N95 respirators for health care workers: the importance of fit, comfort, and usability

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Evidence-based respirator selection, fit testing, fit checking, and proper use are all vital for staff and patient safety

To be effective in protecting health care staff from coronavirus disease 2019 (COVID-19), N95 and P2 respirators must fit correctly[1] because the infection can be transmitted by aerosolised particles.[2] To achieve an adequate seal, two processes that fulfil similar but different purposes are needed: fit testing and fit checking. Fit testing, a formal component of respiratory protection programs, quantitatively or qualitatively determines which brand, model, and size of respirator provides a proper fit for an individual. Trained operators conduct fit testing, which should be undertaken each time a new brand, type or model, or size of respirator is used, even if someone has previously achieved a proper seal with respirators of the same size, brand, or type. Fit checking should be undertaken each time a respirator is donned to confirm a proper seal, as respirators that have passed fit testing may not provide a proper seal for an individual if incorrectly positioned, if the nose bridge is not properly formed, or if facial hair interferes with the seal. Fit checking training improves the ability of respirator users to achieve proper seals.[3]

Respirator comfort and usability, not widely measured with validated instruments,[4] are also important factors, as prolonged respirator use can cause stress and anxiety, skin irritation, breathing difficulties, and headache.[5,6]

While the Australian Infection Control Expert Group recommends both fit testing and checking of respirators, and that fit testing should be undertaken prior to first use of a respirator, the advice is somewhat obfuscated by the caveat that 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 to a surgical mask."[7] This appears to suggest that, although health care workers "… should complete fit testing before first use, and perform a fit (seal) check properly each time they are used",[7] fit checking alone is acceptable if fit testing has not been undertaken. Although this recommendation is stronger than previous advice that described fit testing as "validated" but not "widely applied" and "difficult due to limited supplies and range of types/sizes available",[8] the current recommendation is ambivalent and open to interpretation.

In this issue of the *MJA*, Ng and colleagues report their unblinded comparison of the quantitative fit test pass rates, usability, and comfort assessments of four common N95 respirator types at the Royal Melbourne Hospital.[9] Fit testers undertook guided quantitative fit testing of at least three of four respirator types for each of 2161 health care workers, of whom 378 subsequently completed surveys (4–6 weeks later) on the usability and comfort of the respirators for which fit test results were passes. Most participants were nurses (1271, 59%), medical practitioners (305, 14%), or allied health staff members (262, 12%); 319 participants (15%) were from other clinical or non-clinical staff groups.

In the study by Ng and colleagues, ethnic background was known for only 493 participants (23%: European background, 13%; non-European, 10%), which could have implications for interpreting the study. The authors of a recent systematic review found that Black, Asian, and people with minority ethnic backgrounds are under-represented in respirator research.[10] Their findings were limited by small sample sizes, heterogeneity, and inadequate reporting in the included studies, but some people with non-European ethnic backgrounds, who comprise a large proportion of health care workers, have facial features that can affect respirator fit.[10]

Ng and colleagues report considerable differences in the performance of the included respirators, including their fit test pass rates: 96.4% for the three-panel, flat-fold respirator, 65.0% for the semi-rigid cup respirators, 32.4% for the flat-fold respirator, and 59.2% for the duckbill respirators. Although the assessment of usability and comfort was subjective, marked differences in performance and user-reported results indicated a strong preference for the three-panel flat-fold respirator, consistent with other reports.[11] However, performance differences between specific brands of this respirator type were reported by another Australian study, including significantly different fit test pass rates (overall: 3M Aura, 92.6%; Trident P2, 99.2%).[11]

As COVID-19 is still current in Australia and outbreaks and cases still common in nursing homes, where older people are at greater risk of serious disease,[12] embedding consistent fit testing in respiratory protection programs with ready access to a range of brands, types, and sizes will continue to be vital for the health and safety of community and staff members alike. Further, health care worker safety and wellbeing require ensuring that respirator comfort and usability is considered by policy and in practice.

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Acknowledgements: I thank Casey Marnie (University of South Australia and ANMF Federal Office) and Annie Butler (ANMF Federal Office) for their input into wider discussions regarding personal protective equipment, COVID-19, and infection prevention and control.

Competing interests: No relevant disclosures.

Provenance: Commissioned; not externally peer reviewed. ■

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