

The Infection Control Expert Group (ICEG) has prepared *Guidance on the use of personal protective equipment (PPE) in hospitals during the COVID-19 outbreak* which can be 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>

ICEG urges all individual colleges, associations and societies to refer to this document when preparing statements or guidelines for their members, on the use of PPE.

**ICEG comments on: *ASA Position Statement on Personal Protective Equipment (PPE) for Aerosol Generating Procedures (AGP) in patients at high risk of COVID-19.***

GENERAL COMMENT: ICEG reiterates previous advice that surgery/procedures **should only be performed in an emergency**, on patients who are at high risk of COVID-19 (i.e. either in quarantine because of close contact with a case or overseas travel in the last 14 days or have symptoms consistent with, or confirmed, COVID-19 (see latest case definitions:

<https://www1.health.gov.au/internet/main/publishing.nsf/Content/cdna-song-novel-coronavirus.htm>

During the COVID-19 outbreak, PPE for the care of patients who are not suspected or confirmed cases of COVID-19 should be used in line with the *Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019)*.

<https://www.nhmrc.gov.au/about-us/publications/australian-guidelines-prevention-and-control-infection-healthcare-2019#block-views-block-file-attachments-content-block-1>

**ICEG comments on *Summary of recommendations on PPE for managing of suspect/known COVID-19 patients by anaesthesia teams* (p7 of 9)**

**‘We encourage all health services to provide anaesthetists and anaesthetic assistants with PPE in accordance with the National Guidelines and Australian Standards, except where State guidance recommends a higher level of PPE.**

COMMENT: We support this recommendation

**‘We recommend the anaesthetic team should not undertake or be required to undertake tasks requiring PPE in situations where PPE is not available for use. Any such tasks should not proceed until required PPE is made available.’**

COMMENT: We support this recommendation

**‘In ensuring adequate PPE, we encourage fit-testing and a fit-check be performed and suggest that a fit-check alone is insufficient. We suggest fit-testing to be performed with a range of respirators and compulsory training as to their correct use is provided.’**

COMMENT: Although we in no way discourage fit-testing, we acknowledge that in the current circumstances, fit-testing of all healthcare professionals, who need to use P2/N95

respirators, will be difficult due to limited supplies and range of types/sizes available. Fit-testing does not guarantee that a respirator will not leak, particularly if a different type or size is used – this reinforces the need to fit-check with each use.

Moreover, we do not agree **‘a fit-check alone is insufficient’**. We refer you to “Guidance on the use of personal protective equipment (PPE) in hospitals during the COVID-19 outbreak”, which states that “the minimum standard of use of a P2/N95 respirator is careful fit-checking with each use”.

**‘Where fit-testing is not available, we suggest PAPR be considered.’**

COMMENT: We do not support this recommendation. See above. We agree that the utility of PAPR is limited for the reasons outlined in your document.

**‘As further evidence emerges regarding COVID-19 we recommend ‘full PPE’ including coverage of the head and feet also be considered.’**

COMMENT: We do not support this recommendation. Disposable caps do not provide barrier protection against contamination. Shoe covers become contaminated by a variety of organisms during use – these contaminate healthcare worker hands (or gloves) when removed. This represents an unnecessary risk without clear benefit.

**‘We recommend all anaesthetists undertake training until they are proficient in the donning and doffing of PPE and team-based simulation for protected intubation and extubation as a minimum.’**

COMMENT: We support this recommendation.

03 August 2020

Infection Control Expert Group (ICEG)  
Department of Health  
GPO Box 9848  
Canberra ACT 2601

By email: [ICEG.Secretariat@health.gov.au](mailto:ICEG.Secretariat@health.gov.au)

Dear ICEG Secretariat,

**ASA Response to ICEG ASA Position Statement on Personal Protective Equipment (PPE) for Aerosol Generating Procedures (AGP) in patients at high risk of COVID-19**

Thank you for sharing the *Guidance on the use of personal protective equipment (PPE) in hospitals during the COVID-19 outbreak* which we plan to refer to along with the many other references available regarding PPE.

Thank you also for reviewing ASA – PS20 the ***ASA Position Statement on Personal Protective Equipment (PPE) for Aerosol Generating Procedures (AGP) in patients at high risk of COVID-19***

We note that the following recommendations were not supported:

**‘In ensuring adequate PPE, we encourage fit-testing and a fit-check be performed and suggest that a fit-check alone is insufficient. We suggest fit-testing to be performed with a range of respirators and compulsory training as to their correct use is provided.’**

**‘Where fit-testing is not available, we suggest PAPR be considered.’**

**‘As further evidence emerges regarding COVID-19 we recommend ‘full PPE’ including coverage of the head and feet also be considered.’**

In reply:

We maintain that **fit-checking alone is insufficient**. Fit-testing with a qualified fit-tester provides education about how to don a respirator correctly, what a correctly fitted respirator feels like and how to fit-check it correctly. Our experience has been that many health-care workers (HCWs) are self-taught to fit-check or taught by others who lack expertise in this area. Thus, we maintain that a fit-check alone is insufficient.

This is further supported in the studies referenced in ASA PS 20:

Canadian study of 784 participants: 25% of those who considered they had an adequate seal failed quantitative fit-testing. (Danyluk Q et al (2011). 'Health care workers and respiratory protection: is the user seal check a surrogate for respirator fit- testing?' J Occup Environ Hyg, 8(5):267-270, doi: 10.1080/15459624.2011.566016)

Hong Kong study of 268 participants of Chinese descent: the user seal check was correct on 71-75% of occasions. (Derrick JL. (2005) 'Predictive value of the user seal check in determining half-face respirator fit', Journal of Hospital Infection 59, 152-155)

A Hong Kong study of 204 participants of Chinese descent: the ability of the fit-check to correctly identify a poor fit was 15-23%. Furthermore, the accuracy of the fit-check was higher for males than for females. (Lam, S.C et al. (2011) 'Sensitivity and specificity of the user-seal-check in determining the fit of N95 respirators' Journal of Hospital Infection 77, 252- 256)

The findings of these studies and others consistently indicate that the fit-check (user-seal check) is unable to serve as an effective alternative to fit-testing because of its low accuracy and predictive value. In the current Australian context where fit-checking is taught in an ad hoc manner by inexperienced trainers it could be anticipated that the reliability of fit-checking would be no better than in a research setting.

We commend the Australian Government *Guidance on the use of personal protective equipment (PPE) in hospitals during the COVID-19 outbreak* version 4 published on 24/4/20, which was developed by ICEG and the acknowledgement that "Fit-testing is recommended as the gold-standard (AS/NZS1715:2009) for use of P2/N95 respirators".

In light of this, the ASA amends our position on fit-testing. Our position is that **fit-testing is essential to ensure respirator masks will provide effective protection**. Employers or workplaces must plan and provide or facilitate fit-testing and training expediently for all at risk anaesthetists and associated staff as part of ensuring reasonable workplace protections. Where fit-testing is not available or when fit-testing has failed to identify a respirator that is able to fit, there are a number of options available to health care workers. These include removing the worker from high risk duties or providing a powered air-purifying respirator (PAPR). Another option for those where fit-testing has not been successful is to provide a reusable respirator, however these require fit-testing whereas a loose-fitting PAPR with a full

hood does not. Thus, we maintain that that **PAPR be considered where fit-testing is not available.**

With regard to the recommendation that **'as further evidence emerges regarding COVID-19 we recommend 'full PPE' including coverage of the head and feet also be considered.'** We wish to clarify that head and neck and foot coverage are not the "disposable caps and shoe covers" referred to in the *ICEG response to ASA recommendations -28 April* correspondence.

Experience from overseas has demonstrated that the current level of airborne precautions is insufficient in preventing contamination for those involved with high risk AGP. Recommendations from China, Italy and Canada describe a third level of precaution. The ASA has adopted the Canadian nomenclature "enhanced airborne precautions" for high risk aerosol generating medical procedures<sup>1</sup>.

In addition to the studies included in ASA PS 20, Lockhardt et al<sup>2</sup> recommend neck covering in addition to gown and two pairs of gloves and access to shower facilities after doffing. The neck has been shown to be an area subject to a high degree of contamination in simulated studies<sup>3,4</sup>. Due to the proximity to mucous membranes, contamination of the neck could provide a source of further contamination and infection during doffing and the removal of clothing.

The risk of self-contamination from disposable shoe covers during doffing is uncertain as the available evidence is only from small studies.

Due to the uncertainty regarding the exact level of PPE for high risk aerosol generating medical procedures, we maintain this recommendation with the updated nomenclature that **'as further evidence emerges regarding COVID-19 we recommend 'enhanced airborne precautions' including coverage of the head and feet also be considered.**

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<sup>1</sup> "COVID-Webinar-PDF-Presentation,-March-22,-2020.Pdf."

<sup>2</sup> Shannon L. Lockhart et al., "Personal Protective Equipment (PPE) for Both Anesthesiologists and Other Airway Managers: Principles and Practice during the COVID-19 Pandemic," *Canadian Journal of Anesthesia/Journal Canadien d'anesthésie*, April 23, 2020, <https://doi.org/10.1007/s12630-020-01673-w>.

<sup>3</sup> Shannon L. Lockhart et al., "Simulation as a Tool for Assessing and Evolving Your Current Personal Protective Equipment: Lessons Learned during the Coronavirus Disease (COVID-19) Pandemic," *Canadian Journal of Anesthesia/Journal Canadien d'anesthésie*, March 27, 2020, <https://doi.org/10.1007/s12630-020-01638-z>.

<sup>4</sup> J. E. Zamora, "Contamination: A Comparison of 2 Personal Protective Systems," *Canadian Medical Association Journal* 175, no. 3 (August 1, 2006): 249–54, <https://doi.org/10.1503/cmaj.060094>.

In summary, the ASA recommends:

- We encourage all health services to provide anaesthetists and anaesthetic assistants with PPE in accordance with the National Guidelines and Australian Standards, except where State guidance recommends a higher level of PPE.
- We recommend the anaesthetic team should not undertake or be required to undertake tasks requiring PPE in situations where PPE is not available for use. Any such tasks should not proceed until required PPE is made available.
- In ensuring adequate PPE, we regard **fit-testing as essential to ensure respirator masks will be effective protection**. Fit-checking must be performed however a fit-check alone is insufficient. We suggest fit-testing to be performed with a range of respirators and compulsory training as to their correct use is provided.
- Where fit-testing is not available, we suggest PAPR be considered.
- As further evidence emerges regarding COVID-19 we recommend '**enhanced airborne precautions**' including coverage of the head and feet also be considered.
- We recommend all anaesthetists undertake training until they are proficient in the donning and doffing of PPE and team-based simulation for protected intubation and extubation as a minimum.

Yours sincerely,



**Dr Suzi Nou**  
President  
Australian Society of Anaesthetists

## Position statement

### ASA Position Statement on Personal Protective Equipment (PPE) for Aerosol Generating Procedures (AGP) in patients at high risk of COVID-19

#### Purpose

This Position Statement has been prepared by the ASA to provide evidence-based guidance on personal protective equipment (PPE) for anaesthetists and anaesthesia assistants in Australia performing aerosol generating procedures (AGPS) in patients who are at high risk of COVID-19. It is hoped that within a health setting there is collaboration so that any differences in PPE are minimised or that staff are aware of why these differences have been agreed upon. This Position Statement does not consider the PPE requirements for managing patients at low-risk of COVID-19.

#### Background

In the hierarchy of hazard control, PPE is regarded as the last line of defence and least effective to minimise exposure to hazards. The other components, in order of importance are: elimination, substitution, engineering controls and administrative controls.

Some examples in the setting of managing COVID-19 by anaesthetists are:

1. Elimination – Keeping COVID-19 patients from having unnecessary surgery and managing patient flows in a hospital, or cohorting high, intermediate or low risk patients between different facilities.
2. Substitution – Performing regional anaesthesia instead of a general anaesthetic which would involve an aerosol generating procedure (AGP).
3. Engineering controls – Converting positive pressure rooms to negative pressure or enabling only swipe card access.
4. Administrative controls – Introduce training, proper rostering to minimise fatigue, provide extra staff so that there is an 'inside' and 'outside' team sign posting for 'hot', 'warm' and 'cool' zones.

Even with all these controls in place, anaesthetists and anaesthetic assistants will find themselves performing high risk procedures on high risk patients and will be reliant on effective PPE to prevent health care worker (HCW) exposure to the SARS-CoV-2 virus and infection leading to COVID-19 infections.

Anaesthetists are regarded as the 'airway experts' and will increasingly be called upon to intubate COVID-19 patients, as well as performing AGPs in their usual practice. It has previously been reported that "healthcare worker involvement with tracheal intubation conferred a 13-fold higher relative risk ratio for acquiring SARS infection when compared to healthcare workers not participating in tracheal intubation."<sup>1</sup>

This hierarchy of hazard control has been evident with the rates of HCW infection from SARS-CoV-2 in Wuhan, China.

From Dec 2019 to Jan 22, there was a high HCW infection rate ranging from 3.5-29%. This was due to the poor awareness of the highly contagious nature of SARS-CoV-2 and inadequate protection of HCWs.

On 23 January 2020, when authorities recognised COVID-19 as a disease, a lockdown was imposed on Wuhan. During this second stage, the lockdown impacted the production and supply of PPE, thereby, increasing the number of HCWs infected during this period.

Due to the lack of preparedness by February 11, there were 1,716 HCWs infected, including 5 deaths. During the third stage where the severity of the disease was fully acknowledged all HCWs were fully protected. There was increased hazard control, with cohorting of patients to COVID-19 dedicated hospitals, increased population measures such as social distancing and the wearing of face masks in public and institution of 'full PPE'.<sup>2</sup> Wuhan maintained these precautionary measures in the face of potential disaster and during this phase there were no HCW infections. Similar accounts have emerged in Italy, another country greatly impacted by COVID-19 and where more than 5000 HCWs have been infected. In previous settings, HCWs are over-represented in the number of cases, for example, 22% of SARS cases occurred in HCWs.

When implementing recommendations all healthcare facilities need to consider the high-risk transmission of COVID-19 to HCWs and encourage to implement measures according to their specific facility setting and circumstances.

## **PPE for managing patients with known or suspected COVID-19**

### **PPE**

#### *Summary of recommendations*

We encourage all health services to provide anaesthetists and anaesthetic assistants with PPE in accordance with the National Guidelines and Australian Standards, except where State guidance recommends a higher level of PPE. The anaesthetic team is not to undertake or be required to undertake tasks requiring PPE if the PPE is not available for use. Any such tasks are not to proceed until required PPE is available.

In ensuring adequate PPE, we request fit-testing and a fit-check (user-seal check) to be considered and suggest that a fit-check alone is insufficient. We encourage fit-testing to be performed with a range of respirators and that training as to their correct use is provided. Where fit-testing is not available, we suggest that powered air-purifying respirator (PAPR) be considered. As further evidence emerges regarding COVID-19 we recommend 'full PPE' including coverage of the head and feet also be considered.

We acknowledge that ideally, fit-testing, training and fit-checking be part of a risk management program that is best implemented prior to a pandemic. We commend the many health services that have undertaken fit-testing and all other endeavours in the initial phase of this pandemic to reduce transmission of SARS-CoV-2 to HCWs.

#### **Fit-testing**

Fit-testing is not equivalent to fit-checking. It can be performed quantitatively or qualitatively by a qualified fit-tester. Quantitative assessment is performed using a particulate counter and qualitative assessment involves being able to smell or taste a test agent.

We recommend anaesthetists and anaesthetic assistants wear a fit-tested as well as fit checked N95/P2 respirator or higher level of protection for airway management, where fit-testing is able to be attained. This recommendation is in accordance with the Australian Standard AS/NZS 1715:2009<sup>3</sup> that "it is essential that an adequate face seal is achieved i.e. to be properly fitted to the wearer. The program administrator *shall* (emphasis added) ensure a suitable fit test is carried out for all users of respiratory protective equipment (RPE) with a close fitting facepiece". We note that AS/NZS 1715:2009 does not mandate fit testing but that it should be made available and recommends it to be performed on an annual basis.



Fit-testing is also recommended in the *Australian Guidelines for the Prevention and Control of Infection in Healthcare*.<sup>4</sup> The guidelines identify proper size and style of respirator suitable for an individual. The NHMRC recommends that a “*risk-management approach should be applied to ensure that staff working in high-risk areas are trained in appropriate fit of the P2 respirator and how to perform a fit check at the point of use*” and that this may also include fit-testing. While fit testing may be complex and resource intensive, it is a valuable practice which provides an opportunity to educate healthcare professionals.

The World Health Organization “Infection Prevention and Control guidance for Long-Term Care Facilities in the context of COVID-19 – interim guidance 21 March 2020 also states “use N95 mask only if the LTCF (long-term care facility) has a programme to regularly fit-test employees for the use of N95 respirators”.

Despite these recommendations in the Australian Standards, NHMRC and WHO, there is little evidence that demonstrates that fit-testing results in less transmission of respiratory viruses. In an under-powered cluster study of 1441 HCWs in Beijing that compared medical masks, fit-tested N95 and non-fit tested respirators against a convenience group of 481 HCWs who didn't wear masks, N95s were associated with lower rates of infection, although this result was not statistically significant. Those in the fit-test N95 cluster reported less hand hygiene than the medical mask and non-fit tested N95 groups.<sup>5</sup>

#### ***Fit-testing of a range of respirators be undertaken with training***

If fit testing is to be undertaken, workplaces should offer respirators of different sizes in order to increase the number of HCWs who adequately pass fit-testing.<sup>6</sup>

The US CDC recommends that fit-testing is a “critical component” to a respiratory protection program” and that it be performed on an annual basis with the initial test to be performed to determine the right model, style and size.<sup>7</sup> Therefore it is recommended that fit-testing is performed on an annual basis and that fit-checking be performed every time a respirator is worn.

The efficacy of a respirator is dependent on the maintenance of a tight face seal to prevent contaminated air from bypassing the filter and prior fit-testing does not assure success in attaining and maintaining a tight face seal.<sup>8</sup> In a simulated patient model, an inappropriately worn N95 respirator functioned less effectively than a poorly fitted N95 respirator. The authors concluded that for PPE “to provide the needed protection to workers, they must be part of a respiratory protection program that includes training and fit testing of workers for the PPE they will use”.<sup>9</sup> As fit-testing only indicates the degree of fit at the time of testing, it should occur in the workplace or a simulated workplace test should be included.<sup>10</sup>

Annual training and fit-testing may be insufficient in maintaining proper use. In a study of 43 untrained fit-tested HCWs followed for 14 months, 44% successfully passed fit-testing without specific instruction. This increased to 74% after initial training. The remainder passed fit testing with other types of respirators.<sup>11</sup> This supports the recommendation that workplaces should offer respirators of different sizes and types in order to increase the number of HCWs who adequately pass fit-testing.<sup>12</sup> Failure rates of fit-testing were high at 3 and 14 months follow up but pass rates remained high amongst regular users and wearing an N95 in daily work improves the success of maintaining a face seal. During the current pandemic, it could be anticipated that there is a high motivation to ensure correct use and that use will become regular by anaesthetic teams.

In the absence of formal fit-testing, it can be expected that approximately 75% of HCWs will achieve an adequate fit. Correct strapping and adjusting of the nose-bridge piece appeared to be the most important actions in predicting an adequate seal.<sup>13</sup>

## Fit-checking alone may be insufficient

Fit-checking (user-seal check) is a self-determined test performed according to the manufacturer's recommendations and usually just prior to entering a hazardous environment. It can involve a negative and/or positive pressure check as well as checking that the respirator and straps are seated correctly. The positive pressure fit check confirms that no air escapes from around the mask during exhalation. The negative pressure fit check confirms a vacuum is created causing the mask to be drawn in slightly during inspiration.

Fit-checking without fit-testing has been shown to be inadequate. In a Canadian study of 784 participants, less than 1% of those who had never previously been fit-tested identified an inadequate seal during user seal check. Of these, half went on to pass both qualitative and quantitative fit-testing and half failed both. Of the remaining subjects who considered they had an adequate seal, 25% failed quantitative fit-testing and 14% failed qualitative fit-testing.<sup>14</sup> Of note, 137 of these subjects had previously been fit-tested and indicated they had an adequate fit-check. However, 30% and 25% failed the quantitative and qualitative fit tests respectively. Failure of fit checking in these subjects who had previously been fit-tested may indicate inadequate implementation of the fit-testing, such as provision of training and regular use, as well as that of the fit-testing itself. It may also indicate why Chinese and Italian health professionals recommend the use of hoods that cover the head and all facial skin.

Similarly, in a Hong Kong study, fit checking incorrectly identified whether a respirator passed quantitative fit-testing on 18-31% of occasions. Fit checking also incorrectly identified that the respirator did not fit on 21-40% of occasions, with the authors concluding that the user "fit check should not be used as a surrogate fit test".<sup>15</sup>

## Consideration of PAPR if fit-testing is not available

Where fit-tested (not checked) N95/P2 respirators are not available we suggest the use of a PAPR be considered. This is based on AS/NZS 1715:2009: "risk group 4 (the highest) requires PAPR-P3 filter with full facepiece of head covering and blouse or full body air-supplied positive pressure suit". We consider COVID-19 to fit within risk group 4 (High individual and community risk, without effective and preventative treatment measures available).<sup>16</sup>

PAPR provides a 100-fold higher level of protection than an N95,<sup>17</sup> however this may not be translated to clinical practice. A 2019 Cochrane review found the "use of PAPR may protect better than a simple ensemble of PPE (RR 0.27, 95% CI 0.17–0.43) based on low quality studies."<sup>18</sup>

One of these studies considered infection of 33 Canadian health care workers involved with tracheal intubation during two epochs of the 2003 SARS epidemic. All three of the SARS infections occurred during SARS 1, with 23 HCWs involved in SARS1 and 10 in SARS2, performing 39 tracheal intubations across the epidemic. The use of PAPR, N95 respirators, face shields and gloves increased but the use of surgical masks decreased during SARS 2.<sup>19</sup>

Another study reviewed 43 nurses who worked at least one shift in a critical care environment where there was a patient with SARS. Of the 43, eight were infected. They found a near 80% reduction of risk for infection in nurses who consistently wore either a surgical mask or N95 respirator (RR 0.23, 95%CI 0.07–0.078,  $p < 0.02$ ). Two of 16 nurses who consistently wore an N95 mask acquired SARS.<sup>20</sup>

In a human model where 58 healthy subjects were exposed to live attenuated influenza vaccine, influenza virus was detected in three of 29 subjects wearing a qualitative fit-tested N95 compared to no virus found in the 29 subjects wearing PAPR vs N95, although the difference in rates was not statistically significant (10% difference,  $P=0.24$ , 95% CI -17% -37%).<sup>21</sup>

A cross-over study compared 50 subjects in enhanced PPE (hair cover, goggles, face shield, N95, two pairs of gloves and impervious surgical gown) versus PAPR with a Tyvek hood, coveralls and boot covers contaminated with a fluorescein solution. It found that wearing of PAPR resulted in less contamination, particularly to the neck and wrists. PAPR use took more time (>6 mins vs <2 mins for enhanced PPE) and there were more donning and doffing violations; however only 33 had received any prior PAPR training.<sup>22</sup> Despite the protocol violations, there was less contamination when wearing PAPR.

We note that use of a PAPR suit requires extra training in donning, doffing, decontamination, maintenance and checking and that extra personnel may be required for these processes. PAPR impedes performance of manual procedures, communication between team members can also be more challenging due to noise from the power unit and may trigger claustrophobia. Due to the positive outward airflow, PAPR may be contraindicated for use during surgery.

### **'Full PPE'**

The exact combination of PPE to prevent transmission of the SARS-CoV-2 virus to HCWs is still not established at this time. The Joint Task Force of the Chinese Society of Anesthesiology and the Chinese Association of Anesthesiologists, following their experience with 81,747 confirmed cases of COVID-19 of which 1716 were HCWs (including 5 deaths) recommend a "disposable surgical cap, *test-fit* N95 respirators, gloves, goggles or face shield, gown and fluid resistant shoe-covers" (emphasis added).

The Joint Task Force made the distinction that the "key element... is complete coverage of the head and facial skin, which does not necessary mean a conjoined hood or even a PAPR".<sup>23</sup> The suggestion of complete coverage of the head is plausible given that fit-tested N95 respirators performance may be reduced with movements such as head nodding and bending at the waist.<sup>24</sup> Similarly, the Italian recommendation for airborne PPE is a helmet, cover or hood, P2 respirator or higher, goggles or a face shield (if no helmets); hazmat suits or long-sleeved fluid resistant gowns, double gloves and overshoes.<sup>25</sup> They do not, however, mention fit-testing or PAPR. The highest level of protection in the Chinese COVID-19 handbook<sup>26</sup> includes surgical cap, N95 respirator, work uniform, disposable protective uniform, gloves and a full-face respiratory protective device or PAPR. In a case series of 202 intubations performed in Wuhan with no HCW infections, PPE comprised of N95 respirator and surgical mask, goggles, protective cover-all with hood and foot covers as in inner layer with a water-resistant gown, face shield and a full hood with or without a PAPR and two pairs of gloves.<sup>27</sup>

A Canadian centre, following simulation testing have modified their PPE from a microfibre gown, N95 respirator, visor and gloves, which is similar to the current Australian recommendations, to disposable surgical gown with knee high boots or coveralls with booties, neck protection and high cuff gloves as part of double gloving.<sup>28</sup> This study and the Chinese COVID-19 Handbook also recommend showering after doffing PPE.

Study	Cap	N95/P2	Gloves	Goggles or face shield	Gown	Shoe covers	Head and face
CSA and CAA Joint Taskforce <sup>29</sup>	X	Fit tested	X	X	X	X	Conjoined hood or PAPR
Sorbello, Italy <sup>30</sup>		X	Double	X	Or Hazmat suit	X	Helmet, cover or hood
COVID handbook (China) <sup>31</sup>	X	X	Double	X	Disposable coverall and outer gown	X	Full face respirator or PAPR
Yao, 202 intubations (China) <sup>32</sup>		X AND surgical mask	Double	X	Inner coverall AND outer water-resistant gown	X	Face shield with full hood +/- PAPR
Shannon (simulation, Canada) <sup>33</sup>		X AND Surgical mask with visor	Double, one pair high-cuffed	(Visor on surgical mask)	Surgical gown or coverall	Knee high booties or coverall with booties	Surgical hood with ties
Australian CDNA <sup>34</sup>		Fit checked	X	X	X		

## Training

Training in infection control before patient contact has been shown to be protective during SARS in Hong Kong<sup>35</sup> and Beijing.<sup>36</sup> SARS infection control training of less than 2 hours was associated with increased risk of acquiring SARS (adjusted OR = 13.6, 95% CI 1.24 to 27.50, P = 0.002). Sorbello (2020) recommends “team briefing and co-ordination, task assignment and briefings, team training and the use of checklists and cognitive aids” as all being crucial to reduce physical and cognitive work-loads.<sup>37</sup>

### *We recommend*

All anaesthetists undertake training until they are proficient in the donning and doffing of PPE and team-based simulation for protected tracheal intubation and extubation as a minimum.

## Staffing

Where procedures at high risk of generating aerosols (AGPs) are performed, we recommend an additional staff member be allocated whose sole role is to supervise for PPE breaches (PPE spotter, buddy or guardian). This includes overseeing donning and doffing of PPE. Having a PPE supervisor is advantageous. To minimise the number of people at risk, the supervisor should only observe and instruct and not physically assist the person in removing their PPE.<sup>38</sup>

## PPE for non-COVID-19 patients

Current standard precautions include the use of a surgical mask and gloves for patient interactions. There has been no Australian Government recommendation to use masks in non-patient contact or the community although this has been recommended in some countries during previous epidemics and with this current COVID-19 pandemic.

There have been case reports of COVID-19 patients diagnosed with acute haemorrhagic colitis<sup>39</sup> and acute viral hepatitis<sup>40</sup> and in both cases were afebrile and without respiratory symptoms at the time of presentation. In a case series of 138 patients from Wuhan, 10% of hospitalised patients presented with gastrointestinal symptoms which preceded fever and dyspnoea by 1-2 days.<sup>41</sup>

Exposure to unsuspected SARS patients in Beijing was associated with SARS infection<sup>42</sup> and is characteristic of the first stage of COVID-19 in Wuhan and Italy, contributing to large numbers of early HCW infections.

Guidance on interventions appropriate for a continuous outbreak involving large numbers of hospitalised patients are not immediately relevant to areas where outbreaks are not occurring.<sup>43</sup> On March 29, New York City recommended that anyone presenting to New York City, regardless of symptoms be considered as positive for SARS-CoV-2. This recommendation has not yet been made throughout the United States. Thus, guidance to change standard precautions would depend on estimates of local prevalence (taking into account replication rates, testing rates, natural history of the infection) and infection control infrastructure such as surveillance, contact tracing and reporting of infections to local health services to facilitate a timely and coordinated response. This would likely require advice from infectious diseases and infection control and prevention professionals.

As such in Australia at this time any recommendation to encourage the widespread use of airborne precautions for all HCWs involved with any aerosol generating procedure needs to be balanced with the impact on supplies, particularly as COVID-19 impacts global supply chains and stockpiles. Although it may be regarded as more protective in the short term, any perceived or actual future lack of PPE could increase HCW infection, as occurred in Hong Kong during SARS.<sup>44</sup>

#### Summary of recommendations on PPE for managing of suspect/known COVID-19 patients by anaesthesia teams

- We encourage all health services to provide anaesthetists and anaesthetic assistants with PPE in accordance with the National Guidelines and Australian Standards, except where State guidance recommends a higher level of PPE.
- We recommend the anaesthetic team should not undertake or be required to undertake tasks requiring PPE in situations where PPE is not available for use. Any such tasks should not proceed until required PPE is made available.
- In ensuring adequate PPE, we encourage fit-testing and a fit-check be performed and suggest that a fit-check alone is insufficient. We suggest fit-testing to be performed with a range of respirators and compulsory training as to their correct use is provided.
- Where fit-testing is not available, we suggest PAPR be considered.
- As further evidence emerges regarding COVID-19 we recommend 'full PPE' including coverage of the head and feet also be considered.
- We recommend all anaesthetists undertake training until they are proficient in the donning and doffing of PPE and team-based simulation for protected intubation and extubation as a minimum.

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