Coronavirus (COVID-19) – PPE and levels of protection

July 2020

Purpose of this guide

Personal protective equipment (PPE), such as face masks, gowns and respirators, offer different levels of protection to splash or spray from blood and/or bodily fluids. The type of PPE used by health care workers should reflect the risk to the health care worker of infection whilst delivering care.

The purpose of this guide is to support healthcare workers understanding of the different levels of protection offered by different items of masks, respirators and gowns. Please also refer to the manufacturer's product information that describes an intended use with the desired level of protection.

This document is to be read in conjunction with Coronavirus disease 2019 (COVID-19) - Guide to the conventional use of personal protective equipment (PPE) at https://www.dhhs.vic.gov.au/health-services-and-general-practitioners-coronavirus-disease-covid-19. This provides guidance on the required PPE when providing direct care to people confirmed or suspected of having COVID-19.

For further information about COVID-19, visit the department's website at coronavirus.vic.gov.au.

Single use face masks

Single use face masks, also referred to as surgical masks, provide a protective barrier that prevent the spread of larger droplets from the wearer to others, as well as protect the wearer from inhaling larger droplets, and from fluid splashes or high velocity streams of bodily fluids.

Single use face masks are rated as Level 1, Level 2 or Level 3 according to the degree of barrier protection provided. See Table 1.

Table 1: Single use face mask: barrier protection and COVID-19 application

Barrier level	General purpose[1]	COVID-19 application[2]
Level 1	For procedures where the wearer is not at risk of splash or spray from blood or bodily substances or to protect staff and/or patients from droplet exposure to microorganisms.	Tier 1 – Area of higher clinical risk[3] AND *Where the patient is NOT suspected or confirmed to have COVID-19 and is NOT in quarantine*[4]
Level 2	Where minimal blood droplet exposures may occur such as changing dressing on small wounds or healing wounds.	Tier 2 – Droplet and contact precautions *Direct care or contact with a person who is suspected or confirmed to have COVID-19 or is in quarantine.*
Level 3	All surgical procedures, major trauma first aid or whenever there is a risk of blood or body fluid splash or spray such as orthopaedic or cardiovascular procedures.	Tier 2 – Droplet and contact precautions *Direct care or contact with a person who is suspected or confirmed to have COVID-19 or is in quarantine.*

[1] General purpose information has been reproduced from the AS 4381:2015 - Single use surgical face mask standard.

[2] National PPE guidance is found at https://www.health.gov.au/resources/publications/guidance-on-the-use-of-personal-protective-equipment-ppe-in-hospitals-during-the-covid-19-outbreak and https://www.health.gov.au/resources/publications/the-use-of-face-masks-and-respirators-in-the-context-of-covid-19

[3] Areas of higher clinical risk include intensive care units, urgent care centres, and emergency departments.

[4] The clinical criteria for testing found at https://www.dhhs.vic.gov.au/health-services-and-general-practitioners-coronavirus-disease-covid-19

Note: eye protection, e.g. face shield or safety glasses, is also required for protection against droplet transmission of respiratory infections.[5] See Appendix 1 for further information on fluid resistance.

P2/N95 respirators

A P2/N95 respirator reduces healthcare worker exposure to airborne particles, filtering out very fine particles and therefore reducing exposure to aerosols containing virus particles which may arise from aerosol generating procedures (AGPs), as well as larger droplets. To be effective, a tight facial seal covering the nose, mouth and chin is required.[6]

The terms P2 and N95 respirator are often used interchangeably, but while similar, they are not identical. The difference between these respirators is the different regulatory standards they are required to meet around the world. In Australia, the requirements for P2 respirators are stated in the Australian/New Zealand Standard on Respiratory protective devices (AS/NZS 1716:2012). The United States National Institute of Occupational Safety and Health (NIOSH) specifies N95 respirator requirements.[7]

Types of P2/N95 respirators

Two types of respirators are available and appropriate to use in medical settings:

- Standard respirators - suitable for use around confirmed or suspected COVID-19 patients in non-surgical settings, or settings where there is unlikely to be fluid spray beyond a cough or sneeze.
- Medical and surgical respirators – are used where there is a risk of exposure to bodily fluids and splashes. Where this is not possible, a standard respirator can be used with the addition of a face shield.

Appendix 2 provides examples of standard and medical and surgical respirators.

Both standard and medical/surgical respirators provide protection from small airborne particles, although, only medical and surgical respirators provide fluid resistance to splash or spray from bodily fluids (rated as Level 1, Level 2 or Level 3, ASTM F1862 / F1862M – 17 classification). The P2/N95 rating only indicates the level of protection from airborne particulates, not its resistance to fluids.

P2/N95 respirators used during procedures in which there is a risk of a body fluid splash should be certified as fluid resistant (i.e. medical/surgical grade) or protected by another barrier such as a face shield. See table 2.

Table 2: Respirator fluid resistance and COVID-19 application

Barrier level	General purpose[8]	COVID-19 application
Standard	Because not fluid resistant, protection with another barrier such as a face shield is required to protect from blood and body fluid splash.	Tier 3 – Airborne and contact precautions Undertaking AGP[9] on a person: with suspected or confirmed COVID-19; is in quarantine; or where a history cannot be obtained.
Level 1	For procedures where there is minimal risk of splash or spray from blood or bodily substances, or to protect staff from droplet exposure to microorganisms. Offers a lower level of fluid resistance; risk assess to determine if a face shield is required	Tier 3 – Airborne and contact precautions Undertaking AGP on a person: with suspected or confirmed COVID-19; is in quarantine; or where a history cannot be obtained.
Level 2	Where blood and bodily fluid exposure risk is low to moderate, such as changing a dressing on small wounds or	Tier 3 – Airborne and contact precautions Undertaking AGP on a person: with suspected or

[5] Guidelines on the conventional use of PPE for healthcare workers found at https://www.dhhs.vic.gov.au/health-services-and-general-practitioners-coronavirus-disease-covid-19

[6] The use of face masks and respirators in the context of COVID 19 at https://www.health.gov.au/resources/publications/the-use-of-face-masks-and-respirators-in-the-context-of-covid-19

[7] For more information please see Appendix 1 from the AHPPC factsheet 'The use of face masks and respirators in the context of COVID' at https://www.health.gov.au/resources/publications/the-use-of-face-masks-and-respirators-in-the-context-of-covid-19

[8] General purpose information has been reproduced from the AS 4381:2015 Single use surgical face mask standard.

[9] For further information on aerosol generating procedures (AGPs), please refer to the COVID-19 Infection prevention and control guideline: https://www.dhhs.vic.gov.au/health-services-and-general-practitioners-coronavirus-disease-covid-19

Barrier level	General purpose[8]	COVID-19 application
Standard	Because not fluid resistant, protection with another barrier such as a face shield is required to protect from blood and body fluid splash.	Tier 3 – Airborne and contact precautions Undertaking AGP[9] on a person: with suspected or confirmed COVID-19; is in quarantine; or where a history cannot be obtained.
Level 1	For procedures where there is minimal risk of splash or spray from blood or bodily substances, or to protect staff from droplet exposure to microorganisms. Offers a lower level of fluid resistance; risk assess to determine if a face shield is required	Tier 3 – Airborne and contact precautions Undertaking AGP on a person: with suspected or confirmed COVID-19; is in quarantine; or where a history cannot be obtained.
	healing wounds. Appropriate for some surgical procedures, where risk of blood and bodily fluid exposure is low to moderate.	confirmed COVID-19; is in quarantine; or where a history cannot be obtained.
Level 3	Procedures with risk of higher volume of blood, major trauma, first aid or whenever there is a risk of blood or body fluid splash or spray such as orthopaedic or cardiovascular procedures.	Tier 3 – Airborne and contact precautions Undertaking AGP on a person: with suspected or confirmed COVID-19; is in quarantine; or where a history cannot be obtained.

Disposable fluid resistant isolation gowns

Single use fluid resistant gowns (or 'isolation gowns') protect patients, healthcare workers and visitors from the transfer of infectious agents when they are in contact with each other. Isolation gowns are produced to provide four levels of protection as outlined in Table 3. Level 1 offering the lowest level of protection, and Level 4 offering the highest level of protection.

The American National Standards Institute (ANSI) and the Association of the Advancement of Medical Instrumentation (AAMI): ANSI/AAMI PB70:2012 describes the liquid barrier performance and classification of surgical and isolation gowns for use in health care facilities[10]**.**

When choosing an isolation gown, look for the product labelling that describes an intended use with the desired level of protection and based on the risk levels of care provided**.**

Please note that surgical gowns (not covered in this document) are different to isolation gowns and are intended to protect the patient, health care personnel and operating room personnel from contamination, exposure to infectious bodily fluids, and the transfer of microorganism and particular material. Although they provide suitable protection for isolation, s**urgical gowns should be prioritised for surgical procedures.**

Table 3: Guide for the use of isolation gowns

Barrier level	General applications [11]	COVID-19 application[12]
Level 1 (with plastic apron)	Provides protection for uses that expect the risk of fluid exposure to be low. They are recommended for basic patient care, transporting patients, laundry and housekeeping duties.	Tier 2 – Droplet and contact precautions.
Level 2	Provides protection from low to moderate risk of blood or body fluid exposure/splash seen in procedures such as suturing, blood draw, inserting IVs and specimen handling.	Tier 2 – Droplet and contact precautions. Tier 3 – Airborne and contact precautions

[10] For further information go to: https://wwwn.cdc.gov/PPEInfo/Standards/Info/ANSI/AAMIPB70Class3

[11] For further information go to: https://www.infectioncontroltoday.com/personal-protective-equipment/understanding-barrier-level-protection-medical-gowns

[12] For further information, please go to: https://www.cdc.gov/coronavirus/2019-ncov/hcp/respirator-use-faq.html

Barrier level	General applications [11]	COVID-19 application[12]
Level 3	Provides protection for uses where a moderate to high risk of blood or body fluid exposure/splash is expected. Appropriate for some surgical procedures where there is moderate risk of blood splash or exposure.	Tier 2 – Droplet and contact precautions. Tier 3 – Airborne and contact precautions
Level 4	Gowns provide protection for uses where a moderate to high risk of blood or fluid exposure/splash is expected. Appropriate for major trauma or whenever there is a high risk of blood or body fluid splash or spray such as orthopaedic or cardiovascular procedures.	Tier 2 – Droplet and contact precautions Tier 3 – Airborne and contact precautions

Where can I find out more information?

For Victorian updates: coronavirus.vic.gov.au

For national updates: health.gov.au/news/latest-information-about-novel-coronavirus

For international updates: who.int/westernpacific/emergencies/novel-coronavirus

WHO resources: who.int/health-topics/coronavirus

Appendix 1 – Testing for fluid and particulate resistance

Testing fluid resistance

Testing for fluid resistance against a high-pressure jet of simulated blood aims to replicate an arterial puncture which is sprayed directly at the face mask or respirator. The parameters for testing are based on the mean human blood pressure (80 – 120 mmHg) and likely proximity to the puncture site.

The American Society for Testing and Materials (ASTM) F1862 / F1862M – 17 classification system rates a face mask or respirator as Level 1, Level 2 or Level 3 based on its resistance to a 2ml high velocity directed blood spray at a distance of 300mm:

- Level 1: resistant at 80mmHg
- Level 2: resistant at 120mmHg
- Level 3: resistant at 160mmHg

Face masks and P2/N95 respirators are also tested for their ability to act as a barrier to the passage of aerosolised bacteria and air permeability[13].

Appendix 2 – Examples of P2/N95 respirators/masks

There are several manufactures who currently provide P2/N95 respirators which are distributed through the state supply chain. Examples of these include:

- standard N95 respirators (for example 3M 8110, 8110S and 8210).

8110

8210

- medical and surgical N95 respirators (for example 3M 1860, 1870+, BSN 72509-10).

1860

1870+

BSN 72509-10

[13] AS 4381:2015 Single use surgical face mask standard.