Chapter 4: Personal protective equipment

This chapter is part of the Infection Prevention and Control Manual COVID-19 and other Acute Respiratory Infections for acute and non-acute healthcare settings, Clinical Excellence Commission, 2023.

This chapter summarises the PPE requirements when providing care to patients with an ARI.

Contents

Key points

- Personal protective equipment (PPE) is essential when caring for patients with an ARI
- PPE forms part of standard, contact, droplet and airborne precautions
- Understanding how to choose the appropriate PPE and how put it on (don) and remove it (doff) safely is essential for health worker (HW) safety
- Hand hygiene is a key part of donning and doffing PPE
- PPE training modules are available at HETI My Health Learning
- The use of P2/N95 respirators is accompanied by fit checking (at each point of use) and fit testing
- COVID-19 risk assessment and application of PPE should be aligned with the recommendations in *Chapter 3: NSW IPAC Response and escalation framework.*

Acronyms and abbreviations

AAMI	Association for the Advancement of Medical Instrumentation
ABHR	Alcohol-based hand rub
ACORN	Australian College of Perioperative Nurses
AGP	Aerosol-generating procedure
ANZCA	Australian and New Zealand Collage of Anaesthetists
APF	Assigned protection factor
ARTG	Australian Register of Therapeutic Goods
ASTM	American Society for Testing and Materials
BFE	Bacterial filtration efficiency
BiPAP	Bilevel Positive Airway Pressure
CDC	U.S. Centres for Disease Control and Prevention
CDNA	Communicable Diseases Network Australia

CPAP	Continuous positive airway pressure
ED	Emergency Department
ESLI	End of service life indicator
FDA	U.S Food and Drug Administration
HME	Heat and moisture exchanger
HW	Health worker
IFU	Instructions for use
IPAC	Infection prevention and control
NIOSH	U.S. National Institute for Occupational Health and Safety
ONS	Oncological Nursing Society
PAPR	Powered air purifying respirator
PEEP	Positive end expiratory pressure
PEL	Permissible exposure limit
PFE	Particle filtration efficiency
PPE	Personal protective equipment
RPD	Respiratory protection device
RPP	Respiratory protection program
SHPA	Society of Hospital Pharmacists of Australia
WHO	World Health Organization

4.1 Introduction

Personal protective equipment (PPE) protects the wearer from pathogenic microorganisms. Correct use helps to keep HWs safe and reduce the spread of acute respiratory infection (ARI) including COVID-19, influenza, respiratory syncytial virus (RSV) and other pathogens.

This chapter provides guidance on the use of PPE in acute and non-acute healthcare settings when providing care to patients with an ARI. The guidance in the chapter should be considered as the **minimum**.

4.2 General principles when using PPE

Using PPE optimally is important for HW safety. This means selecting appropriate PPE at the right time, in the right setting, for the right patient and then **applying** (donning) and **removing** (doffing) PPE in line with evidence-based practice is utmost important.

General principles when using PPE include:

- HWs should be trained in the correct use of PPE including donning and doffing. Training should include when hand hygiene and glove changes are required during different procedures or tasks on the same patient/client
- Only PPE labelled as reusable should be cleaned, disinfected, and reused according to the manufacturer's reprocessing instructions; all other PPE must be disposed of after use
- Extended or sessional use of a respirator is currently only recommended when caring for patients with suspected or confirmed COVID-19
- Isolation aprons/gowns (Levels 1, 2, 3 and 4) which are impervious, or fluid resistant are suitable for standard, and transmission-based precautions
- Sterile surgical gowns (Levels 1, 2, 3 and 4) should only be used in surgical environments and for sterile procedures
- When caring for patients with droplet and airborne precautions, eye protection is required along with a surgical mask or P2/N95 respirator
- Fluid resistant surgical masks (Levels 1, 2 and 3) are all suitable for standard and droplet precautions
- Fluid resistant P2/N95 respirators are used when providing care to patients with suspected or confirmed ARI
- P2/N95 respirators should be fit tested before first use and fit checked at every use
- Incorrect removal of PPE is associated with an increased risk of contamination.

For further information on recommended PPE refer to:

Appendix 4A: ARI risk assessment guide for PPE selection for direct care of patients

Appendix 4B: Application of transmission-based precautions - visual guide to PPE

Appendix 4C: Aerosol-generating procedures

Appendix 4D: ARI/COVID-19 PPE in Allied Health procedures

4.3 PPE training

Training on the appropriate selection, use and disposal of PPE is required to ensure safe use of PPE. Some of the potential issues to consider are:

- How to minimise unnecessary contact with a mask and eye protection
- Importance of adherence to hand hygiene before donning PPE and during the PPE doffing process
- When and how to change gloves between different procedures or tasks
- Correct removal and cleaning/disinfection of reusable items
- How to ensure adherence to proper PPE donning and doffing technique to reduce self-contamination.

Refer to HETI My Health Learning training modules in Table 2 below.

TABLE 2: MY HEALTH LEARNING MODULES RELEVANT TO PPE

Title	Course code
Step-by-step guidance on PPE donning and doffing	294450660
Donning and fit checking of P2/N95 respirators in NSW healthcare settings video series	319438161
Personal protective equipment for combined Transmission-Based Precautions	294450660
Infection Prevention – Transmission-Based Precautions	253093581
Infection Prevention – Enhanced Precautions for Pandemic Flu	289888589

4.4 PPE risk assessment

Risk assessment for PPE should be based on:

1. **Standard precautions** – use PPE when there is an anticipated or likely risk of contamination with splashes of blood or body substances and based on the nature of care or the task being undertaken
2. **Transmission-based precautions** – consider the need for contact, droplet and airborne precautions based on the mode of transmission when caring for patients with epidemiologically important or transmissible pathogens with high-risk consequences that can transmit or cause infection
3. **NSW IPAC Response and escalation framework** – the level and type of PPE for clinical care of suspected or confirmed COVID-19 patients should be based on the risk assessment (refer to *Chapter 3: NSW IPAC Response and escalation framework*).

4.5 Types of PPE

The type of PPE used will vary based on the level of precautions required, such as standard, contact, droplet or airborne precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE.

Appropriate PPE should be selected to prevent contamination of skin, mucous membranes and/or clothing. Selection should be guided by the anticipated type and amount of exposure to blood and body substances and the likely transmission route of microorganisms.

Aprons and gowns

Disposable fluid resistant aprons or gowns are designed to protect uniforms or clothing from moisture or soiling from blood, body substances and/or transmissible microorganisms during direct patient care. They also protect the patient during direct contact.

Disposable, **fluid resistant aprons** are recommended for general clinical use where the risk of contamination from blood or body substance is low e.g., when providing routine care for a patient who is not coughing, sneezing or vomiting. Apron use can be considered based on anticipated contact or exposure to particles while caring for symptomatic ARI patients. For guidance see *Appendix 4A: ARI risk assessment guide for PPE selection for direct care of patients.*

There are two main types of gowns available: isolation gowns and surgical gowns.

Isolation gowns offer varying resistance to blood and other bodily substances depending on the type of the material, permeability and wear and tear. Isolation gowns may be classified as ‘disposable/single-use’ or ‘reusable/multi-use’.

Single use surgical gowns are sterile, fluid-resistant, disposable garments made of natural and/or synthetic materials worn over uniform ‘scrubs’ and operating theatre attire during surgical and aseptic procedures. Surgical gowns help protect the patient, HWs performing the procedure and operating room personnel from the transfer of microorganisms, body substances and particulate material.

The Association for the Advancement of Medical Instrumentation (AAMI) is a recognised and collaborative organisation that develops international standards, information and guidance to

achieve safe use of medical devices (ACORN, 2018; CDC, 2015). According to AAMI classification a surgical gown with a level 1 classification provides the lowest level of protection and level 4 provides the highest level of protection (CDC, 2015). For more information refer to *Appendix 4F: AAMI level standards for gowns.*

Risk assessment and gown selection in procedural areas and operating suites

Risk assessment considers the anticipated risk of exposure to blood, body fluids/substances and irrigation fluid, the procedure itself, and the patient. Regardless of gown level, once fluid has penetrated the gown, the integrity of the protective barrier and sterility is compromised. It is recommended the gown is then changed (ACORN, 2018). Some common procedures are provided as examples in the tables below, to guide sterile gown selection based on the AAMI standard.

TABLE 3: STERILE SURGICAL GOWN SELECTION FOR ROUTINE SURGERY (CARDINAL HEALTH, CONSIDE2021; CDC, 2015; ASTM INTERNATIONAL 2017)

Examples of procedures drawn from industry supplier *This list is not exhaustive*	Barrier performance	Risk of exposure	Description
• Regional anaesthesia (epidural/spinal) • Biopsies, excision of superficial lesions • Minor gynaecological procedures (e.g., dilatation and curettage) • Minor orthopaedic surgery (e.g., carpal tunnel, wedge resection toenails)	Level 1 *Use sterile Level 2 gowns if Level 1 gowns are not available*	Minimal fluid	Used for situations where risk of exposure to blood, body fluids/substances or irrigation fluids is MINIMAL Provides a barrier to small volumes of fluid Single test of water impacting the surface of the gown material is conducted to assess barrier protection performance
• Minimally invasive surgery (e.g., laparoscopic, endoscopic) • Hernia repair • Breast reduction, plastic/cosmetic surgery • Orthopaedic arthroscopy (ankle) • Open reduction internal fixation • Dental surgery • Chest drain insertion	Level 2	Low fluid	Used for situations where risk of exposure to blood, body substances or irrigation fluids is LOW Provides a barrier to larger amounts of fluid penetration Two tests are conducted to assess barrier protection performance: • Water impacting the surface of the gown material • Pressurising the material

Examples of procedures drawn from industry supplier *This list is not exhaustive*	Barrier performance	Risk of exposure	Description
• Mastectomy • Urological procedures and hysteroscopy • Laparoscopic assisted hysterectomy/bowel resection • Joint replacement surgery • Neurosurgery & vascular surgery • Orthopaedic arthroscopy (shoulder/knees) • Burns	Level 3	Moderate fluid	Used for situations where risk of exposure to blood, body substances or irrigation fluids is MODERATE Provides a barrier to larger amounts of fluid penetration Two tests are conducted to test barrier protection performance: • Water impacting the surface of the gown material • Pressurising the material
• Major trauma • Knee/shoulder reconstruction • Lower segment caesarean section • Cardiac/thoracic – open procedures where the surgeon's hands/arms are in a body cavity throughout the procedure	Level 4	Highest fluid and microbial barrier	Used for situations where risk of exposure to blood, body substances or irrigation fluids is HIGH Provides a barrier to large volumes of fluid penetration and greater resistance to fluid soaking than Level 3

Gloves

HWs wear gloves as a barrier to protect their hands from contamination or to prevent the transfer of microorganisms on their hands to patients or the environment.

After entering a room or patient zone gloves should only be donned immediately before touching the patient or patients' surroundings.

Before donning gloves perform a risk assessment on the need for glove use i.e., contact with blood or body substance. Change or remove gloves (if worn) and perform hand hygiene in between dirty and clean tasks.

Key points for glove use include:

- Intact gloves must be worn on both hands and used where the HW is potentially exposed to blood or body substances or has direct or indirect contact with communicable diseases or multidrug-resistant organisms
- Double gloving is only recommended in theatre settings and/or on a risk-based approach for specifically determined procedures. Double gloving is usually

implemented to allow a seamless transition during a procedure from ‘dirty’ to ‘clean(er)’ steps or reduce the impact of sharps injuries for the surgeon

- Double gloving is not recommended as a protective measure against ARI/COVID-19 acquisition due to the increased incidence of dermatologic side effects including irritant dermatitis and eczema, excessive skin soakage with sweat and skin chapping
- The use of ABHR on gloves must be avoided as the effects of hand sanitisers are tested on the skin and application on gloved hands may affect gloves’ mechanical properties. In addition, alcohol is inactivated in the presence of organic matter, which can easily remain on used gloves, thus potentially driving viral transmission. Use of ABHR on the outside of gloves can affect the porosity of gloves, causing them to become more porous, create pinholes or cause the gloves to rupture after a short period of time
- If a glove manufacturer states that ABHR can be used on gloves, evidence must be provided, and HW educated on how and when it can be used safely
- Gloves should always be put on immediately before:
    - a procedure
    - cleaning shared patient care equipment
    - contact with blood or body substance
    - when cleaning the healthcare environment
- Gloves should not be worn in non-patient zones unless directly handling blood or body substance such as pathology specimens or cleaning up a blood or body substance spill or when in contact with cleaning chemicals.

Wearing gloves is not a substitute for hand hygiene. Hand hygiene must be performed immediately:

- before putting on gloves to avoid contamination of the outer surface of the gloves

  AND
- after removing gloves to avoid transfer of microorganisms to another person, the environment, clinical equipment or the HW.

Inappropriate glove use can result in transmission of pathogenic organisms:

- between different surfaces
- between the wearer and their face (eyes, nose, mouth)
- from the patient to biomedical or other equipment and furnishings.

Eye protection

Evidence shows that the mucous membranes including conjunctivae of HWs can be exposed to infective respiratory particles from patients with an ARI during close contact. Eye protection must be worn when there is risk of body substances splashing or spraying into the conjunctiva. Personal eyeglasses, prescription glasses and contact lenses are not considered adequate eye protection and are not a substitute for eye protection unless they are specified as safety glasses.

Eye protection such as safety glasses, mask visor, goggles or a face shield are required for close contact within 1.5m of a patient with ARI.

Goggles with a manufacturer's anti-fog coating provide reliable, practical eye protection from splashes, sprays, and respiratory particles from multiple angles.

Visors are transparent personal protective devices intended to shield the face and eyes of a HW and are suitable for use with prescription glasses and masks. Use a mask visor or a face shield if there is exposure to an excessive amount of splash or spray.

If reusable eye protection is used, it should be cleaned and disinfected in accordance with the manufacturer's instructions for use.

If HWs wish to use prescription protective eyewear, the eyewear needs to meet the appropriate standard for impact as described in AS/NZS 1337.6.2012 – Personal eye protection Prescription eye protectors against low and medium impact. Prescription eyewear is considered to provide appropriate eye protection for blood or body fluid splash or droplet exposure if:

- the eyewear is close fitting, particularly at the corners of the eye and across the brow
- includes side protection that is indirectly vented
- can be cleaned and disinfected between use.

Additional protective eyewear does not need to be worn with prescription eyewear that has these features.

HWs should note the following:

- Single use eye protection can be worn for an extended period unless moist, wet or contaminated, and disposed of at the end of the session
- Reusable eye protection requires cleaning and disinfection between use
- There must be a clearly described procedure in place for the cleaning, disinfection, drying and storage of reusable eye protection to reduce the risk of a HW donning an item that has not been effectively reprocessed since its last use.

Respiratory and facial protective equipment

A Respiratory Protective Device (RPD) is worn on the face, covers at least the nose and mouth, and is used to reduce the wearer's risk of inhaling hazardous particles (including dust particles and infectious agents), gases or vapors. There is a range of RPDs available that provide facial and respiratory protection, and this includes either a surgical mask or a respirator, with or without eye protection.

Respiratory and facial protection is required for those organisms that are usually transmitted via the droplet or airborne route, including when particles have been artificially created, such as during AGPs.

Surgical masks

Surgical face masks provide a barrier to splashes and particles impacting on the wearer's nose, mouth and respiratory tract. They do not provide protection against airborne particles and are not classed as an RPD. They are loose-fitting protection devices that create a physical barrier for the mouth and nose of the wearer. Some surgical masks have an

integrated eye protection shield (mask visor). Surgical face masks used by HWs for protection against microorganisms must be fluid repellent and disposable.

Surgical masks are for use in clinical care, dental settings, and surgery as per standard precautions. Surgical masks should be worn for the duration of the relevant exposure, task or procedure.

Masks have different properties and colours depending on the manufacturer. Each mask barrier level will provide varying levels of fluid penetration resistance and protection against particles from a patient with an ARI.

See *Appendix 4G: AS 4381:2015 Single use surgical face mask us in healthcare* for more details on mask barrier levels and properties.

When wearing a mask, it is important to remember the following:

Do not:

- Touch the mask or face as this may contaminate the wearer
- Pull the mask below the nose or chin
- Hang the mask around the neck, ear or top of the head.

Do:

- Change the mask if it becomes moist or damp
- Change the mask if it is sprayed or splashed on
- Change the mask if contaminated with blood or body fluids
- Immediately perform hand hygiene if the mask is accidentally touched
- Perform hand hygiene after removing a mask
- Place the mask into a general waste bin, perform hand hygiene and replace with a new mask
- Report mask pressure injuries to the supervisor or manager, following local reporting processes and usual WHS processes
- Remove a mask outside of patient care areas or patients requiring other precautions (e.g., between rooms or patient zones, break room, reception area) and before proceeding to care for patients that are not isolated for ARI.

Respirators

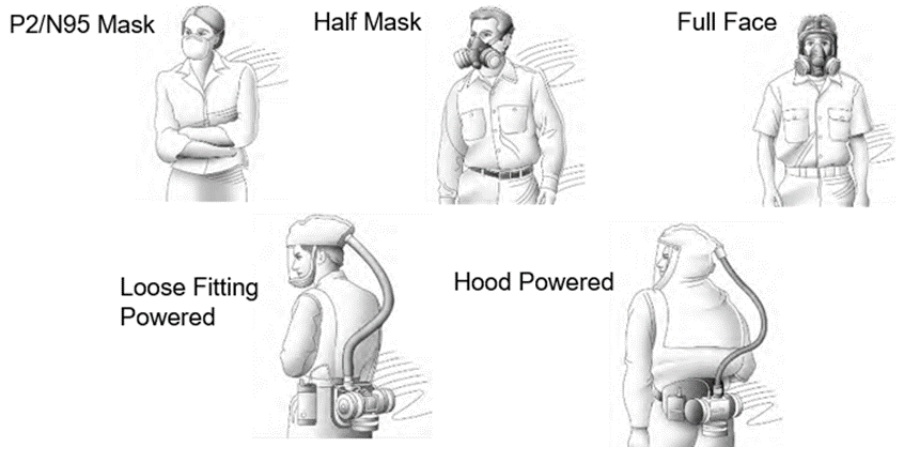
A respirator is used by an individual to provide respiratory protection. There are many types of respirators available which include:

- Air-purifying respirators which protect the wearer by filtering inhaled air. These types of respirators can be disposable or reusable and are either:
    - non-powered – uses inhalation to draw air through a filter
    - powered – uses a fan to draw air through a filter
- Supplied-air respirators which protect the wearer by supplying clean breathing air from an independent source such as an air compressor or compressed air cylinder.

In the healthcare setting, an air-purifying respirator (or particulate filtering respirator) most commonly relates to the disposable filtering half face respirator also known as a **P2 or N95 mask.**

There are a variety of respirators available, and these may differ between healthcare facilities. For more information refer to *Appendix 4H: Properties of P2 and N95 respirators* and *Appendix 4I: P2 and N95 respirator range within NSW Health.*

FIGURE 7: MAJOR TYPES OF RESPIRATORS (ADAPTED FROM OSHA)



The category of particulate filtering respirators can be further divided into:

- **Disposable particulate filtering respirators**, where the entire respirator is discarded at the end of a session of care, or when it becomes unsuitable for further use due to excessive resistance, sorbent exhaustion, or physical damage
- **Reusable particulate filtering respirators**, also called elastomeric respirators, may take the form of a reusable full-face or half-face respirator and harness fitted with particulate P2 or P3 filters that are activated passively by inhalation
- **Powered Air Purifying Respirators** (PAPRs) full-face or half-face PAPRS actively supply filtered air to the wearer and deliver positive air pressure via a battery-operated blower unit.

Reusable respirator facepieces are cleaned and reused but the filter cartridges are discarded and replaced when they become unsuitable for further use. All reusable items must be cleaned and disinfected in accordance with the manufacturer's recommendations and AS/NZS 4187:2014 Reprocessing of reusable medical devices in health service organisations.

Filter efficiency

Disposable P2/N95 face masks or respirators can filter out very fine particles (less than 0.5 micron) from the air when worn correctly.

AS/NZS1716:2012 Respiratory protective devices uses a classification system to identify the different types of particulate filters which are P1, P2 and P3. The 'P' refers to the particle size of the particulate matter that the respirator is designed to protect against.

Particulate filters are classified and marked as P1, P2 or P3, with P3 providing the highest level of protection. However, P3 protection can only be achieved if the P3 filter is used in a full-face respirator. P3 filters are currently not part of the Standards or readily available for use in Australian healthcare.

- P1 = 80% Filter efficiency
- P2 = 94% Filter efficiency
- P3 = 99% Filter efficiency.

Assigned protection factor

A respiratory protective device is considered adequate if it has the capacity to reduce the wearer's exposure to a hazardous substance to acceptable levels. Assigned protection factor (APF) refers to the level of respiratory protection that a respirator or class of respirators is expected to provide to users. The APF is the ratio of the airborne concentration of the substance outside the device to that inside the device (Table 4).

TABLE 4: FILTER TYPES AND ASSIGNED PROTECTION FACTORS

Conformité Européen Marked Particle Filter Type	Assigned Protection Factor (what is likely to be attained in practice)
P1	**4**
P2	**10**
P3	**20**

Elastomeric and PAPRs are regarded as having high levels of APF, particularly when used with full-face protection. The typical APF for a disposable N95 respirator and a half facepiece elastomeric is 10 and full facepiece elastomeric is 50. An APF of 10 means that the respirator (if used properly) can be safely used in an atmosphere that has a hazardous concentration of up to 10 times the Permissible Exposure Limit (PEL) or other exposure limit for that hazard.

N95 respirators and P2 respirators are similar and applied interchangeably to the same conditions. There are, however, differences in testing and certification practices between Australia and the USA (Table 5).

TABLE 5: DIFFERENCE BETWEEN TESTING OF P2 AND N95 RESPIRATORS

	P2 respirator (Australian & New Zealand Standard)	N95 respirator (USA NIOSH Standard)
Filter efficiency	at least 94%	at least 95%
Testing substance	Sodium Chloride Aerosol	Sodium Chloride Aerosol
Aerosol flow rate	95 litres per minute	85 litres per minute
Aerosol particle size	0.3 to 0.6 microns	0.3 microns

Surgical and standard P2/N95 respirators

There are two types of P2/N95 respirators: surgical and standard.

- **Surgical** P2/N95 respirators are fluid resistant
- **Standard** or **non-surgical** P2/N95 respirators are not fluid resistant.

Use a surgical P2/N95 respirator when:

- performing tasks such as surgery, that may expose HWs to high pressure streams that produce particles of blood or body fluid
- providing care for suspected or confirmed COVID-19 patients.

Standard P2/N95 respirators can be used for dry airborne situations where minimal exposure to wet particles is expected such as caring for patients with suspected or confirmed tuberculosis, measles or chickenpox. Standard P2/N95 respirators can be used together with a face shield, surgical mask or a visor (these additions must be approved by the product manufacturer) if fluid resistance is required.

For more information refer to *Appendix 4H: Properties of P2 and N95 respirator* and *Appendix 4I: P2 and N95 respirator range within NSW Health.*

Considerations before selecting respiratory protection devices

Before selecting RPD, the following should be considered:

- Identify hazards (e.g., the respiratory hazards to which HWs will be potentially exposed during routine and emergency situations)
- Proper donning, doffing and use of respirators
- Fit check (user seal check) at point of use every time a respirator is used. Refer to the donning and fit checking of P2/N95 respirators in NSW healthcare settings video series available through HETI My Health Learning (Course code 319438161) for more information
- Fit testing of respirators
- HWs are to ensure that they have the physiological ability to wear a respirator.

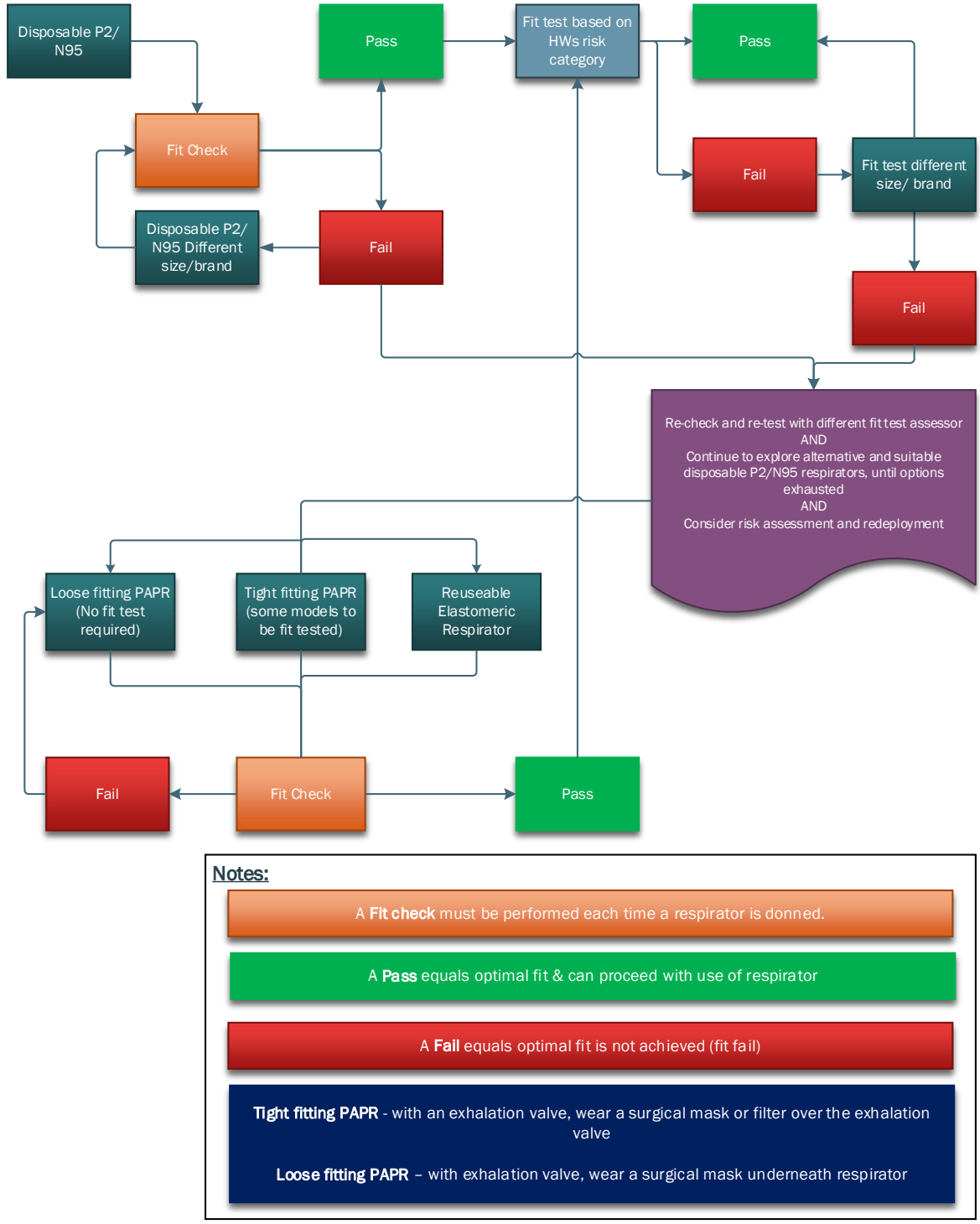
A respiratory protection program (RPP) should be in place including fit testing after fit (seal) checking is fully implemented. Fit testing provides additional information to determine the suitable type(s) of P2/N95 respirators for an individual. In situations where fit testing has not yet been carried out, and a P2/N95 respirator is recommended for use, a fit-checked P2/N95 respirator is preferred over a surgical mask.

Australian and New Zealand Standards and P2/N95 respirator manufacturers' instructions for use (IFU) require the wearer to have **no** facial hair to achieve a good facial seal. At all times when a HW is required to use a respirator; the HW must not have any facial hair present. This includes at the time of fit testing. However, HWs who are unable to remove facial hair to wear a tight-fitting respirator due to medical reasons, cultural or religious observance should be able to obtain an exemption to wear a beard cover technique.

No member of HW is required or expected to undertake any work requiring a P2/N95 respirator unless an adequate facial seal can be achieved. Ensure a risk assessment is conducted on the possibility of removing facial hair, redeployment, alternative respiratory

protective device provision or an exemption where the HW cannot achieve an adequate facial seal. For more information refer to CEC Respiratory Protection Program *Appendix 4A: Use of respiratory protective device with beard cover technique*. Also refer to *Figure 8: Flowchart for Respiratory Protection Fit Checking and Fit Testing Process*.

FIGURE 8: FLOWCHART – RESPIRATORY PROTECTION-FIT CHECKING AND FIT TESTING PROCESS



Discarding P2/N95 respirators after use

A P2/N95 respirator should be:

- **Discarded and replaced** if it becomes contaminated with blood, respiratory or nasal secretions, or other bodily fluids
- **Discarded and replaced** following an AGP, if it becomes hard to breathe through or if the respirator no longer conforms to the face or loses its shape or fit
- **Removed** outside of patient care areas or before caring for patients requiring other precautions (e.g., between rooms or patient zones, or before entering break rooms or reception areas) and before proceeding to care for patients that are not isolated for COVID-19.

Alternatives to disposable P2/N95 respirators

There are a variety of respirators used by HWs when caring for patients with a respiratory infection. In situations where there is a risk of airborne spread the recommended RPD is a particulate filter respirator. For some HWs and in some conditions, the available disposable P2N/95 respirators may not provide optimal fit.

A reusable respirator should be considered for HWs who are unable to achieve a facial seal (fit check) with available disposable P2/N95 respirators and/or have not passed a fit test and cannot be re-deployed to a lower risk clinical area due to their specialist skills. In this situation, alternatives to consider include reusable elastomeric respirators and PAPR.

Considering the complexities and challenges surrounding the use of reusable respirators in healthcare, the decisions on the selection and purchase of elastomeric respirators or PAPRs for use in healthcare facilities must involve specialists in infection prevention and control, work health and safety, biomedical engineering, reprocessing and the procurement or product evaluation committee.

Elastomeric respirators

Elastomeric respirators have historically had limited use in healthcare and their design may not comply with requirements of the healthcare environment and they are not recommended for routine use in healthcare. The illustrations in figure 9 is not an endorsement but as an illustration of different types for consideration. Decisions on the selection and purchase of these respirators for use in healthcare should follow the process for procurement including certification where required on ARTG.

For more information refer to CEC Respiratory protection program manual.

Powered air-purifying respirators

A PAPR is a battery-powered device that provides filtered air under positive pressure into either a loose-fitting hood or helmet or a tight-fitting facepiece. Because the filtered air is delivered under positive pressure, the device can compensate for an imperfect seal. For this reason, a PAPR is regarded as potentially providing a higher level of protection than other RPD but is more complex to use and maintain.

For more information refer to CEC Respiratory Protection Program resources.

FIGURE 9: EXAMPLES OF DIFFERENT TYPES OF RESPIRATORS

Difference between disposable P2/N95 respirators, reusable elastomeric respirators and PAPRs

The most significant difference between disposable respirators, reusable elastomeric respirators and PAPRs is that reusable respirators must be maintained and inspected after each use, including cleaning and disinfection of the reusable components such as facepiece valves, valve covers and straps.

4.6 PPE donning and doffing

HWs should understand PPE requirements, when to wear PPE and how to remove and dispose of PPE safely.

HW should not use PPE other than those prescribed in NSW Ministry of Health policy directives, CEC IPAC guidance and local policy or procedures.

PPE 'creep' has been identified during the pandemic as a risk to HWs who add or choose PPE that is not recommended for transmission-based precautions e.g., a cloth or disposable surgical scrub cap and overshoes, an apron over a long-sleeved disposable gown or other PPE adornments. This potentially increases the risk of self-contamination, particularly on PPE removal. If the PPE is uncomfortable, does not fit properly, or the HW has an adverse reaction using it, they should consult their manager or supervisor.

PPE donning

When providing care to patients under airborne precautions, the following PPE should be donned before entering the patient's room or zone.

HWs should be bare below the elbows and tie long hair back when donning PPE and providing care. The sequence of donning is:

- Perform hand hygiene
- Apron* or fluid resistant long-sleeved or isolation gown
- P2/N95 respirator
- Eye protection
- Perform hand hygiene** and don disposable nonsterile gloves upon entering the room before contact with the patient.

*Apron use can be considered when it is based on the anticipated contact/exposure to particles while providing care.

**Do not apply ABHR to the outside of a glove once the glove is on the hand – ABHR can create pinholes unless the glove is designed to be sanitised.

While wearing PPE avoid self-contamination and the spread of microorganisms by:

- Keeping hands away from face
- Limiting surfaces touched
- Changing gloves when torn or visibly contaminated
- Performing hand hygiene after PPE is removed.

Respirator fit checking and fit testing

Fit checking or user seal check is a process to ensure that the P2/N95 respirator fits the wearer's face snugly (i.e., creates a seal) to minimise the number of particles that bypass the filter through gaps between the wearer's skin and the mask seal. Fit checking involves a check each time the respirator is put on to ensure that the respirator is properly applied and is the appropriate minimum standard at the point of use for HWs using respirators.

Fit testing is performed to determine whether a specific type, model and size of respirator is a suitable fit for the wearer and that it is worn correctly to achieve a facial seal and comfort.

Healthcare settings are to ensure that a range of models and sizes of P2/N95 respirators are available for HWs so that users can have access to respirators that achieve a seal against their face.

Detailed fit checking and fit testing processes are explained in the CEC Respiratory Protection Program Manual. Also refer to Principles of Fit Checking and CEC PPE donning and doffing training videos for more information.

The following items are NOT required when in contact with a patient/client with suspected or confirmed COVID-19:

- Use of **boots or shoe covers** is not recommended as part of COVID-19 PPE. These are only required in the operating theatre or a trauma room
- A **head covering** is not required. Head coverings are part of operating theatre attire or when performing a sterile/aseptic procedure (e.g., central line insertion) to prevent

contact between a HWs hair and patient/equipment and to reduce shedding of skin squames/hair and associated bacteria into the sterile/aseptic field

- **PPE adornments** or extra equipment such as cloth caps are not to be used. If HWs have WHS concerns regarding their skin integrity around their hair area, they should be raised via their normal reporting processes
- The use of a **mask loop holder** should only be used if all other avenues to secure masks have been trialed. Their use can increase the risk of contamination and contribute to issues with both donning and doffing. If a mask loop holder is used, the following need consideration:
    - Whether to use a single use or a reusable item?
    - Are there any additional steps for donning and doffing that is required to be added to the procedure e.g., additional hand hygiene, cleaning/disinfection of the mask loop holder?
    - Do they interfere with the seal (for P2/N95 respirators)?
- **Coveralls** are NOT recommended for use in NSW health facilities based on evidence regarding COVID-19/ARI modes of transmission. There is an increased risk of contamination on removal as they are not used routinely or frequently to become proficient. Currently there are no guidelines from the World Health Organization (WHO), the U.S. Centers for Disease Control and Prevention (CDC), the U.S. Occupational Safety and Health Administration (OSHA) or Communicable Diseases Network of Australia (CDNA) regarding use of coveralls for protection from COVID-19/ARI during patient care. If a determination is made to use protective coveralls, then the selection of appropriate protective coveralls should be based upon a site-specific risk assessment conducted by qualified individuals such as those working in infection prevention and control and infectious diseases roles.

PPE removal

There are a variety of ways to safely remove PPE without contaminating clothing, skin, or mucous membranes with potentially infectious materials. Remove all PPE upon exiting the patient zone/room, removing mask and protective eyewear last after leaving room or zone and closing the door.

Always perform hand hygiene if there is risk of contamination between steps, immediately after removing gloves and when the sequence of PPE doffing has been completed.

Example 1: Suggested doffing sequence

1. Gloves
2. Hand hygiene
3. Apron or gown
4. Hand hygiene
5. Eye protection or face shield (if reusable, clean immediately)
6. Hand hygiene (if cleaned reusable protective eyewear)

7. Mask or respirator
8. Hand hygiene

Example 2: Suggested doffing sequence

1. Gloves and gown (as one step)
2. Perform hand hygiene
3. Goggles or face shield
4. Mask or respirator
5. Perform hand hygiene

Note:

- Dispose of removed PPE into the general waste unless visibly soiled or contaminated with blood or body substance
- Gown and gloves can be removed as one step
- Avoid touching the face while wearing PPE and during removal
- Facilities can adopt other safe ways of PPE removal according to local guidelines and procedures.

See posters on the CEC Infection Prevention and Control (IPAC) and Healthcare Associated Infections (HAI) Program for further guidance.

4.7 Extended or sessional use of PPE

Extended use of PPE refers to wearing the same PPE for repeated close contact episodes with more than one patient, without removing them between patient care based on risk assessment and contamination risk, e.g., on a ward round or providing ongoing care for multiple inpatients in a cohort area with suspected or confirmed COVID-19. Hand hygiene must be performed in between patients and care episodes.

Extended or sessional use of PPE is only recommended when caring for patients during a pandemic with suspected or confirmed COVID-19. This is not recommended for any infectious conditions outside of COVID-19 (e.g., Multidrug-resistant organisms). Evidence continues to evolve on the issue of increased healthcare associated infection when gown and gloves are not changed in between patients.

The following points should be considered when deciding on an extended or session use:

- Extended use of above neck PPE (mask/respirator and eye protection) is well suited to situations where multiple patients are confirmed with COVID-19 and patients are cohorted together in a dedicated waiting room or hospital inpatient clinical area
- The decision on extended or sessional use of PPE must be based on a risk assessment, clinical situation, local facility needs and consultation with the facility infection prevention and control team
- A single session refers to a period where a HW is undertaking duties in a specific clinical care setting or exposure environment. A session ends when the health worker leaves the care setting/exposure environment, PPE becomes contaminated or the HW requires food or drink

- Both surgical mask and P2/N95 respirator can be safely and comfortably worn for up to 4 hours continuously without removing the mask unless damaged, soiled, or contaminated
- The duration of use of PPE items should not exceed the manufacturer's instructions
- Gown and gloves must not be used in between patients and are to be removed on exit or before exiting the room along with hand hygiene. The exception for gown or apron extended use will be COVID-19 testing clinics or similar settings where there is limited contact with patients or low risk of gown/apron contamination e.g., meal tray collection. Gloves must always be changed, and hand hygiene performed in between patients.

For guidance on appropriate use of PPE in community and home visits refer to *Chapter 5*.

4.8 Bringing your own PPE

Clinicians must not bring any PPE (reusable or disposable) into a health facility unless it has been approved for use by the local facility, LHD/SHN, and/or NSW Health. Considerations include:

- Checking with HealthShare NSW if the PPE is available
- All PPE must conform to AS/NZS standards and Australian Register of Therapeutic Goods (ARTG) registration and certificate; this information is required from the PPE manufacturer
- Approval for use by the relevant clinical department, the hospital and LHD/SHN executive (PPE Strategic Committee) following HealthShare NSW procurement processes
- The full approval process of the equipment and the circumstances it is to be used in must be documented following:
    - PPE assessment and acceptance for use within the facility by Infection Prevention and Control, Work Health and Safety, biomedical engineering, unit manager and the facility sterilizing service manager, who will undertake service compatibility and risk assessment for reprocessing between uses within the capacity of their sterilizing facility
    - Manufacturer's IFU on reprocessing, filter management and maintenance, and a supply of replaceable components including straps, inhalation and exhalation valves, valve covers, filters, cartridges, and canisters
    - Insurance coverage for privately owned PPE that requires reprocessing within the health facility
    - Appropriate training required for the safe use of the PPE. Training and education should be clearly documented; the manufacturer may be obligated to provide training in the proper use of the PPE
    - Decision on who will provide and take responsibility for the training and assessment of the HW wearing or using their own PPE

- Donning and doffing procedures may need to be altered to accommodate non-standard equipment and this will need assessment by Infection Prevention and Control
- The financial and resource implications, including the capacity to accommodate the volume, complexity, storage, and resources required for reprocessing.

For more details on the management of reusable RPD refer to CEC Respiratory Protection Program Manual.

4.9 Mask use and skin sensitivity

Prolonged wearing of masks and eye protection can cause adverse skin reactions such as acne, contact dermatitis and skin injuries from pressure effects, as well as exacerbating any underlying skin conditions. This guidance relates solely to considerations to reduce skin irritation for disposable P2/N95 respirator or surgical mask use.

Facial skin care to reduce adverse effects of wearing masks

Advice for facial skin care to reduce adverse effects of wearing masks includes:

- Use a mild skin cleanser, soap substitute or micellar water at the beginning and end of the day. Standard soap is alkaline and has been shown to change skin pH and can damage the skin barrier function
- Moisturise regularly with simple formulations and avoid fragranced products
- Start with a less greasy lotion before progressing to a greasier cream if tolerated
- Avoid greasy creams if acne prone
- Anti-ageing skin care products containing glycolic acids or retinoids can be very irritating, especially when the skin barrier is damaged or compromised; these products may also exacerbate skin sensitivity
- Moisturise face before going to bed.

Mask fitting and skin sensitivity

To reduce the risk of skin sensitivity when fitting a mask:

- Perform hand hygiene before putting on the mask and after taking it off
- Find the best fitting mask and take time to fit the mask
- Do not overtighten the mask.

Wearing a mask if experiencing skin sensitivity

To help prevent or minimise skin problems while wearing a mask:

- Before going to work or 1 to 2 hours before donning a surgical mask
  - Wash face and hands well, dry thoroughly
  - Apply moisturiser to face and hands and let the skin dry

- At work, before donning a surgical mask
    - Apply skin barrier to dry face including forehead, nose, cheeks and ears
    - Let the skin dry
    - Don the surgical mask
- Try to minimise the time wearing a mask as much as possible and give skin regular breaks for at least 5 minutes, preferably every few hours
- Find the best fitting mask
- Remain hydrated for general skin health.

If friction is a problem, consider the following actions:

- Apply moisturising lotion at least 30 minutes before wearing a mask to lubricate the skin and reduce friction between the skin and surgical mask
- Apply silicone protectors such as a no-sting barrier film wipe which will protect the skin and prevent friction
- Barrier creams can also be used when wearing masks for an extended length of time, however these products tend to be greasy which may aggravate acne in which case a lighter silicone-based product is recommended.

Allergic reactions

There are very few chemicals used in masks, and reactions are most likely irritation rather than allergy. Allergic reactions rarely occur.

Monitor areas that may contribute to a reaction including:

- The glue strip along the nose
- The nose bridge that contains a metal wire for moulding
- Where the mask is in contact with cheeks.

Skin irritation

Irritant contact dermatitis is nearly always the cause of mild redness and dryness from masks. The following actions are suggested:

- Change the brand or type of a mask to a softer variety if available
- Put a soft dressing or a thin silicone pad or a barrier wipe under the surgical mask where irritation occurs (not indicated when using a tight-fitting respirator)
- Increase moisturiser use, particularly at night and consider using a greasier variety
- If significant dermatitis persists, low-strength topical steroids available over the pharmacy counter can be used.

If the irritation worsens, consider consulting a dermatologist and report the worsening condition to the HW line manager or supervisor for risk assessment.

Pressure injuries

Pressure from the mask can cause skin indentation and minor injuries. Most indentation will resolve spontaneously. Consider the following actions for pressure injuries from masks:

- Apply compresses with three to four layers of gauze soaked in cold water/normal saline to the skin for around 20 minutes every 2 to 3 hours
- Moisturisers can be applied to intact skin before and after wearing a surgical mask
- Use a silicone dressing (e.g., tape, thin pad) under the surgical mask, and behind the ears for skin protection; the pad redistributes pressure, and the dressings conform to the face to reduce pain, shear and friction and are gentle on removal
- Hydrocolloids may also protect the skin but are not indicated when wearing tight fitting respirators; care should be taken when removing the hydrocolloid to reduce trauma and monitor moisture build up
- Avoid using hot water or ethanol or other irritants to clean the skin
- If pressure from goggles is the main problem, switch to a visor
- If there is skin breakdown secondary to pressure, use a medical grade silicone-based cream cloth to moisturise, protect and restore the skin when a dressing can't be applied
- Consult a doctor or dermatologist if there is further aggravation of the skin condition
- Do not wear a mask whilst skin is broken and redeployment away from clinical care may be required until skin has recovered.

Use of prophylactic dressings to prevent facial skin injury due to tight fitting respirators

Prolonged wear of tight-fitting respirators may cause unintended skin injuries, despite taking steps to protect skin integrity. To prevent loss of skin integrity, the wearing of a prophylactic dressing may be appropriate. Certain prophylactic dressing can be worn under a respirator providing a 'fit test' pass is achieved. Prophylactic dressings (also known as dressings used to prevent injuries or moisture) are applied under a respirator to relieve pressure. A fit check must then be performed every time a respirator is applied. For more information refer to CEC Respiratory Protection Program and Fit testing and comfort evaluation of prophylactic dressing use for healthcare workers under N95/P2 respirators in one health service district in Australia.

Reporting incidents

HWs should notify a No person incident in ims+ when PPE has contributed to harm or near misses, such as masks with defective strings or ear loops.

HWs should notify a Worker incident case when PPE has caused a skin rash, allergic reaction or other adverse effect.

For health services that do not use ims+, HWs should use their usual local process (e.g., IIMS) for reporting incidents with or harm caused by PPE.

Mask wearing exemptions in healthcare facilities

During red alert risk level HWs risk of exposure may increase when inadequate PPE is worn. HWs who are unable to wear a mask at all should not come to work when mask wearing is mandatory within healthcare facilities. There may be HWs who can wear masks for shorter periods and should have a process to risk assess whether they could be accommodated doing suitable duties.

4.10 Uniforms and scrubs

The following information is provided to clarify the use of uniforms, scrubs, aprons and gowns in healthcare settings.

Uniform 'scrubs' are supplied by NSW Health to meet uniform requirements and are referred to as 'uniform' in this guidance.

Surgical scrubs are theatre attire worn by HWs in theatre or other specialities. They are supplied by NSW linen service and are referred to as 'surgical scrubs' in this guidance.

NSW Health stipulates when scrubs and uniforms should be worn, as outlined in the NSW Health policy directive Uniforms Policy (PD2019_012). Employees who are required to wear a uniform are required to comply with the policy, LHD/SHN Uniform and Dress Code requirements and the NSW Code of Conduct.

Perioperative attire (surgical scrubs) should not be worn outside of the perioperative area as per local procedures, with the exception of emergency attendance of patients within the hospital building. An outer gown should cover the front of the attire when leaving the peri-operative environment (ACORN, 2020).

The NSW Health Code of Conduct (PD2015_049) states that HW must:

> *"4.3.4 Dress in a way that is appropriate for the work they do and complies with any local dress requirements."*

A range of frequently asked questions are addressed below.

Is there specific advice in relation to scrubs or uniforms and PPE for clinical HWs?

Specific reference is made in relation to HW clothing in the Infection Prevention and Control Practice Handbook.

At any time, if a HWs clothing becomes contaminated with blood or body fluid, the clothing should be removed as soon as practical and before the HW attends to other patients.

If skin is contaminated with blood or body fluid, the HW must remove contaminated clothing/uniform or PPE and wash any affected skin, then perform hand hygiene.

PPE must not be worn outside the hospital setting unless it is specific for clinical service e.g., during a home visit, resuscitation/first aid on campus grounds, COVID-19 screening clinics.

How long can the COVID-19 virus live on the parts of the uniform not covered by an apron?

There have been no documented cases of transmission of the novel coronavirus via clothing at this point of the pandemic.

Chin et al. (2020) found no viable virus on clothing 2 days after exposure with coronavirus. There is no data that supports transmission of coronavirus via clothing.

Can I wear my uniform outside of the hospital setting?

HWs can wear a uniform outside the hospital and for community visits and use PPE when they are in contact with blood and body fluid. The PPE protects their uniforms when worn.

Standard and transmission-based precautions are both a requirement of NSW Health Infection Prevention and Control Policy (PD2017_013) and NSW Health Practitioner Regulation 2016: Schedule 3. These precautions protect clinical HW uniforms.

In acute healthcare settings HWs are required to use appropriate PPE for any close contact with blood or body substances. The risk of uniform contamination from wearing appropriate PPE is unlikely or extremely low.

In community settings the same principles apply, and the recommendations are the same as for acute healthcare settings. That is, if they anticipate close contact or exposure to blood and body fluid, PPE must be worn which includes wearing a fluid resistant apron or a gown.

If a uniform becomes contaminated during community care, the usual local procedures should be applied to remove, or spot clean any contamination.

The choice to change out of a uniform before leaving work is a personal one. Surgical scrubs are not to be worn outside the hospital setting.

Should HWs wear an apron or a gown for standard and contact precautions?

The choice of an apron or gown is based on a risk assessment and is documented in the Australian Guidelines for the Prevention and Control of Infection in Healthcare and also supported by the ICEG Guidance on the use of personal protective equipment (PPE) for health care workers in the context of COVID-19.

The risk assessment approach to choosing an apron or a gown for standard and contact precautions remains an option in any clinical care situation.

During the risk assessment, if the HW anticipates exposure to blood and body fluid on an uncovered part of their uniform, then the risk assessment will direct them to a gown for contact precautions.

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Appendix 4A: ARI risk assessment guide for PPE selection for direct care of patients

Patient Characteristics			Precautions Required					
			Frequent hand hygiene	Surgical mask[3]	P2/N95 Respirator[3,4]	Eye Protection	Fluid Resistant Gown	Gloves
No acute respiratory infection (ARI) symptoms	STANDARD PRECAUTIONS FOR ALL[1]	Subject to current NSW Risk Level	✓	As per standard precautions	✗	As per standard precautions	As per standard precautions	As per standard precautions
With ARI symptoms (important to test for other respiratory viruses ##)		STANDARD + DROPLET	✓	✓	✗	✓	As per standard precautions	As per standard precautions
Patients with suspected[2] or confirmed COVID-19 OR as identified as a close contact		STANDARD + AIRBORNE[4]	✓	✗	✓	✓	As per standard precautions	As per standard precautions

Notes:

1. Standard precautions always include a risk assessment of the need for PPE. All health workers require COVID-19 vaccination
2. COVID19 epidemiological evidence (in the past 14 days) as specified by CDNA COVID-19 SoNG https://www1.health.gov.au/internet/main/publishing.nsf/Content/cdna-song-novel-coronavirus.htm
3. For extended use, masks or respirators can be worn for up to 4-8 hours respectively. Eye protection can also remain on between patients. Masks/respirators and eye protection should be discarded (or reprocessed in the case of reusable eye protection) if they are moist or contaminated with blood or bodily fluids and after removal
4. HWs required to wear P2/N95 respirators should be trained in the correct use including fit checking, donning and doffing. This also applies to the use of reusable respirators

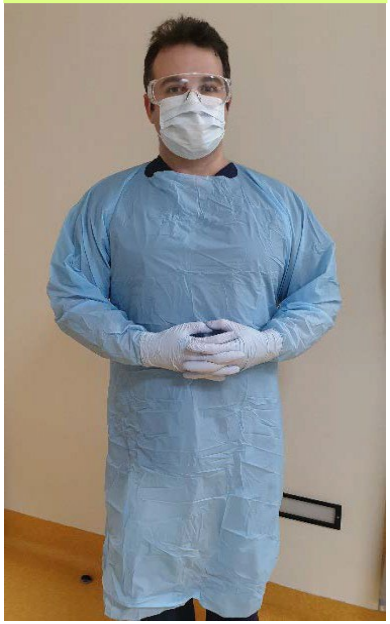
Risk assess ARI for use of respiratory protection (P2/N95) for AGPs or other similar procedures

Adapted from *Personal Protective Equipment (PPE) for patient care with symptoms of acute respiratory illness including COVID-19* – HNELHD.

Appendix 4B: Application of transmission-based precautions – visual guide to PPE

- Gloves must be changed, and hand hygiene performed between patients; change or remove gloves when clinically indicated, if contaminated, moving from dirty to clean site on the same patient or when torn or damaged
- Perform hand hygiene immediately after removing gloves and other PPE if there is risk of contamination between steps
- Gown/apron should be removed and discarded appropriately upon completion of care (session) and/or on leaving the room/zone
- Reusable eye protection should be cleaned/disinfected between use
- Clean and disinfect reusable shared patient equipment and high touch points.

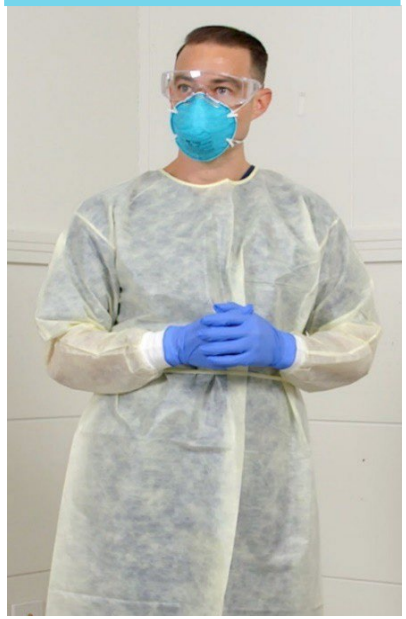
CONTACT + DROPLET



CONTACT + DROPLET

CONTACT + AIRBORNE

CONTACT + AIRBORNE



Appendix 4C: Aerosol-generating procedures

The notion of aerosol-generating procedures (AGPs) has undergone considerable debate and change during the COVID-19 pandemic. Of importance is the understanding that some procedures will generate aerosols and add considerable dispersion of infectious particles and should be considered during risk assessment for mitigation.

AGPs produce smaller respiratory particles due to air or gas flowing rapidly over a moist or wet surface. There are many procedures that may be 'aerosol-generating', and these are considered to increase the risk of transmission of respiratory viruses including SARS-CoV-2.

Note that other procedures that may cause aerosolisation of fluid or tissues that are not from the respiratory tract or lungs are not considered high risk AGPs for transmission of COVID-19 or other respiratory pathogens.

Some considerations include:

- AGPs on suspected or confirmed ARIs should be performed with a minimum number of HWs present and where possible, the most qualified person should carry out the procedure
- Nebulisers are not recommended and alternative means of delivering medication (such as pressurised metered-dose inhaler or a spacer) should be used. If the use of a nebuliser cannot be avoided, then:
    - Isolate the patient
    - Use a negative-pressure room if available, otherwise use a single room with the door closed
    - HWs administering nebulisers should wear airborne precaution PPE, including an impervious gown and gloves, P2/N95 respirator and eye protection
    - If staying in the room, depending on the air changes per hour, continue these precautions for at least 30 minutes after the nebuliser treatment. See link: CDC Air Changes.

For guidance regarding other specialised procedures related to **Allied Health procedures,** refer to *Appendix 4D*.

Cardiopulmonary resuscitation

While providing CPR for patients suspected or confirmed to have COVID-19 or ARI wear a P2/N95 respirator and eye protection. For more information refer to CPR during the pandemic National Clinical Taskforce.

References for Appendix 4C

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Appendix 4D: ARI/COVID-19 PPE in Allied Health procedures

The following advice is intended to support Allied Health decision making for the recommended use of PPE in hospitals, community health centres and other facilities. It was prepared by speech pathologists and physiotherapists and in collaboration with the NSW Health Chief Allied Health Officer and the CEC. Broad consultation with NSW Health physiotherapists, speech pathologists and the CEC Infection Prevention and Control Community of Practice and Expert Reference Committee was also undertaken during the development.

The presence and risks related to SARS-CoV-2 vary between locations and therefore this information should be used in collaboration with individualised advice received from LHD/SHNs and services according to *Chapter 3: NSW IPAC Response and escalation framework.*

Where it is considered that particular risks apply to a service, specialist advice should be sought from local specialist infectious diseases experts and infection prevention and control before deviating from the advice included in Figure 10.

Clinicians should refer to ACI Clinical practice guide for respiratory support in adults with COVID-19 and all other documents that are relevant to their specific clinical practice.

Underpinning this advice is the need for all Allied Health professionals to use a risk-based approach prior to undertaking clinical assessment, procedures and treatments to ensure that the appropriate PPE is always used, not only related to COVID-19.

General considerations

Apply transmission-based precautions for patients suspected or confirmed to have ARI/COVID-19.

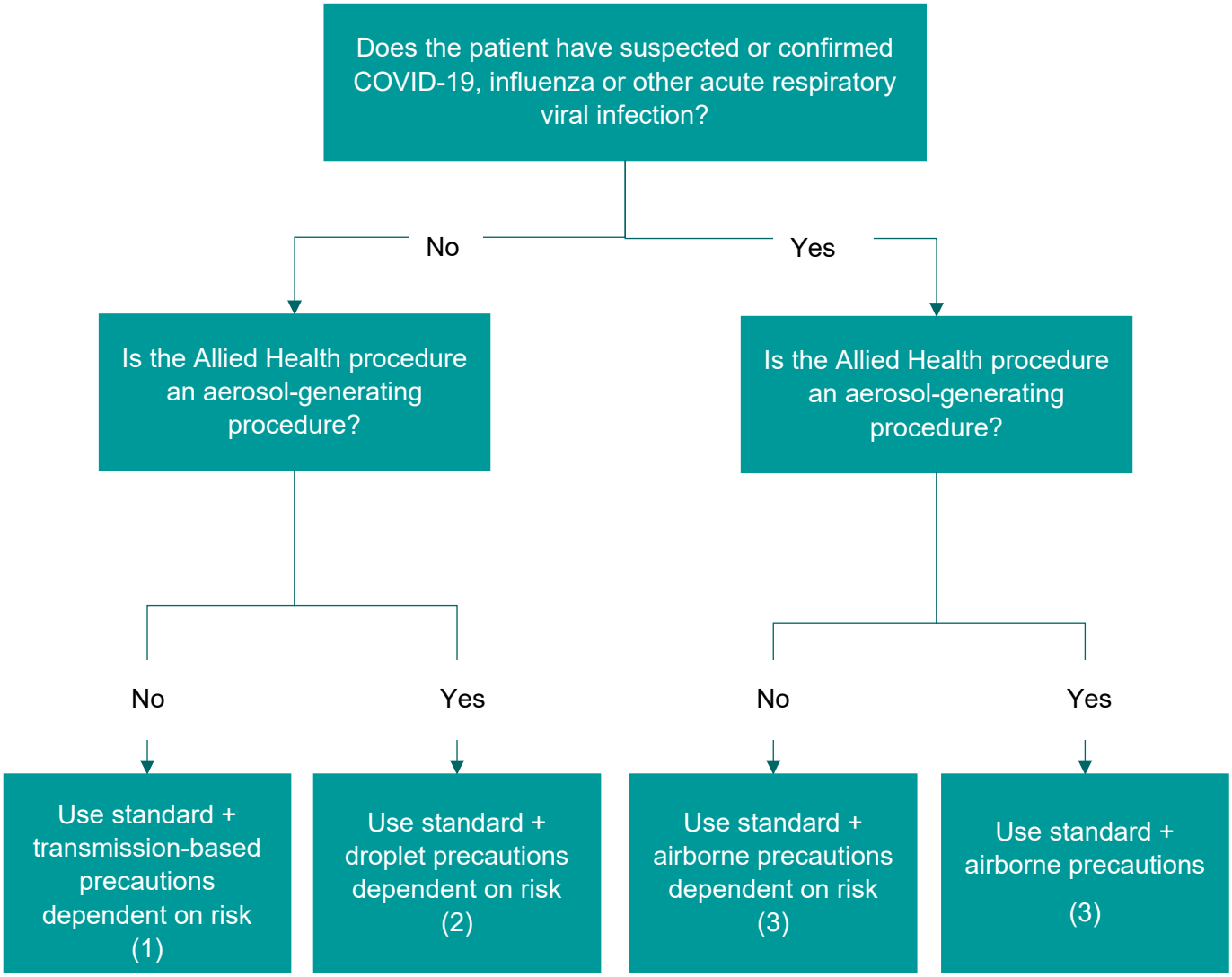
Risk factors

Risk factors to be considered:

- Cognition and cooperation of patient
- Secretion control/volume
- Cough etiquette and respiratory hygiene
- The position of the clinician during the procedure (e.g., behind or beside patient) where possible and practical
- The cumulative length of time spent with an individual patient (2 hours >1.5 metres over a 48-hour period is considered low risk). If this is longer or distance can't be maintained, additional PPE may be required.

If these circumstances put the clinician at risk of infection, droplet precautions should be considered.

FIGURE 10: DECISION ALGORITHM FOR RECOMMENDED PPE IN ALLIED HEALTH PROCEDURES



1. Allied Health procedures with no risk of droplet exposure

Standard precautions should always be adhered to, ensuring ongoing risk assessment approach during patient contact.

Examples of procedures (not exclusive):

- General mobilisation of patients
- Outpatient orthopaedics / hydrotherapy / musculoskeletal / lymphoedema / women's health / cardiac and pulmonary rehabilitation
- Videofluoroscopic swallow assessment / Modified barium swallow
- Clinical dysphagia assessment
- The presence of dysphonia, dysphasia or dyspraxia.

Transmission-based precautions are applied where patients are suspected or confirmed of an infectious disease according to mode of transmission.

2. Allied Health procedures with risk of exposure to particles or body fluids

Standard precautions, plus droplet precautions

Examples of procedures (not exclusive):

- Airway clearance techniques including, closed suction, sputum collection procedure, positioning / gravity assisted drainage techniques, active cycle of breathing technique (ACBT) and manual techniques (excluding where open suction is required)
- Manual assisted cough i.e., abdominal cough or cough with pressure
- Use of breathing devices with viral filter (positive end expiratory pressure (PEEP) devices, excluding non-invasive ventilation)
- Inspiratory and expiratory muscle strength training on non-ventilated patients
- Non-AGP assessment, weaning and treatment of tracheostomy patient (e.g., deflating cuff, changing inner cannula or placement of speaking value in non-ventilated patients)
- Assessment and treatment of laryngectomy patient including change of voice prosthesis / Heat Moisture Exchanger (HME) management where there is direct manipulation of stoma or treatment in close proximity
- Neonatal / paediatric feeding assessment where 1.5m distance cannot be maintained
- Treatment of head and neck cancer patient where 1.5m distance cannot be maintained
- Spirometry or peak flow meter device (to avoid contamination of the device consider using viral filter).

3. Allied Health aerosol-generating procedures

Examples of procedures (not exclusive):

- Use of positive pressure breathing devices, mechanical insufflation-exsufflation devices, intra/extra pulmonary high frequency oscillation devices
- Open suctioning of nasopharynx, oropharynx, tracheostomy, endotracheal tube or laryngectomy stoma
- Assessments where a patient is receiving non-invasive ventilation, high-flow nasal prongs, inhalation therapy or a nebuliser
- Manual hyperinflation and inspiratory muscle training device on ventilated patient
- Procedures that have risk of ventilator disconnection e.g., manual assisted cough, manual techniques, mobilising
- Induced sputum via ultrasonic jet nebuliser
- Fibreoptic endoscopic evaluation of swallowing assessment (Co-phenylcaine spray should not be used at present as aerosolises. It is recommended that this procedure should NOT be conducted on COVID-19 suspected/confirmed cases).

Explanatory Notes

- There is good evidence that COVID-19, like most respiratory viral infections, is predominantly transmitted by particles
- Clinical and epidemiological evidence suggest aerosolisation risks potentially increase when air circulation or air exchanges are poor
- Coughing, sneezing and shouting are known to increase the number and size range of particles produced
- By definition respiratory AGPs aerosolise respiratory particles hence the increased risk for transmission.

Appendix 4E: PPE guidance for NSW Health security HWs

In managing acute respiratory infections including COVID-19 risks, security HWs are advised to seek to eliminate the risk first, as far as is reasonably practicable. If it cannot be eliminated, the security HW must minimise the risk as far as is reasonably practicable. Adherence to risk level requirements applies during alerts.

Frequently asked questions

1. **What PPE is to be worn when:**
    a. in close proximity with an individual outside the hospital but on hospital grounds (e.g., when restraining or escorting off the premises or when enforcing smoking by-laws)?
    b. touching surfaces (e.g., as part of lock up / lock down)?
    c. managing hospital access points?
    d. conducting general patrols within a health campus?

No specific PPE is required for any of these situations unless in contact with blood or body fluids.

It is recommended that frequent hand hygiene is performed using alcohol-based hand rubs (ABHR) or washing with soap and water for 20 seconds at a hand wash basin.

Care should be taken to avoid touching the face.

Physical distancing (>1.5 m) should be utilised during amber and red alert risk level where practical.

Shared keys should be cleaned with a disposable cleaning cloth. This should occur before the start of the shift and at the end of each shift.

Standard precautions apply to all patient care and comprise of hand hygiene, respiratory hygiene (cough etiquette), PPE if in contact with blood or body substances, occupational exposures prevention, cleaning and disinfection of the healthcare environment and shared equipment, and appropriate waste disposal.

2. **What PPE is to be worn routinely while in attendance in a COVID clinic?**

COVID clinics are attended by people who are symptomatic for COVID-19 or are being tested if they have a known exposure.

Physical distancing should be utilised during amber and red alert risk level where practical.

It is recommended that standard and airborne precautions are applied if in direct contact with patients. This includes P2/N95 respirator, eye protection, plastic apron/gown and gloves based on risk assessment.

Gloves should be worn during direct contact with patients.

HWs wearing PPE must complete the My Health Learning training for donning and removal of PPE (Course Code 294450660).

Hand hygiene is performed using ABHR or washing with soap and water for 20 seconds before and after contact with patients or their surroundings.

Care should be taken to avoid touching the face.

3. What PPE is to be worn when restraint of a patient is required?

Patients with suspected or confirmed ARI/COVID-19 in hospital will be known. It is important to maintain security HW safety against respiratory particles by putting on the correct PPE prior to contact with the patient.

If called to a clinical area and restraint is required, the HW will inform the security HW what PPE is required which will include:

- P2/N95 respirator for suspected or confirmed COVID-19
- Surgical mask for other confirmed infections as per transmission -based precautions
- Protective eyewear
- Gloves (suspected exposure to blood or body substances)
- Apron/gown for close contact.

Appendix 4F: AAMI Level Standards for gowns

Extracted from Standard American Society for Testing and Materials – International (ASTM) F1670 / F1670M Standard Test Method for Resistance of Materials Used in Surgical Gowns to Penetration by Synthetic Blood.

Barrier Performance	Barrier Protection	Resistance Measure	Description
Level 1	Minimal	Liquid penetration	• Used for MINIMAL risk situations • Provides a slight barrier to small amounts of fluid penetration • Single test of water impacting the surface of the gown material is conducted to assess barrier protection performance

Level 2	Low	Liquid penetration	• Used in LOW-risk situations
			• Provides a barrier to larger amounts of fluid penetration through splatter and some fluid exposure through soaking
			• Two tests are conducted to assess barrier protection performance:
			  ○ Water impacting the surface of the gown material
			  ○ Pressurising the material

Level 3	Moderate	Liquid penetration	• Used in MODERATE risk situations
			• Provides a barrier to larger amounts of fluid penetration through splatter and more fluid exposure through soaking than Level 2
			• Two tests are conducted to test barrier protection performance:
			  ○ Water impacting the surface of the gown material
			  ○ Pressurising the material

Level 4	High	Liquid and viral penetration	• Used in HIGH-risk situations • Prevents all fluid penetration for up to 1 hour • May prevent VIRUS penetration for up to 1 hour • In addition to the other tests conducted under Levels 1-3, barrier level performance is tested with a simulated blood containing a virus – if no virus is found at the end of the test, the gown passes

Appendix 4G: AS 4381:2015 Single-use surgical face mask use in healthcare

Extracted from Australian Standard AS 4381: 2015 Single-use surgical face masks for use in healthcare.

Testing	Barrier Performance	Bacterial Filtration Efficiency (BFE) %	Differential pressure (ΔP), mm H_2O/cm^2	Resistance to penetration by synthetic blood (fluid resistance) minimum pressure in mmHg for pass result
Mask materials are evaluated for resistance to penetration by synthetic blood, bacterial filtration efficiency and differential pressure	Level 1	≥ 95%	< 4.0	80mm Hg
	Level 2	≥ 98%	< 5.0	120mm Hg
	Level 3	≥ 98%	< 5.0	160mm Hg
	Test method	ASTM F2101-14 or EN 14683:2014	EN 14683:2014	ASTM F1862 /F1862M-13 or ISO 22609

Appendix 4H: Properties of P2 and N95 respirators

Properties	P2 Respirator	N95 Respirator
Other names	N95 masks, respiratory protection device, particulate respirator	P2 respirator, respiratory protection device, particulate respirator
Characteristics	P2 particulate filtering respirators/masks must have a filter efficiency of at least 94% when tested with sodium chloride aerosol at a flow rate of 95 litres/minute Under the European Norms system, aerosol testing is similar to Standard AS/ NZS 1716: 2012 but has additional filter efficiency testing with paraffin oil aerosol that must also meet the minimum 94% filter efficiency to be classified as P2. The particle size of this aerosol has a median diameter of 0.3 to 0.6 microns with a range of particles in the 0.02 to 2-micron size range	NIOSH classified N95 particulate filtering respirators/masks must have a filter efficiency of at least 95% when tested with sodium chloride aerosol at a flow rate of 85 litres/minute
	• Raised dome or duckbill • 4–5 layers (outer polypropylene, central layers electret [charged polypropylene]) • Filtration through mechanical impaction and electrostatic capture • Designed to provide a good facial fit to minimise aerosol contamination of the mucous membranes of the nose and mouth	
Sealing	• Ties or straps at crown and bottom of head, pliable metal nose bridge • Recommend fit checking all respirators, fit testing based on risk category	
Australian Standards	Standard AS/NZS 1715: 2009 Standard AS/NZS 1716: 2012	Set by the US NIOSH classification (NIOSH Guidelines – Procedure No. TEB-APR-STP-0059)
Intended use	• Routine care of patients on airborne precautions • High-risk procedures (or AGPs) such as bronchoscopy when the patient's infectious status is unknown, or the patient has suspected or confirmed COVID-19 • Procedures that involve aerosolisation of particles that may contain specific known pathogens (AGPs)	

Source: Australian Guidelines for the Prevention and Control of Infection in Healthcare, 2019

Appendix 4I: P2 and N95 respirator range within NSW Health

This table is not exhaustive and additional products will be added on to the respiratory protection program fit testing algorithm

Respirator	Description	P2/N95	Fluid resistant	Standard	Precautions suited to	Specifications and additional information
BSN Medical (Aust) Pty Ltd 	P2/N95 Filter, Medium/ small Pleated, Double Strap (Proshield)	P2/ N95	160mmHg	AS/NZS 1716:2012 NIOSH	Airborne / AGP	• BFE greater than 99% for particles greater than 3 microns • The super high PFE material filters more than 99% of particles greater than 0.1 microns • The N95 mask is NIOSH approved as an N95 particulate filter respirator.
3M Australia Pty Ltd 	P2 masks 1860	P2/ N95	120mmHg	AS/NZS 1716:2012	Airborne / AGP	• NIOSH certified N95 • Meets CDC guidelines for *Mycobacterium tuberculosis* exposure control • FDA cleared for use as a surgical mask • BFE more than 99% according to ASTM F2101 • Fluid resistant according to ASTM F1862 at 120 mmHg • Respirator contains no components made from natural rubber latex

Respirator	Description	P2/N95	Fluid resistant	Standard	Precautions suited to	Specifications and additional information
Care Essentials MSK-004 		P2	160mmHg	AS/NZS 1716:2012	Airborne / AGP	• NIOSH certified N95 • Synthetic blood penetration resistance: 160 mmHg (Level 3 Fluid Resistance) • BFE ≥95% • This respirator does not contain components made from natural rubber latex
3M Australia Pty Ltd 	P2 masks 1870	P2/ N95	160mmHg	AS/NZS 1716:2012	Airborne / AGP	• NIOSH certified N95 • Meets CDC guidelines for *Mycobacterium tuberculosis* exposure control • FDA cleared for use as a surgical mask • BFE more than 99% according to ASTM F2101 • Fluid resistant according to ASTM F1862 at 160 mm Hg • Respirator contains no components made from natural rubber latex
Trident 	P2 respirator	P2	Level 3	AS/NZS 1716: 2012 AS 4381: 2015	Airborne / AGP	• Bacterial Filtration Efficiency (BFE) >99% • Fluid protection level 3, 160 mmHg • Proprietary adjustable foam nose pad to ensure consistent optimum facial seal and reduce fogging of eyewear
Respirator with an exhalation valve	Not recommended					