

# Journal Pre-proof

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BJAN-D-20-00420\_Letter to the Editor

## **Donning N95 respirator masks during COVID-19 pandemic: look before you leap!**

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*Dear Editor,*

The novel Coronavirus Disease (COVID-19) is a respiratory disease transmitted by contact, droplets, and fomites. Healthcare Workers (HCWs) taking care of suspected or confirmed COVID-19 patients need to adhere to strict self-protection precautions, including N95 masks, to protect themselves against the virus-containing aerosols.[1]

A N95 respirator is a respiratory protective mask designed to achieve a very tight facial fit and an efficient filtration of airborne particles. Evidently, its improper use could compromise its protective effect and may even increase the risk of infection.[2,3]

Many N95 masks being distributed for use of HCWs come in a single non-adjustable configuration and may not properly fit people of different gender or built. We recently noticed that the N95 supplied at our institution did not fit well to thin and short people, especially females, during donning process. A large part of it was left hanging below the chin (Fig. 1A).

The designation “N95” indicates the respirator is not resistant to oil or solvents (N) and that it is intended to block at least 95% of exceedingly small (> 0.3  $\mu\text{m}$  in size) test particles. HCWs are at high risk of getting COVID-19 due to repeated exposure from infected patients in the workplace and may transmit the infection to others. The Occupational Safety and Health Administration (OSHA) (29 CFR 1910.134) requires an annual “Fit Test” to verify the fit of any respirator that forms a tight seal on the wearer’s face before it is used. After the fit test is made in an individual, a “User Seal Check” should be done every time it is worn to ensure

adequate seal. However, a regular Fit Test is time-consuming, and all sizes may not be available. So, the test may not be practical for every HCWs in a pandemic situation. Also, during such outbreaks, PPE are searched from multiple sources on urgent basis. Hence, end users may not get time to be familiarized with these, and chances of improper usage increase. User Seal check (either positive pressure or negative pressure) is an easily performed measure which should be a mandatory step for N95 respirator donning process prior to entering the patient care area.[4] During a positive pressure seal check (useful for non-valved masks and not applicable for valved masks), the person exhales gently while obstructing the paths for air to exit the mask. A successful check is when the facemask is slightly pressurized before the increased pressure causes outward leakage. During a negative pressure user seal test (useful for both valved and non-valved masks), the N95 user inhales briskly while hindering the paths for air to enter the facemask. A successful check is when the mask collapses slightly under the negative pressure thus created. National Institute of Occupational Safety and Health (NIOSH) data indicates that performing a user seal check leads to higher quality donning.[5] Nonetheless, the OSHA warns that seal checks does not have the sensitivity and specificity to replace fit tests.

We started doing negative pressure seal test (for valved masks) and both positive and negative pressure seal tests for non-valved masks. Unsurprisingly, most of valved masks failed the test for thin built HCWs. Duckbilled non-valved masks fared best in terms of seal for majority. To curtail the wastage, we folded the margin of the mask fitting the chin on itself in the middle and stapled (with the staple pin bending towards outside to avoid hurting the person) (Fig. 1B). A negative pressure seal test performed subsequently confirmed a good seal (Fig. 1C). For minor irregularities in fitment, applying adhesive tapes all around or wearing the lower tie band more cephalad could rectify the ill fit. Many N95 masks have adjustable tie-band sizes and need to be tightened as per patient's fitment requirement. While applying any such tapes to the mask, care should be taken to fold one edge of the tape so that it can be easily removed during doffing without creating additional risk to the HCWs.

No previous study has identified the impact of ill-fitted N95 respirators on the transmission of COVID-19. Awareness of the importance of maintaining an adequate mask seal is of pivotal importance to prevent transmission of infection to the HCWs during the present COVID-19 outbreak.

We, therefore, would advise caution in the use of these respirators by ensuring proper seal before entering patient care areas. The use of positive and/or negative pressure seal check should be universally adopted by all wearing these respirators. We also would like to urge the

manufacturers to deliberate into mask designs universally acceptable to all healthcare workers irrespective of the race, facial configuration, and gender.

### **Conflicts of interest**

The authors declare no conflicts of interest.

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**Figure 1** A, N95 mask with leak; B, N95 mask stapled; C, adequate seal after stapling.



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