Towards evidence-based hearing loss prevention

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The literature on the effectiveness of interventions to control noise and prevent hearing loss will be discussed. The American Recovery and Reinvestment Act of 2009 included a provision for federal funding to investigate how effective health interventions are, and called on the Institute of Medicine to identify a list of priorities for such research. Research on hearing loss interventions was placed in the highest priority group. There is consensus in the literature that some interventions improve the use of hearing protection devices compared to non-intervention; there is low quality evidence that legislation can reduce noise levels in workplaces, and contradictory evidence that prevention programs are effective in the long-term. Most reported interventions focus on the use of hearing protection devices, and effectiveness depends on the quality of the implementation of prevention programs. Substantial noise control can be achieved in the workplace, with no evidence of this practice in the literature.

1 INTRODUCTION

Greater demands for accountability over federal funds have motivated an interest in studies on the effectiveness of public health interventions. In 2009, the American Recovery and Reinvestment Act provided federal funding to investigate how different interventions stack up against each other. In the same Act, Congress asked the Institute of Medicine (IOM), a National Academy of Sciences organization, to identify priorities for these studies of comparative effectiveness. To establish such priorities, the law required the IOM to seek advice from stakeholders, including researchers, physicians, professional organizations, and the general public. The IOM's recommendations are contained in the report *Initial National Priorities for Comparative Effectiveness Research*[1], available at http://www.nap.edu/catalog/12648.html. The need for research on hearing loss interventions was placed in the top quartile, the highest priority group.

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The IOM recommendation underscores the human and societal costs of the condition and the importance of prevention. The risk of hearing impairment increases with age and is exacerbated by exposure to noise, particularly at work. Estimates indicate that one in six people will have seriously impaired hearing in older age because of occupational noise exposure. This risk can be essentially eliminated by reducing noise levels to 80 dB(A) or less. Many countries have mandated hearing loss prevention programs when noise exposures cannot be reduced to this level. However, the continuing high rate of noise-induced hearing loss casts doubt on the effectiveness of these programs.

2 LITERATURE

Results from the existing intervention effectiveness studies on hearing loss prevention in the workplace do not provide much evidence for current hearing loss prevention practices[2,3, 4, 5, 6]. A 2009 Cochrane Review[7] investigated various initiatives and mechanisms (e.g., legislation, proper hearing protector usage, etc.) to determine which work best to reduce noise levels in workplaces and/or reduce noise exposure or hearing loss among workers. [Cochrane Reviews are published by the Cochrane Collaboration, an independent international not-for-profit organization dedicated to examining the evidence for or against the effectiveness of health care interventions]. The 2009 Cochrane Review[7] identified 21 intervention studies meeting their criteria for scientific rigor, most of which concerned hearing loss prevention programs. While the review found that legislation was effective in reducing noise levels (based on one study in the US mining industry), it found contradictory evidence on the effectiveness of hearing conservation programs and hearing protection devices. Comparisons of unexposed workers to exposed workers who used hearing protection ranged from no difference to three- or four-fold increases in noise-induced hearing loss among those noise-exposed who wore hearing protectors. Four studies attributed these disparate results to variability in the implementation of various program components within and across industries. There is consensus that programs are often incomplete and over-rely on the distribution of hearing protection devices to reduce individual worker exposure. Better and large scale implementation of technical interventions and evaluation of their long-term effects are necessary to identify the most effective strategies for reducing occupational hearing loss. An update of this review is expected to be released in 2012.

3 IMPLICATIONS

This did not escape the attention of the US Occupational Safety Health Administration (OSHA). "There is sufficient evidence that hearing protection alone cannot prevent workers from suffering preventable hearing loss," said David Michaels Assistant US Secretary of Labor for Occupational Safety and Health. On October 19, 2010, OSHA published a notice in the Federal Register proposing a small but important change to the noise standard (Section (b)(1))[8]. This standard requires employers to use feasible engineering or administrative controls for workers exposed to average noise levels above 90 dB(A). Up to now, *feasible* has been interpreted to mean *costing less than a hearing conservation program*. OSHA proposed to interpret *feasible* in its plain meaning – i.e., capable *of being done* (Docket No. OSHA-2010-0032). The National Institute for Occupational Safety and Health (NIOSH) supported the change proposed by OSHA, citing the evidence from the reports mentioned above[9]. NIOSH[10] indicated that technical measures to control noise, where feasible, offer advantages for both the employer and the worker, including reduced hearing loss, lower compensation costs, improved communication,

decreased absenteeism, and fewer injuries in the workplace[11]. NIOSH also provided real-world examples showing that technological advances now enable quieting machinery and workplaces without adding substantially to the cost of operating a business.

On January 20, 2011, OSHA withdrew its proposed reinterpretation of *feasible* noise controls to allow more public outreach and further study of the resources required for implementation. OSHA indicated that, while the proposed modification is suspended, it will study other approaches to abating workplace noise (see Meeting Summary Report online at: http://www.osha.gov/dsg/noise/stakeholder-meeting.html).

Meanwhile, hearing loss investigators at NIOSH, in addition to conducting and publishing research, are making use of new communication tools and social media, such as the NIOSH Science Blogs, Wikipedia, Facebook, and NIOSH NoiseTwitter, to reach out to the general public and occupational health community, improve the exchange of information, and expedite progress in hearing loss prevention. Links to such efforts are provided below. NIOSH received the 2011 National Hearing Conservation Association Media award for this undertaking (see Useful Links below).

For the past three years, NIOSH and the National Hearing Conservation Association have awarded the Safe-in-Sound Excellence in Hearing Loss Prevention Award™ to companies and public agencies which have proactively implemented technical solutions resulting in substantial cost savings compared to enrolling all employees in company-wide hearing conservation programs[12]. These examples demonstrate the diversity of solutions that can be employed to reduce or eliminate noise through the use of technical noise controls.

In 2010 the New York City Department of Environmental Protection (NYCDEP) and Parsons Brinckerhoff (PB), Inc. were recognized for their combined efforts in developing, implementing and overseeing the New York City Construction Noise Mitigation Rule (visit http://www.safeinsound.us/archive.html). The NYC DEP and PB established a partnership to address a mayoral charge to update the New York City's Noise Code and create a new law establishing rules for construction noise. Parsons Brinckerhoff has been a leader in the transportation and infrastructure engineering industry for almost 125 years, and for this particular endeavor, became the primary consultant supporting NYC DEP to research, develop, write, present and defend the new NYC Construction Noise Rules. These Rules were developed primarily to reduce community noise by establishing noise emission limits and requiring noise mitigation measures for all construction work occurring within New York City, but because of NYC DEP and PB's insight, the rules proactively address work-related exposures, thereby extending its reach and benefits.

3.1 Useful Links

http://www.cochrane.org/podcasts/issue-3-july-2009/interventions-prevent-occupational-noise-induced-hearing-loss
http://www.safeinsound.us/
http://twitter.com/nioshnoise
http://blogs.cdc.gov/niosh-science-blog/category/hearing-loss/

4 DISCLAIMER

The findings and conclusions in this report are those of the author and do not necessarily represent the views of the US National Institute for Occupational Safety and Health.

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