Australian Nursing & Midwifery Federation

ANMF EVIDENCE BRIEF

COVID-19: FIT TESTING AND FIT CHECKING FOR RESPIRATORS

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Question: What is the best available evidence regarding fit testing and fit checking for respirators in the context of COVID-19?

***ALERT* Evidence regarding COVID-19 is continually evolving. This Evidence Brief will be updated regularly to reflect new emerging evidence but may not always include the very latest evidence in real-time.**

Key messages:

- Respirators (minimum P2 or N95) are recommended for use in the context of potential airborne transmission and should be used in high-risk areas including ICUs, COVID-19 wards, when providing frequent and/or close-contact care for people with suspected or confirmed COVID-19, and where aerosol generating procedures and the collection of respiratory samples via bronchoalveolar lavage and induced sputum take place.
- To work effectively against potential airborne respiratory droplets, aerosols, and splashes, respirators must; be the correct type, make, model, and size for each individual (assessed by fit testing), fit properly to achieve an airtight seal at each wearing (assessed by fit checking), be undamaged and uncontaminated, be correctly used (put on/donned, worn, taken off/doffed, and disposed of).
- Employers must provide staff with adequate supplies of a range (make, model) of the right (correct type, size, condition) respirators as well as information and education/training for safe, effective use including correct donning, wearing, doffing, and disposal.
- Respirator use is only safe and effective when implemented in the context of a high quality organisational respiratory protection program and in combination with correct use of other PPE, correct and consistently applied hygiene and infection control methods, organisational and point of care risk assessment, engineering and system controls, administrative controls, and patient accommodation and care policies and practices.
- Fit testing and fit checking fulfil related but differing purposes to ensure safe, effective respirator use and reduction of infection risk. In Australia fit testing and checking is recommended for respirator use in the context of COVID-19.
- Staff should receive training in fit testing and perform a fit test each time a new type (brand, model, size) of respirator is used to ensure that a proper seal is able to be achieved with that particular type of respirator.
- Fit testing does not guarantee that the same respirator will achieve a proper seal on other occasions.
- Staff should not be made to wear respirators (or other PPE) that does not fit them (i.e. has failed fit testing) and should instead be deployed to other areas where the unfitting PPE is not required.
- Staff should receive training in fit checking and perform a fit check every time a respirator is donned to ensure a proper seal.

- Fit checking improves the likelihood of achieving a proper seal but does not guarantee it.
- If a proper seal cannot be achieved through fit checking, the staff member should not work in an area where a respirator is required.
- Fit testing performed with a range of types of respirator is effective in identifying a suitable type for most individuals.
- Due to differences in facial size and shape, some individuals may not be able to identify a suitable type of respirator via fit testing.

This ANMF COVID-19 Evidence Brief may be read in conjunction with:

- COVID-19: Personal Protective Equipment
- COVID-19: Modes of Transmission and Infection
- COVID-19: Protecting Healthcare Workers from Infection
- COVID-19: Wearing Masks and Face Coverings in the Community

Summary

Background: COVID-19 (from 'severe acute respiratory syndrome coronavirus 2' (or 'SARS-CoV-2') is a newly discovered (novel) coronavirus first identified in Wuhan, Hubei province, China in 2019 as the cause of a cluster of pneumonia cases.[1] Coronaviruses are similar to a number of human and animal pathogens including some of those which cause the common cold as well as more serious illnesses including severe acute respiratory syndrome (SARS/ SARS-CoV-1) and Middle East respiratory syndrome (MERS). Since discovery, COVID-19 has spread to many countries and was declared a global emergency by the World Health Organization (WHO) on 30 January 2020,[2] and a pandemic on March 11.[3] The most at-risk individuals of infection are those in close contact with patients with COVID-19 which includes health and aged care workers. Personal protective equipment (PPE) is one line of defence against COVID-19 infection and should be part of all respiratory protection programs for infection prevention and control. To work effectively, all PPE including respirators, must fit properly and therefore be the right size for each individual who wears it. Because different brands, makes, and models of respirator fit differently due to different sizing and shape, fit testing is necessary to determine which ones fit each individual. Fit checking is also necessary each time a respirator is put on to check to see if a proper seal has been achieved.

COVID-19 transmission: droplets, surfaces, and aerosols

Evidence regarding potential modes of COVID-19 transmission is continually emerging, particularly around the potential for airborne transmission via small aerosolised droplets. Based on currently available evidence, COVID-19 is transmitted when virus particles enter the body via the mucosae (mouth and nose) or conjunctiva (eyes) which can occur through;[4]

- direct person-to-person contact,
- respiratory droplets >5-10μm in diameter (e.g. from coughing and sneezing), and;
- indirect contact from touching infected environmental surfaces/formites and transferring viral particles to the mucosae or conjunctiva.

The SARS-CoV-2 may be found in small, aerosolised particles,[5] but the extent to which these smaller particles pose an infection risk or how they move in the air under different conditions is currently unconfirmed.[6] There is ongoing inquiry regarding the potential for smaller viral particles/aerosols (<5μm) to remain in the air and upon different environmental surfaces. Specific evidence for COVID-19 transmission is emerging, particularly around the potential for 'airborne' transmission.[7] It is important to recognise that both large and smaller droplets travel through the air and may be considered 'airborne', however smaller droplets behave differently to larger droplets as they are lighter, more buoyant, and evaporate more quickly.

The science regarding the airborne transmission of disease is itself complex and equivocal. Questions remain regarding virology (i.e. what amount of a virus is enough to cause an infection?) and biophysics (i.e. how do particles move in the air under different conditions?).[6]

Some authors have indicated that combined with previous and developing understandings regarding the behaviour of aerosolised particles from coughs, sneezes and aerosol generating procedures, as well as evidence concerning other respiratory viruses (e.g. SARS-CoV-1), the emerging evidence regarding the potential for COVID-19 to be a transmission risk via aerosols suggests that additional precautions beyond usual droplet and contact contamination should be considered in some contexts such as crowded, poorly ventilated, and indoor environments.[7-14]

The ANMF Evidence Brief COVID-19: Modes of Transmission and Infection contains additional detailed information and guidance regarding the evidence of COVID-19 transmission and infection.[15]

Personal protective equipment

In the context of COVID-19, precautions for contact, droplet, and airborne transmission are relevant depending upon the situation. Health and aged care staff must have access to appropriate PPE resources and receive information and training regarding how to correctly put on (don), wear/use, take off (doff), and dispose of PPE in different situations.[16] Correct size, fit, use, and disposal of PPE is essential to safe, effective infection prevention and control activities in the context of responding to COVID-19.[1] Currently, many jurisdictions globally are facing limitations in terms of access to suitable types and sizes of PPE, so correct, rational use is vital.[1] The ANMF Evidence Brief COVID-19: Personal Protective Equipment contains additional detailed information and guidance regarding the evidence for PPE use in the context of COVID-19.[17]

COVID-19 and respirator use

Aerosolised mucus and saliva particles <5μm can be produced by coughing, sneezing, and talking as well as during clinical aerosol generating procedures including respiratory sample collection which may lead to potential infection and contamination risks.[4] Aerosolised particles may travel several metres and potentially remain in the air for up to three hours, however the viability and infection risk of such particles is not yet known.[18] Correct respirator use is a vital component of infection control and maintenance of staff and patient safety, as incorrect use (e.g. incorrect doffing process) has been found to be a primary cause of contamination when removing PPE.[19]

The WHO recommends rational use of personal protective equipment (PPE) and urges precautions for droplet and contact transmission in the setting of caring for people with COVID-19 and airborne precautions in settings when aerosols may be generated.[4] In response to emerging evidence and advice, the WHO has reviewed its position regarding the degree of infection risk that smaller airborne particles (droplets <5μm) pose, which has implications for the types of PPE that should be used in different scenarios. The Australian Government Department of Health recommends that health and aged care staff use P2/N95 respirators instead of masks in the context of both aerosol generating procedures and if in frequent close contact with patients with suspected or confirmed COVID-19.[20]

Respirators: fit testing and fit checking

To work safely and effectively all PPE, including respirators, must be the correct size and fit for each individual health or aged care worker.[21] Manufactures of respirators recommend that both fit tests and checks be conducted and highlight that fit testing is the responsibility of the employer while fit checking is the responsibility of the worker.[22] In Australia, the Commonwealth Department of Health, National Medical Research Council, and the Australian Commission of Healthcare Safety and Quality recommend that both fit testing and fit checking are required for both P2 and N95 respirators.[23] This is also supported by State-based bodies including the New South Wales Government and Clinical Excellence Commission in the context of COVID-19.[24]

Respirator fit testing is a formal component of an overall respiratory protection program and provides health and aged care workers with guidance for choosing the brand, model, and size of respirator which provides the best fit for each individual employee, as well as instructions for proper use.[25,26] Fit testing can be conducted using quantitative and qualitative approaches and should be conducted by a trained operator. Fit testing should occur each time a new brand, model, or size of respirator is used by an individual to ensure adequate fit.[27,28]

Respirator fit checking is another component of respiratory protection programs and involves the health or aged care worker checking to ensure that a proper seal has been achieved on the face each time a respirator has been donned.[25] This includes correcting positioning the respirator and straps, forming the nose bridge/clip of the respirator, and ensuring that facial hair is not present to interfere with the seal. Training in fit checking has been found to result in staff achieving a better seal when they use respirators and should be performed each time a respirator is put on.[29]

An incorrectly sized or fitted respirator may not provide a sufficient seal on the person's face.[30,31] This allows entry of particles around the sides of the respirator which may then contaminate the inner surface of the mask or face or be inhaled. Both exposures may cause infection. A respirator which does not fit properly due to incorrect size or fit may also lead to otherwise avoidable adjustments and touching of the respirator – potential contamination and infection risks during respirator use.

While training in the proper use of respirators is vital, fit testing may be associated with additional time and costs.[32] Some have argued that fit tests for respirators should not be conducted due to associated additional time and cost, arguing that the user fit check adequately ensures an effective face seal. More recent evidence however suggests that lack of fit testing results in apparent reductions in the number staff able to achieve an effective seal.[33] Fit testing as part of a respiratory protection program is often effective in ensuring that almost all workers are able to identify a suitably fitting mask from the existing available range of respirators.[34]

Performing a fit test alone may not always be sufficient for ensuring an effective fit each time a respirator is used, with some findings that subsequent fit checking may be necessary despite passing a previous fit test.[31] Fit checking also does not guarantee that a proper seal has been achieved even if a fit test has been passed, so it is critical that staff are trained to apply fit checking correctly. Further, it appears that multiple fit tests (i.e. performing a fit test with multiple types/models/sizes of respirator increase the chance of selecting a mask with an appropriate fit for the individual.[27,28] This also highlights the importance of providing training to perform fit tests and ensuring availability of a range of respirators for staff to select from and perform fit tests.[28] It is important to note that because each individual has a different sized and shaped face, even when a number of different respirators are available, some individuals may not successfully identify an adequately fitting selection.[28,30] Adequate supply, fit testing, and fit checking is thus important to ensure that all staff have optimum access and the best chance of identifying and correctly fitting a suitable, safe, effective respirator.

In the context of COVID-19 where many jurisdictions may face shortages of appropriate PPE including respirators,[1,35] rational use is critical to avoid wastage. Among the WHO's recommended approaches for minimising PPE use, ensuring that staff correctly don, use, doff, and dispose of appropriate PPE is suggested.[1] Because using incorrectly sized or fitting respirators can be classified as incorrect use/inappropriate PPE, ensuring that staff have access to correctly sized and fitting respirators is a rational and effective approach for avoiding wastage and supporting staff and patient safety.

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