via a spacer instead.

Airborne transmission means: transmission of infection by very small particles (generally <5 microns in size) being generated from the respiratory tract of an infected individual during activities such as coughing, sneezing and during some procedures that are capable of forming aerosols which can be inhaled by other persons.

Droplet transmission means: transmission of infection by larger particles (generally >5 microns in size) that are expelled when coughing, sneezing or talking but do not remain suspended in the air and only travel short distances (approximately one metre) from the patient.^{1;5}

Fit check (user seal check) means: a procedure that must be performed every time a P2/N95 respirator is used to ensure it is properly applied. This includes exhaling and inhaling once a respirator is applied to check the seal. If leaks are detected then the respirator must be readjusted. (Refer to Appendix 2 & 3: P2/N95 respirator donning and fit checking).

Fit test means: a validated method that determines the brand and size of respirator most suited to the individual's face.

Powered air-purifying respirator (PAPR): a hood which uses a power source to drive ambient air through a high-efficiency particulate air (HEPA) filter prior to inhalation by the wearer, increasing the filtration performance over the P2/N95 respirators. However, PAPR devices are expensive, cumbersome, and noisy and require significant ongoing maintenance.

P2/N95 Respirator means: a medical device designed to protect the wearer from infectious aerosols generated directly from the patient or created during aerosol-generating procedures e.g. bronchoscopy. The respirators generally used in healthcare settings are able to filter out approximately 94% of particles <5 microns in size and are known in Australia as P2 respirators (approximately equivalent to N95 in USA or FFP2 in the UK).

There are two types of respirators; standard and surgical (refer to definitions below)

- > **Standard P2/N95 respirator** means: a respirator defined as above that does not have resistance to high velocity fluid sprays e.g. those generated in operative, procedural settings or major trauma. Standard P2/N95 respirators are suitable for most applications but should be used together with a full-face shield for any procedure where fluid resistance against direct blood or body fluid splash is required.⁷
- > **Surgical P2/N95 respirator** means: a respirator defined as above that is also fluid resistant and therefore suitable to be worn during aerosol-generating and surgical procedures that involve a risk of direct blood or body fluid splash. Surgical respirators do not require the associated use of a full-faced shield as these masks are fluid resistant.⁷

Respiratory Infection means: an infectious process affecting any part of the upper or lower respiratory tract. Symptoms can include fever, runny nose, sore throat and cough, joint or muscle pain, lethargy, chest pain and difficulty breathing.

Single use face mask (levels 1, 2 or 3 barrier) means: a loose-fitting, single-use, fluid resistant disposable facemask that creates a physical barrier between the mouth/nose of the wearer and potential contaminants in the immediate environment, as well as reducing the spread of respiratory droplets from the wearer.

4. Principles of the standards

This clinical guideline provides information on general principles of respiratory protection for workers and is formally aligned with following legislation and standards:

4.1. Australian/New Zealand Standards:

- > Standards Australia AS/NZS 1715:2009 - Selection, use and maintenance of respiratory protective equipment
- > Standards Australia AS/NZS 1716:2012 - Respiratory protective devices
- > Standards Australia AS 4381:2015 - Single-use face masks for use in healthcare

4.2. Australian Guidelines for the Prevention & Control of Infection in Healthcare (2019)

- > Recommends that where there is a high probability of airborne transmission due to the nature of the infectious agent or procedure then a correctly fitted P2/N95 respirator should be worn.

4.3. The Policy for Control of Tuberculosis (TB) in South Australian Health Services (2013)

- > States that workers must use a correctly fitted P2/N95 respirator when attending identified or suspected infectious cases of pulmonary TB.

4.4. Work Health and Safety Act 2012 (Section 19) and Work Health and Safety Regulations 2012 (r44, 45, 46)

- > **Division 2** – Primary duty of care, states that the health and safety of other persons is not put at risk from work carried out as part of the business or undertaking and must provide and maintain so far as is reasonably practicable:
 - a safe working environment without risks to health and safety
 - information, instruction, training, instruction or supervision that is necessary to protect all persons from risks to their health and safety arising from work carried out as part of the conduct of the business or undertaking.
- > **Division 4** – Duty of officers, workers and other persons, Section 28 of the Act states that an employee must:
 - Take reasonable care for his or her own health and safety
 - Take reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons
 - Comply with any reasonable instruction
 - Cooperate with any reasonable policy or procedure.

5. General

5.1. Immunisation

All healthcare workers should be fully immunised against common vaccine-preventable diseases in line with the Immunisation for Health Care Workers in South Australia Policy Directive (2017) and their immune status to vaccine-preventable diseases should be recorded.

Personal Protective Equipment (PPE) Competency Assessment

- > All workers must be assessed for their risk of exposure to serious airborne infections against the risk assessment guidance provided in the “Risk assessment for P2/N95 respirator fit testing” section on page 8. Depending on the level of risk, workers may require fit testing (see below).
- > All workers required to wear PPE must be trained and assessed for competency in the use of all PPE as part of an ongoing training program. The Training Tool for the Correct Use of Personal Protective Equipment & Respirator Fit Testing is available on the SA Health website and will assist in worker training.

Note: During times of increased need such as during a novel virus pandemic, other brands of P2/N95 respirators may need to be sourced. Relevant staff should be fit tested prior to use.

For those workers required to wear a P2/N95 respirator, fit testing should be undertaken:

1. prior to working in a high risk area
2. when there is a significant change in the wearer’s facial characteristics that could alter the facial seal of the respirator (e.g. facial surgery or significant change in body weight)
3. when failing to demonstrate a proper fit check at annual competency assessment.

5.2. Fit testing

There are two types of facial fit test – qualitative and quantitative:

- > A **qualitative fit test** is fast and simple but can be influenced by the wearer. It relies on the wearer’s senses to determine if there is a gap in the seal of the respirator to the wearer’s face. A test agent such as saccharin or Bitrex™ (a bitter tasting substance) is used at a sensitivity level that demonstrates the user will be able to appropriately sense the presence of the test agent within the respirator by taste, smell or the urge to cough.
- > A **quantitative fit test** requires the use of specialised particle counting equipment (such as a PortaCount™ Plus machine) to provide quantitative, or numerical, measurements of the amount of face seal leakage present when a given respirator is donned by a particular user.

5.3. Portacount™ Plus Machines

All Local Health Networks have been provided with Portacount™ Plus machines or similar fit testing machines for use within their healthcare facilities. Some points to note are:

- > it is the responsibility of the Local Health Network to ensure that the equipment is maintained in good order and regularly serviced i.e. annually
- > users must be adequately trained by an experienced user or fit testing machine supplier prior to operating the machine
- > a designated person should be nominated to ensure that the machine is used and maintained correctly as per the manufacturer’s instructions by a trained operator.

To ensure a continued adequate fit, an annual competency assessment which involves donning and doffing of the respirator and the ability to demonstrate an adequate fit check is required. The “real time” fit test function of the Portacount™ Pro Plus machine or other similar approved fit testing machine can be used for this purpose. If a worker cannot demonstrate a successful fit check then they should be repeat fit tested for correct brand and size of respirator.

5.4. Selection of respirators

Initial selection of a suitable respirator for fit testing an individual should be made according to the tester's visual assessment of the facial characteristics of the wearer. Where possible one of the brands/sizes contained within the state respirator stockpile should be chosen. Refer to SA Procurement and Oracle ordering systems.

5.5. Risk assessment for P2/N95 respirator fit testing

Regardless of immune status a P2/N95 respirator must be worn by all workers when caring for patients with measles (rubeola virus) or chickenpox (varicella zoster virus). Where possible, workers who are not immune should not care for patients with confirmed or suspected measles or chickenpox. There is evidence of fully immunised workers who acquired measles during a hospital outbreak.⁶ A standard P2/N95 respirator can be used for respiratory protection when the wearer might be exposed to particulate hazards, including during AGPs. If fluid resistance is required, a full face shield is to be worn with the standard P2/N95 respirator or use a surgical P2/N95 mask.

P2/N95 respiratory protection must be worn by workers in the following circumstances:

- > While caring for patients who have a known or suspected airborne-transmissible disease e.g. TB, including extra-pulmonary draining TB lesions when performing wound irrigation (due to aerosolisation of exudate), measles, chickenpox, severe acute respiratory syndrome (SARS) or any pandemic novel virus that may be transmitted via the airborne route.

OR

- > Where aerosol-generating procedures (AGPs) are being performed on patients with a suspected or confirmed airborne or respiratory infection.

OR

- > Other circumstances as directed, such as in a pandemic of a novel respiratory infectious disease.

Priority for fit-testing is based on the likelihood of a worker required to be:

- > Present in a room where there is a patient confirmed or suspected to have a high morbidity/mortality airborne-transmissible infection.

OR

- > Present in a room where an AGP is being performed on a patient with a known or suspected high morbidity/mortality airborne-transmissible infection.

High risk areas are defined as:

- > Emergency Departments
- > ICU, Paediatric/Neonatal Units
- > Wards with negative pressure rooms or respiratory isolation rooms
- > Bronchoscopy Units
- > Operating rooms where bronchoscopy or other aerosol generating procedures are performed.
- > Any other area / situation identified as high risk for worker exposure

High risk workers are defined as:

- > Workers such as clinicians who work in high risk areas, e.g. nurses, doctors, physiotherapists, speech pathologists, radiographers
- > Emergency and first responders e.g. SA ambulance operational staff any other staff identified as being at high risk of exposure

- > Ancillary staff, e.g. cleaners, who are required to enter a negative pressure room.









All other workers should be fit tested based on a risk assessment of the likelihood of caring for patients or having to enter the room of a patient with a known or suspected high morbidity/mortality airborne or respiratory infection.

Reducing risk

To reduce the number of workers requiring fit testing the following strategies are recommended:

- > Limit the number of people present during aerosol generating procedures
- > Maintain workers immunisation rates and records

6. Safety, quality and risk management

 <u>National Standard 1</u> <u>Clinical Governance</u>	 <u>National Standard 2</u> <u>Partnering with Consumers</u>	 <u>National Standard 3</u> <u>Preventing & Controlling Healthcare-Associated Infection</u>	 <u>National Standard 4</u> <u>Medication Safety</u>	 <u>National Standard 5</u> <u>Comprehensive Care</u>	 <u>National Standard 6</u> <u>Communicating for Safety</u>	 <u>National Standard 7</u> <u>Blood Management</u>	 <u>National Standard 8</u> <u>Recognising & Responding to Acute Deterioration</u>
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7. Eligibility Criteria

7.1. Inclusion

All people working in clinical areas of SA Health facilities or services.

7.2. Exclusion

All people working in non-clinical areas.

8. Appendices

Appendix 1: Risk assessment for P2/N95 respirator fit testing flow chart

Appendix 2: Donning and fit checking: Flat style N95/P2 respirator

Appendix 3: Donning and fit checking: Cupped style N95/P2 respirator

9. References

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7. 3M Technical Bulletin, March 2020 Revision 2, Surgical N95 vs Standard N95 – Which to consider
8. 3M Technical Bulletin, January 2020, Revision 2, Comparison of FFP2, KN95, and N95 and Other Filtering Facepiece Respirator Classes

10. Additional Resources

- > Immunisation for Health Care Workers in South Australia Policy Directive (2017)
- > OSHA (USA) Fact Sheet: <https://www.osha.gov/Publications/respirators-vs-surgicalmasks-factsheet.pdf>
- > CDC/OSHA Hospital Respiratory Protection Program Toolkit: <https://www.cdc.gov/niosh/docs/2015-117/pdfs/2015-117.pdf>
- > CDC personal Protective Equipment: Questions and Answers: Updated March 14, 2020 <https://www.cdc.gov/coronavirus/2019-ncov/hcp/respirator-use-faq.html>

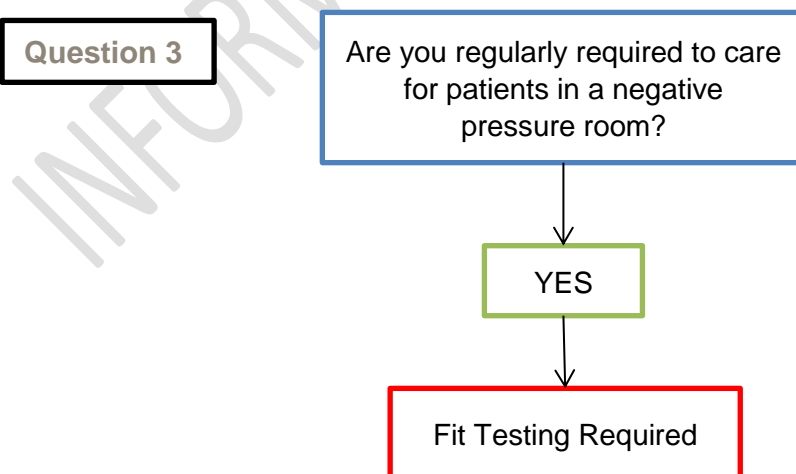
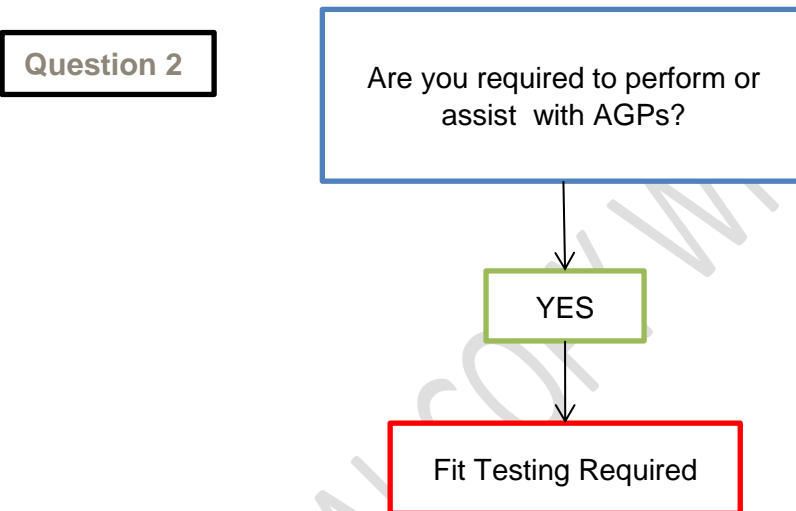
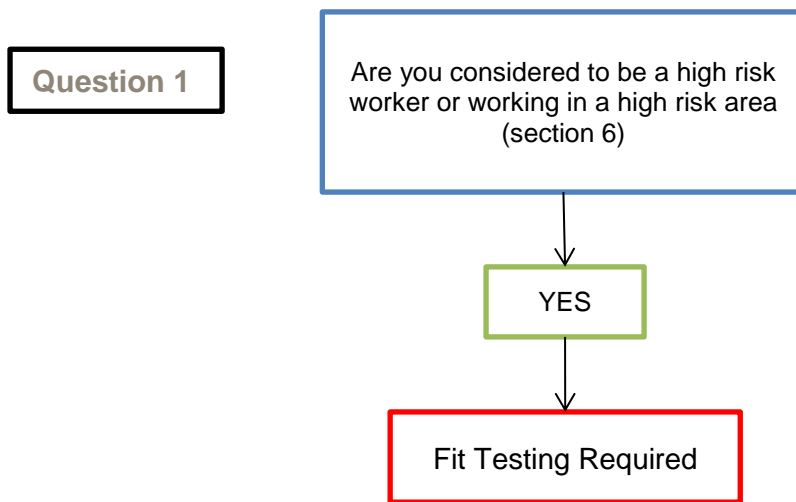
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22/06/20	V1.4	Communicable Disease Control Branch Director	Minor alteration
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07/03/14	V1.1	Communicable Disease Control Branch Director	Update URL reference
10/12/13	V1	Safety and Quality Strategic Governance Group	Original approved version.

Appendix 1: Risk assessment for P2/N95 respirator fit testing flow chart



Appendix 2: Donning and fit checking: Flat style N95/P2 respirator

Note – Perform hand hygiene prior to donning mask

 <p>1</p>	 <p>2</p>	 <p>3</p>
<p>Separate the edges of the respirator to fully open it</p>	<p>Slightly bend the nose wire to form a gentle curve</p>	<p>Hold the respirator upside down to expose the two headbands</p>
 <p>4</p>	 <p>5</p>	 <p>6</p>
<p>Using your index fingers and thumbs, separate the two headbands</p>	<p>Cup the respirator under your chin and pull headbands up and over your head</p>	<p>Place the lower headband at the base of your skull (under your ears)</p>
 <p>7</p>	 <p>8</p>	 <p>9</p>
<p>Place the upper headband on the crown of your head. The band should run just above the top of the ears</p>	<p>Gently mould the nosepiece over the bridge of your nose by pressing down with fingers until it fits snugly</p>	<p>Don your eyewear and continue to adjust the respirator and edges - and perform a fit check (see below for further information) until you feel you have achieved a good facial fit</p>

A fit check must be done each time a P2/N95 respirator is worn

Once your P2/N95 respirator is in place, the next step is to **fit check** your mask.








1. Gently inhale. When you breathe in, the respirator should draw in slightly towards the face
2. Gently exhale. The respirator should fill up with air. It is important at this stage that there is **NO** air leakage around the edges of the respirator

If you have not achieved a successful fit as instructed above you MUST seek advice from Worker Health or Staff Health. Regional LHN staff will need to contact their infection control nurse.

An incorrectly fitted respirator may not provide you with the intended level of protection.

Appendix 3: Donning and fit checking: Cupped style N95/P2 respirator

Note – Perform hand hygiene prior to donning mask

<p>1</p>  <p>Pre-stretch entire length of each strap by pulling between two hands</p>	<p>2</p>  <p>Cup respirator in one hand, with fingertips positioned at nosepiece and straps hanging below the hand</p>	<p>3</p>  <p>Place the respirator in one hand and against your chest Position the respirator under the chin with the nosepiece across the bridge of your nose</p>
<p>4</p>  <p>Pull the top strap resting it high over the crown of your head</p>	<p>5</p>  <p>Pull the bottom strap over your head then position it around your neck and below your ears Straps must not be twisted</p>	<p>6</p>  <p>Using both hands, mould nose piece to the shape of the nose bridge by pushing inwards whilst moving your fingertips down both sides of the nosepiece</p>
<p>7</p>  <p>Perform Fit Check (see below for further information) Cover front of the respirator with both hands taking care not to disturb its fit. If you cannot achieve a proper fit, repeat steps 2-7</p>	<p>References</p> <ul style="list-style-type: none">> Donning a P2/N95 Cupped Respirator Poster Fitting instructions for 3M cupped respirator poster https://multimedia.3m.com/mws/media/936143O/3m-cupped-respirator-fit-poster-pdf.pdf> Donning a P2/N95 Cupped Respirator Video Donning a Cup or cone shaped P2/N95 Respirator https://www.youtube.com/watch?v=iHGFaVrq8SQ	

A fit check should be done each time a P2/N95 respirator is worn.

Once your P2/N95 respirator is in place, the next step is to **fit check** your mask.

- > **Non-valved respirator** - Sharply exhale. The respirator should fill up (bulge) with air and **NO** air leakage around the edges of the respirator.
- > **Valved respirator** – Sharply inhale. The respirator should collapse slightly indicating a proper seal has been obtained.

If you have not achieved a successful fit as instructed above you MUST seek advice from Worker Health or Staff Health. Regional LHN staff will need to contact their infection control nurse.

An incorrectly fitted respirator may not provide you with the intended level of protection.

Further information

- > SA Health Staff protection from infections
<https://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/clinical+programs+and+practice+guidelines/infection+and+injury+management/healthcare+associated+infections/prevention+and+management+of+infections+in+healthcare+settings/staff+protection+from+infections>
- > Australian Government Department of Health: Safe use of personal protective equipment (PPE) DVD
<https://www1.health.gov.au/internet/main/publishing.nsf/Content/safe-use-dvd>

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