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CHEST

Optimizing Respirator Fit Testing for Health Care Personnel

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Editor's Note: The following editorial was intended to accompany an article in the June 2022 issue. We are publishing it this month to provide full access to our readers.

Respiratory protective devices include cloth masks, medical/surgical masks, and bona fide respirators. Use of respiratory personal protective equipment is particularly important in health care settings because source control such as isolation or ventilation alone are often infeasible or inadequate. Because loose-fitting devices such as surgical masks do not seal against the face, use of respirators (eg, N95) increased after recognition that small aerosol particles and larger particles were common and contained the SARS-CoV-2 virus.

The US Occupational Safety and Health Administration (OSHA)[1] and worker protection agencies in many other countries require that employees with mandatory respirator use undergo either qualitative or quantitative fit testing on initial use and annually thereafter. A qualitative test assesses whether the user senses a sweet or bitter test aerosol. Quantitative fit tests commonly measure the ratio of a test aerosol outside and inside the mask.[2]

Most respirators used by health care workers (HCWs) require a tight seal between the face and the device to be fully effective. In the ubiquitous N95 (and KN95), the surface of the mask filters incoming air; airflow through facial seal leaks is not filtered. Similarly, exhaled air from the wearer through leaks is not filtered. (Powered-air purifying respirators do not require a facial seal but are used less widely). Improvements in particle capture efficacy of the filter medium itself cannot compensate for even small gaps because airflow will go preferentially through the gap rather than the (low) resistance of the filter medium.

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The brief report by Regli et al[3] in *CHEST* (June 2022) evaluates whether the current protocol may be abbreviated safely by reduction of the number of facial maneuvers from eight to four and shortening the sampling time for each. Eleven of 19 participants (58%) failed with the full protocol, but only five of 19 participants (26%) failed with the abbreviated protocol. They therefore recommend against the shorter procedure.

Limitations acknowledged by the authors include the small sample size, study of a single respirator model, exclusion of many HCWs who changed respirator model, and temporal gap between long and short protocol testing. Despite these limitations, the report is an important stimulus for careful thought and collecting high-quality data. Their longer review article provides important insights.[4]

Annual medical assessment and fit testing impose significant time demands on health care workers and institutional occupational health (OH) professionals. The time burden includes responding to a very long OSHA-mandated questionnaire,[5] questionnaire review and/or examination, time away from the clinical worksite to visit the OH facility, fit testing per se, and follow-up discussion. Optimally, time should be allocated for retraining about proper donning and doffing technique also because skills decline over time.[6] The reduction of quantitative fit testing time from 7.2 to 2.5 min represents a small, albeit useful, incremental benefit.[7] Optimizing the very long OSHA respirator questionnaire will also reduce the burden for HCWs and OH professionals. Inadequacy of OH resources during the rapid rollout of personal protective equipment early in the COVID-19 pandemic necessitated relaxing fit testing requirements, but this should not become permanent. Even without fit testing, protection with the N95 is superior to that of surgical masks and cloth coverings.[8]

Several years ago, the ritual of an annual tuberculin skin test for all HCWs was significantly reduced based on empiric risk data[9]; a similar rational assessment of performing a complete respirator reassessment every 12 months is warranted. Longer intervals may be appropriate for many HCWs. Conversely, shorter periodicity may be appropriate for some HCWs with higher risk exposures. Quantitative fit testing provides a numeric fit factor result on a continuous scale, yet it generally is reported as simply pass/fail referenced to an arbitrary value of 100. Perhaps people who "pass" with a 101 should be retested sooner than those with results consistently $>$ 400.[10] Because the sensitivity of the medical assessment for detection of adverse effects of respirator use is unknown, a short time span between the first medical approval and first reassessment may be warranted.

The report implicitly assumes that passing a fit test implies adequate protection for the ensuing year. Respirators have an assigned protection factor based on their design (ranging from 10 for N95s to 10,000 for certain self-contained breathing apparatus devices).[2] The quantitative fit test determines the measured fit factor on one occasion in which the mask is donned, frequently with active coaching by the OH professional. Although inadequately studied in HCWs,[11] actual workplace protection factors in other settings are generally significantly below the assigned protection factor and the fit factor from the quantitative fit test.[2]

The article underscores the need to compare "real world" and controlled laboratory results. Both qualitative and quantitative testing depend on the skills of those conducting the tests. The poor consistency in the reported audit by Regli et al[4] contrasts with the excellent results in the initial report of the abbreviated protocol.[7] The latter study was conducted in a research laboratory with control subjects that were unlikely to be feasible in active medical centers. Medical center OH programs should consider seriously emulating the "audit" approach of Regli et al[4] modified to repeat fit tests for a small number of designated individuals after 1 week as a quality assessment measure. This is analogous to the practice of repeating clinical pulmonary function test results as a laboratory quality control measure. Appropriate certification of testers may be comparable with the mandatory or strongly recommended certification for spirometry technicians.

Respirators are likely to provide greater protection to HCWs than surgical masks, although this has not been confirmed rigorously in formal trials.[8,12] Because fit testing enhances the likelihood of protection but is burdensome, its implementation in health care facilities should be optimized.

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