

Personal protective equipment in the operating theatre

COVID-19 pandemic decision support tool

This decision support tool has been developed for healthcare workers in the operating theatre environment during the COVID-19 pandemic, and should be read in conjunction with the Principles for Resuming Elective Surgery.

This tool outlines what specific personal protective equipment (PPE) is to be worn by each staff member in the operating theatre environment. The recommendation for PPE usage needs to be based on a number of factors listed below.

1. Current recommended national advice: [CDNA National Guidelines for Public Health Units](#) and [Commonwealth Infection Control Expert Group](#)ⁱⁱⁱ
2. Likelihood of patient having COVID-19
3. Patient risk factors related to underlying respiratory illness
4. The procedure being undertaken
5. The underlying risk within the facility.

Within this document, there are three levels of facility risk identified. This allows for a safe and rational approach to PPE utilisation for the duration of the pandemic. The method for calculating the facility risk is based on epidemiological parameters, and is currently a decision between:

- the relevant facility clinical experts (including local infectious diseases team and public health unit)
- the local health district management team
- the NSW Health Public Health Emergency Operations Centre (PHEOC)
- the Clinical Excellence Commission (CEC).

The risk of COVID-19 changes over time and is not the same across geographic areas, including local health districts, local government areas or jurisdictions. The PHEOC is continuing to provide advice around areas

considered 'hot-spots'. In the interim the suggested approach is for local health districts to consult with their local public health unit (who would be expected to be in contact with PHEOC) and infectious diseases team to more closely examine local risk.

Aerosol generating procedures (AGPs) are material to the risk posed to the healthcare worker. There are some procedures for which there is no dispute as to their aerosol-generating nature, such as intubation, called high risk in this tool. There are others for which there is some biological possibility based on evidence from other viral or biological studies. Given COVID-19 is a novel disease and evidence on transmission is continually emerging, recommendations on AGP risks are subject to change. The use of low AGP risk is not standard practice, but reflects this underlying tension of incomplete evidence and the need for staff to be safe and to feel safe during COVID-19 pandemic. Notably for confirmed, probable or possible COVID-19 cases, the procedure should be conducted in a negative pressure theatre if possible. All patients should be screened for risk and physical distancing should continue where possible, including minimising the number of people in a theatre. Hand hygiene is imperative.

This document exclusively addresses PPE for the theatre environment. Definitive and comprehensive advice on PPE utilisation is available in the CEC's [Infection Prevention and Control Practice Handbook](#), with advice for local health districts to guide responses to changing risk profiles and appropriate infection prevention and control measures in the CEC's [COVID-19 Infection Prevention and Control Response and Escalation Framework](#).^{iii,iv} All facilities are expected to comply with the infection control and prevention framework including engineering and administrative controls.

PPE definitions for operating suites: for all patient encounters

Standard precautions

- Hand hygiene
- Aseptic technique
- Cleaning and disinfection
- Choose PPE based on the risk of contamination of skin or clothing and appropriate to your role
- Respiratory etiquette
- Safe handling of sharps
- Waste disposal
- Includes usual operating theatre attire^v

Note: PPE for transmission based precautions (contact, droplet or airborne) include all the elements of standard precautions

Contact precautions

Used when infectious particles are transmitted by contact with patient or surrounds

As a minimum

- Hand hygiene
- Gloves
- Long sleeve impervious gown

Droplet precautions

Used when infectious particles are transmitted by droplets

In addition to contact precautions

- Surgical mask
- Face shield and/or eye protection

Airborne precautions

If infectious particles are transmitted by aerosols

In addition to contact and droplet

- N95/P2 mask (or higher) in place of surgical mask
- Where possible, the patient should be in a negative pressure room
- Patient should wear a surgical mask when possible

Powered air purifying respirators (PAPR)

For use with airborne precautions if required

COVID-19 procedural PPE: low facility risk¹

Patient COVID-19 risk ²	Low			Suspect, probable or confirmed		
	AGP ³	No	Low risk	High risk	No	High or low risk ⁷
Patient	Nil	Nil	Nil	Nil	Surgical mask	Surgical mask ⁴
Anaesthetist (and assistant)	Usual theatre attire	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Airborne Optional PAPR ⁸
Anaesthetic nurse	Usual theatre attire	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Airborne Optional PAPR ⁸
Instrument or circulating nurse	Usual theatre attire	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Airborne Optional PAPR ⁸
Surgical team	Usual theatre attire	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Airborne Optional PAPR ⁸
Operating assistants ⁵	Usual theatre attire	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Airborne
Recovery nurse	Usual theatre attire	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Airborne
Medical imaging or allied health staff ⁶	Usual theatre attire	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Airborne
Surgical representatives ⁶	Usual theatre attire	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Airborne

Operating theatres	Non-COVID 19 theatres	Non-COVID 19 theatres	Non-COVID 19 theatres	COVID 19 theatres	COVID 19 theatres
Patient transportation	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Droplet
Perioperative staff requirements	As per the Australian College of Perioperative Nurses guidelines	As per the Australian College of Perioperative Nurses guidelines	As per the Australian College of Perioperative Nurses guidelines	Outside anaesthetic runner and/or clinical runner to support theatre team	Outside anaesthetic runner and/or clinical runner to support theatre team
Recovery of patients	Recovery unit	Recovery unit	Recovery unit	Extubate and recover in operating theatre	Extubate and recover in operating theatre

Notes

1. PPE: All include standard precautions.
Droplet includes contact. Airborne includes droplet and contact.
2. COVID-19 risk is based on local health district definitions.
3. The AGP list may change based on evidence and/or local definitions.
4. Apply a surgical mask to the **at risk COVID-19 patient** if they are able to tolerate it (until anaesthetic induced).
5. Operating assistants **and staff not involved in the procedure** are expected to be outside the operating theatre during the procedure. If they must return to the theatre in the 30 minutes following an AGP, appropriate PPE is required.
6. Medical imaging, allied health staff and surgical representatives should be outside the operating theatre during an AGP.
7. COVID-19 patients having a low or high risk aerosol generating procedure should be managed with airborne precautions for all anaesthesia types, including regional anaesthesia.
8. Optional use of optional PAPR will be defined for each facility by the local health district or specialty health network, and is subject to availability of devices.

COVID-19 procedural PPE: medium facility risk¹

Patient COVID-19 risk ²	Low			Suspect, probable or confirmed	
	No	Low risk	High risk	No	High or low risk ⁷
AGP ³	Nil	Nil	Nil	Surgical mask	Surgical mask ⁴
Patient	Nil	Nil	Nil	Surgical mask	Surgical mask ⁴
Anaesthetist (and assistant)	Usual theatre attire	Droplet	Airborne	Droplet	Airborne Optional PAPR ⁸
Anaesthetic nurse	Usual theatre attire	Droplet	Airborne	Droplet	Airborne Optional PAPR ⁸
Instrument or circulating nurse	Usual theatre attire	Droplet	Airborne	Droplet	Airborne Optional PAPR ⁸
Surgical team	Usual theatre attire	Droplet	Airborne	Droplet	Airborne Optional PAPR ⁸
Operating assistants ⁵	Usual theatre attire	Droplet	Airborne	Droplet	Airborne
Recovery nurse	Usual theatre attire	Droplet	Airborne	Droplet	Airborne
Medical imaging or allied health staff ⁶	Usual theatre attire	Droplet	Airborne	Droplet	Airborne
Surgical representatives ⁶	Usual theatre attire	Droplet	Airborne	Droplet	Airborne

Operating theatres	Non-COVID 19 theatres	Non-COVID 19 theatres	Non-COVID 19 theatres	COVID 19 theatres	COVID 19 theatres
Patient transportation	Usual theatre attire	Usual theatre attire	Usual theatre attire	Droplet	Droplet
Perioperative staff requirements	As per Australian College of Perioperative Nurses	As per Australian College of Perioperative Nurses	As per Australian College of Perioperative Nurses	Outside anaesthetic runner and/or clinical runner to support theatre team	Outside anaesthetic nurse and circulating nurse; outside operating assistant
Recovery of patients	Recovery unit	Recovery unit	Recovery unit	Extubate and recover in operating theatre	Extubate and recover in operating theatre

Notes

1. PPE: All include standard precautions.
Droplet includes contact. Airborne includes droplet and contact.
2. COVID-19 risk is based on local health district definitions.
3. The AGP list may change based on evidence and/or local definitions.
4. Apply a surgical mask to the **at risk COVID-19 patient** if they are able to tolerate it (**until anaesthetic induced**).
5. Operating assistants **and staff not involved in the procedure** are expected to be outside the operating theatre during the procedure. If they must return to the theatre in the 30 minutes following an AGP, appropriate PPE is required.
6. Medical imaging, allied health services and surgical representatives should be outside the operating theatre during an AGP.
7. COVID-19 patients having a low or high risk aerosol generating procedure should be managed with airborne precautions for all anaesthesia types, including regional anaesthesia.
8. Optional use of optional PAPR will be defined for each facility by the local health district or specialty health network, and is subject to availability of devices.

COVID-19 procedural PPE: high facility risk¹

Patient COVID-19 risk ²	Low			Suspect, probable or confirmed		
	AGP ³	No	Low risk	High risk	No	High or low risk ⁷
Patient		Surgical mask ⁴	Surgical mask ⁴	Surgical mask ⁴	Surgical mask ⁴	Surgical mask ⁴
Anaesthetist (and assistant)		Droplet	Airborne	Airborne	Droplet	Airborne Optional PAPR ⁸
Anaesthetic nurse		Droplet	Airborne	Airborne	Droplet	Airborne Optional PAPR ⁸
Instrument or circulating nurse		Droplet	Airborne	Airborne	Droplet	Airborne Optional PAPR ⁸
Surgical team		Droplet	Airborne	Airborne	Droplet	Airborne Optional PAPR ⁸
Operating assistants ⁵		Droplet	Airborne	Airborne	Droplet	Airborne
Recovery nurse		Droplet	Airborne	Airborne	Droplet	Airborne
Medical imaging or allied health staff ⁶		Droplet	Airborne	Airborne	Droplet	Airborne
Surgical representatives ⁶		Droplet	Airborne	Airborne	Droplet	Airborne

Operating theatres	COVID 19 theatres	COVID 19 theatres	COVID 19 theatres	COVID 19 theatres	COVID 19 theatres
Patient transportation	Droplet	Droplet	Droplet	Droplet	Droplet
Perioperative staff requirements	Outside anaesthetic nurse and circulating nurse; outside operating assistants			Outside anaesthetic runner and/or clinical runner to support theatre team	
Recovery of patients	Extubate and recover in operating theatre			Extubate and recover in operating theatre	

Notes

1. PPE: All include standard precautions.
Droplet includes contact. Airborne includes droplet and contact.
2. COVID-19 risk is based on local health district definitions.
3. The AGP list may change based on evidence and/or local definitions.
4. Apply a surgical mask to the **at risk COVID-19 patient** if they are able to tolerate it (**until anaesthetic induced**).
5. Operating assistants **and staff not involved in the procedure** are expected to be outside the operating theatre during the procedure. If they must return to the theatre in the 30 minutes following an AGP, appropriate PPE is required.
6. Medical imaging, allied health services and surgical representatives should be outside the operating theatre during an AGP.
7. COVID-19 patients having a low or high risk aerosol generating procedure should be managed with airborne precautions for all anaesthesia types, including regional anaesthesia.
8. Optional use of optional PAPR will be defined for each facility by the local health district or specialty health network, and is subject to availability of devices.

Aerosol generating procedures in relation to COVID-19

COVID-19 is a respiratory tract infection predominantly transmitted by large droplets.ⁱⁱ Contact and droplet precautions are therefore recommended during routine care of patients with suspected, probable or confirmed COVID-19.^{ii,vi} AGPs may need to be performed during the care of these patients. AGPs may lead to the production of droplet nuclei (<5 micrometres in size) or airborne particles (aerosols) due to air or gas flowing rapidly over a moist or wet surface.^{vii} There are many procedures that may be aerosol generating but evidence is evolving as to whether they lead to an increased risk of respiratory infection transmission.

In addition to the nature of the procedure itself, the overall risk of transmission of SARS-CoV-2 is also associated with the viral load in the body fluid potentially being aerosolised, and whether the virus is intact and capable of causing infection (which is an important distinction, since many body fluid, air-sampling and environmental studies use methods that detect any viral RNA rather than intact, infective virus). Studies have shown that SARS-CoV-2 is most commonly detected in respiratory tract samples (lower greater than upper) in those who are infected; thus procedures involving potential exposure to respiratory tract secretions or tissues are of particular relevance with respect to the risk of COVID-19 transmission.^{viii} SARS-CoV-2 has also been detected in non-respiratory specimens, in particular stool and to a lesser extent blood and ocular secretions, but the role of these sites in transmission is uncertain. Of note, faecal-oral transmission has not been clinically described, and does not appear to be a significant factor in the spread of infection.^{ix}

With respect to COVID-19, high risk AGPs are those associated with production of respiratory tract-generated aerosols. These procedures have the potential to pose an airborne transmission risk of SARS-CoV-2 and therefore airborne precautions are recommended. High risk AGPs should be performed with the minimum number of personnel present and where possible, the most qualified person should carry out the procedure. In contrast, low risk AGPs for COVID-19 transmission or procedures not associated with the potential to produce aerosols, can be performed using contact and droplet precautions, as

indicated for the routine care of suspected, probable or confirmed cases of COVID-19. In general, it is recommended that nebulised medication is avoided in favour of metered dose inhaler and spacer use. If a COVID-19 patient requires an AGP for optimal care, the procedure should be performed, with appropriate infection control precautions which will minimise risk to staff.

See Table 1 for examples of AGPs of varying risk based on current evidence and expert opinion, including considerations of biological plausibility.^{x,xi} It must be noted that at present, the evidence is limited and these classifications may change as new data emerge. For guidance regarding other specialised procedures related to allied health interventions, please refer to the CEC website.

Cardiopulmonary resuscitation (CPR) is complex in terms of assessing AGP risk. While many procedures (e.g. intubation), undertaken during the course of CPR, are considered high risk AGPs, it is uncertain whether chest compressions or defibrillation result in aerosol generation or transmission of COVID-19. There is very limited, poor quality data in the current literature concerning this issue.^{x,xii} In many reports, it is likely that there was simultaneous exposure to airway manoeuvres, such that the isolated effect of either chest compressions or defibrillation could not be reliably identified. In the setting of low rates of community transmission of COVID-19, chest compression and defibrillation are unlikely to pose a risk to first responders who start CPR, without knowledge of the subject's COVID-19 status.ⁱⁱ Healthcare workers can safely start chest compression or defibrillation of a patient with suspected, probable or confirmed COVID-19 using contact and droplet precautions, until another clinician arrives, using airborne precautions, to manage the airway.ⁱⁱ

Table 1: Examples of aerosol generating procedures classified according to risk of airborne transmission of SARS-CoV-2

Procedure	High risk AGPs	Low risk AGPs or not AGPs
Airway interventions	<ul style="list-style-type: none"> • Tracheal intubation or extubation • Manual bag-mask ventilation¹ • Non-invasive ventilation¹ • Tracheostomy or tracheotomy (insertion and removal)¹ • Laryngeal mask or supraglottic airway • Intentional or inadvertent disconnection or reconnection of closed ventilator circuit • High flow nasal oxygen² • Open-suctioning of airways 	<ul style="list-style-type: none"> • Mechanical ventilation via closed circuit
Procedures involving the respiratory tract	<ul style="list-style-type: none"> • Sputum induction³ • Bronchoscopy • Thoracic surgery involving the lung • Maxillofacial surgery • Ear, nose and throat procedures that involve suctioning or high-speed drilling, including transphenoidal surgery 	<ul style="list-style-type: none"> • Swabbing of upper respiratory tract • Examination of the throat, eyes or ears without invasive instrumentation • Nasendoscopy
Other procedures	<ul style="list-style-type: none"> • Procedures that involve open suctioning of the upper airways (e.g. gastroscopy with suctioning) • Dental procedures with high-speed drilling • Post-mortem procedures involving high-speed devices on the respiratory tract 	<ul style="list-style-type: none"> • Insertion of a nasogastric tube • Transoesophageal echocardiogram • Colonoscopy • Laparoscopic surgery • Orthopaedic procedures with saws, drills or large volume washouts





Precautions for COVID 19	Contact, droplet and airborne	Contact and droplet
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1. Evidence for AGP being associated with transmission of acute respiratory infections.^x
2. High flow nasal oxygen is a specific form of non-invasive respiratory support which delivers high flow oxygen via large diameter nasal cannula which is humidified and heated. Flow rates can be given up to 60l/min in adults and 25l/min in children with an oxygen air blender supplying oxygen at 21–100%.
3. Sputum induction is classified as a high risk AGP as it is performed using an ultrasonic nebuliser. It is the nebuliser that makes it an AGP, not the fact that the procedure induces coughing in the patient.

Evidence base

This document has been developed through review of published literature, clinical guidelines from domestic and international organisations, sourced in April and May 2020, defining suitable personal protective equipment in surgical care during the COVID-19 pandemic. This published evidence was supplemented with experiential evidence from subject matter experts to specify the protective equipment suitable for various surgical and perioperative care team members.

A sub-committee of the Surgery Community of Practice developed the document, with further input from the broader Surgery Community of Practice and Anaesthesia Community of Practice. This was obtained through virtual consultation with members with expertise in surgical services, anaesthesia, quality and safety, perioperative care, nursing and allied health over a period of four weeks. Further targeted consultation with the Clinical Excellence Commission led to the inclusion of advice relating to aerosol generating procedures. The final document was approved by the Clinical Leads of the Surgery and Anaesthesia Communities of Practice.

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