Editorial

Respirators and Fit Testing

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Hannum and colleagues[1] report this month on their experiences in training and fit testing different groups of healthcare workers to use respirators for protection against occupational exposure to tuberculosis. Beginning in 1993, in a large Veterans' Affairs Hospital with 2,100 full-time–equivalent employees, they were able to train 200 employees in a 6-month period when an industrial hygienist performed respirator training and fit testing on one employee at a time. Due to the slow nature of this process, their epidemiology unit began respirator training for groups of healthcare workers as part of their didactic tuberculosis education, but fit testing was not performed. A third group of employees received no training, only fit testing. Fit testing of the high-efficiency particulate air (HEPA) respirators (3M model 9970) initially was performed with a hood and saccharin. Three months into the study, saccharin was replaced with irritant smoke. One hundred seventy-nine healthcare workers (mostly nurses) were enrolled in the three different groups; 94% of employees trained by the industrial hygienist passed qualitative fit testing, a rate that did not significantly differ from the 91% pass rate for employees trained in groups by the epidemiology unit nurses. Only 79% of the group without any training passed the fit test, a significant difference from the group trained by the industrial hygienist, but not from the group trained by the epidemiology unit. The highest rates of successful fit testing occurred among those who had used respirators previously. Of note, 22 (12%) of 179 healthcare workers initially failed fit testing; however, with repeat training, 21 of these 22 employees passed on repeat testing. To train 2,100 employees who have direct patient-care responsibilities, using the industrial hygienist training, one employee at a time, would take 400 hours and cost approximately $20,600. If the infection control specialists train groups of employees, the cost was estimated to be $1,485. It is interesting to note that the infection control specialist's hourly wage is substantially lower than the industrial hygienist's and lower than the cost given for the employees to be off work for an hour to be trained.

Over the past several years, there have been substantial changes in the recommendations for respiratory protection against occupational exposure to tuberculosis, as well as increasing diversity and availability of devices to choose from. The role of respiratory protective devices in the control of tuberculosis has been reviewed by Hodous, Nardell, Jarvis, and Vesley, among others.[1-6] Adal and colleagues[7] and Nettleman et al[8] both contributed to our understanding of the substantial costs attributable to the use of particulate respirators for prevention of tuberculosis in healthcare workers. As yet, there are very few data on the actual resources required in personnel, time, and direct expenses to perform respirator training and fit testing to prevent occupational exposure to tuberculosis in healthcare settings using the newer N-95 respirators.[9] Nor is there much published information on the most efficient method of training and fit testing workers. Hannum and colleagues[1] have

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contributed to the literature by beginning to study the impact of different methods of respirator training and by outlining some of the realistic barriers to effective compliance with the tuberculosis guidelines. The need for fit testing in most healthcare facilities arises from the desire to comply with regulations[10] and to avoid monetary fines. This is not the same as performing fit testing, because it clearly is demonstrated to be beneficial to healthcare workers or useful in protecting healthcare workers from occupational exposure to tuberculosis. Many question the validity or meaning of fit testing, because it is unclear what determines an appropriate fit. Is an appropriate fit determined by the size or type of respirator, is it the facial characteristics of the person wearing the respirator, or will correct fit be affected by the position or activities performed when wearing a respirator, the frequency or the duration the respirator is worn, or is it the education the worker receives about how to wear the respirator? Is the fit test actually a test of the worker's understanding of how to use a respirator more than an evaluation of the match between face and respirator? No one really knows how important or meaningful fit testing is, particularly when it is unclear if repetitive fit testing yields the same results in the same person over time, if the same respirator is used over several days or months. If a worker is fitted correctly one day, would they still pass fit testing in a day, or a week, or months later, and what does it mean if they pass or fail a fit test? Should someone pass fit testing 50% of the time, 75% of the time, or 100% of the time?

Is there a less arduous method to determine if workers understand how to use respirators and if they are using them appropriately? I have seen healthcare workers holding respirators on their face and not using the straps to avoid disrupting a hairdo, as well as healthcare workers adjusting respirators to expose their nose so they could breathe better, and respirators taken off or lifted up so they could talk to patients better. I also have seen patients wearing respirators. Will respiratory protection programs and fit testing stop these obvious suboptimal practices? Or do we simply need better education?

Given the prolonged and heated controversies about the best and most cost-effective methods of protecting workers from occupational exposure to tuberculosis, there has been time for most healthcare facilities to understand the risks of tuberculosis in their facilities, to develop and implement functional tuberculosis control plans with effective administrative and engineering controls, and to perform surveillance for exposures through periodic tuberculin skin testing programs for employees.[11,12] I suspect that what is still problematic is the extent to which various healthcare facilities in different regions of the country have been able to implement effective respiratory protection programs, including medical screening, education, and fit testing.

The evolution of the recommendations, guidelines, and standards for respiratory protection against tuberculosis has been somewhat painful. The approval and certification by the National Institute of Occupational Safety and Health (NIOSH) of N-95 respirators for use against tuberculosis provides substantial opportunities for cost savings, because they generally are less expensive than many HEPA respirators[2]; however, NIOSH does not certify the fit testing of N-95 respirators. The very nature of N-95 respirators, in terms of their shape, size, and weight, may make them appear to be single-use disposable items, which may have an impact on a facility's actual respirator costs.

Substantial controversy remains about the cost and time required for fit testing, which still is mandated for N-95 respirators. Many questions arise in discussions of fit testing, and there are surprisingly few data and few answers. Recommendations for worker safety that affect hundreds of thousands of healthcare workers and substantially increase the cost of healthcare should be studied carefully. It is interesting to look at the real costs of tuberculosis control programs as a proportion of the total occupational health and infection control budgets in hospitals. Have the budgets of occupational health and infection control been expanded to meet Occupational Safety and Health Administration (OSHA) requirements, or have these additional responsibilities simply been absorbed by programs with inadequate resources to perform the myriad functions for which they already are responsible? Does infection control spend less time preventing infections in patients because they are dealing with worker safety issues? Is health care spending too little or too much on worker safety and education? Is money for worker safety used in the most cost-effective manner? How does the healthcare industry compare with other industries in terms of resources and staffing for occupational health and worker safety? Unfortunately, this editorial raises many more questions than it answers. The Occupational Safety and Health Administration, NIOSH, the Society for Healthcare Epidemiology of America, the Association for Professionals in Infection Control and Epidemiology, and other occupational health, industrial hygiene, and safety groups should work togeth-

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er to design carefully research studies to answer these important questions. Studies should be performed on large numbers of workers with different job descriptions to determine the validity, reliability, and outcome of fit testing using N-95 and other respirators. Comparing time, cost, and outcome of functional quick fit testing, fit checking, and education alone with traditional fit testing would be useful. Determining the necessity or benefit of medical screening prior to fit testing would be useful as well. If carefully designed studies show substantial validity and benefit of fit testing, then it is much easier to justify the substantial resource involved. However, if the data show no benefit, NIOSH and OSHA should not mandate these components in all respiratory protection programs. For these studies to take place, funding should be made available to determine the validity, consistency, and outcome of fit testing with N-95 respirators in healthcare settings. The goal of such research studies would be to answer these questions systematically and to contribute to improving the occupational health and safety of healthcare workers.

REFERENCES

1. Hannum D, Cycan K, Jones L, Sterwart M, Markowitz SM, Wong ES. The effect of respirator training on the ability of healthcare workers to pass a qualitative fit -test. *Infect Control Hosp Epidemiol* 1996;17:636-640.
2. Hodous TK, Coffey CC. The role of respiratory protective devices in the control of tuberculosis. *Occup Med* 1994;9:631-657. Review.
3. Nardell EA. Environmental control of tuberculosis. *Med Clin North Am* 1993;77:1315-1334. Review.
4. Jarvis WR, Bolyard EA, Bozzi CJ, et al. Respirators, recommendations, and regulations: the controversy surrounding protection of health care workers from tuberculosis. *Ann Intern Med* 1995;122:142-146.
5. Chen S, Vesley D, Brousseau L, et al. Evaluation of single-use masks and respirators for protection of health care workers against mycobacterial aerosols. *Am J Infect Control* 1994;22:65-74.
6. Vesley DL. Respiratory protection devices. *Am J Infect Control* 1995;23:165-168.
7. Adal KA, Anglim AM, Paulumbo CL, Titus MG, Coyner BJ, Farr BM. The use of high-efficiency particulate air-filter respirators to protect hospital workers from tuberculosis. *N Engl J Med* 1994;331:169-173.
8. Nettleman MD, Fredrickson M, Good NL, Hunter SA. Tuberculosis control strategies: the cost of particulate respirators [see comments]. *Ann Intern Med* 1994;121:37-40.
9. Rosenstock L. 42 CFR Part 84: respiratory protective devices implications for tuberculosis protection. *Infect Control Hosp Epidemiol* 1995;16:529-531.
10. Occupational Safety and Health Administration. OSHA enforcement policy and procedures for occupational exposure to tuberculosis. *Infect Control Hosp Epidemiol* 1993;14:694-699.
11. Fridkin SK, Managan L, Bolyard E, Jarvis WR. SHEA-CDC TB survey part I: status of TB infection control programs at member hospitals, 1989-1992. *Infect Control Hosp Epidemiol* 1995;16:129-134.
12. Fridkin SK, Managan L, Bolyard E, Jarvis WR. SHEA-CDC TB survey, part II: efficacy of TB infection control programs at member hospitals, 1992. Society for Healthcare Epidemiology of America. *Infect Control Hosp Epidemiol* 1995;16:135-140.

Repeat Fit Testing Not Routinely Required

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As noted recently in the *SHEA Newsletter* (volume 6, number 2, Summer 1996), OSHA has clarified that fit testing of respirators for protection from tuberculosis need not be repeated routinely (eg, annually). In an October 1992 letter responding to an inquiry, Roger A. Clark, Acting Director, OSHA Directorate of Compliance Programs, wrote, "You ask how often the fit test indicated at 29 CFR 1910.134 (e)(5)(i) must be provided for employees who wear a negative-pressure, air-purifying respirator. Fit testing must be repeated whenever respirator design or facial changes occur that could affect the proper fit of the respirator. Please bear in mind that the OSHA standards for asbestos, arsenic, lead, and acrylonitrile require that respirators be fit tested at least semiannually, and the standards for benzene and formaldehyde require that respirators be fit tested at least annually."

Thus, repeat fit testing is required only in the event of a change in the respirator or a change in the employee (injury, surgery, major weight change, etc) that could affect respirator fit.

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