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American Journal of OTOLARYNGOLOGY

American Journal of Otolaryngology–Head and Neck Medicine and Surgery 27 (2006) 18–23

www.elsevier.com/locate/amjoto

Physician hearing loss

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Abstract

Purpose: Hearing is an important sense for physicians, making communication and stethoscope use possible, yet not much is known about the impact of hearing loss on professional function. The purpose of this study was to explore hearing-related issues affecting physicians.

Materials and methods: We administered a hearing test and questionnaire to 107 physicians and medical students.

Results: The proportion of physicians reporting trouble with their hearing increased with age, reaching almost 100% in those older than 60 years. Audiometric hearing loss also increased with age. Perceived hearing trouble was significantly associated with audiometric hearing loss, yet 46% of physicians with hearing loss described their hearing as good. Older physicians more frequently reported difficulty communicating with patients, staff, and colleagues owing to hearing problems ($P = .007$). Reported stethoscope difficulties did not significantly increase with age; there was no association with hearing thresholds. No physician reported use of electronic stethoscopes or hearing aids. Noise exposures were common, yet 51% of respondents never used hearing protection. Younger physicians were less likely to use protection ($P = .002$).

Conclusion: Physicians lose hearing with age but may not notice or report the loss. Physician hearing loss is associated with difficulty communicating with patients, staff, and colleagues. Neither age nor hearing level predicts problems with stethoscope use; possible explanations include a training effect or denial. Many physicians, especially younger ones, never use hearing protection around noise. Strategies to recognize and reduce the impact of hearing loss on professional function throughout a physician's career deserve greater attention.

1. Introduction

As the American population ages, adult hearing loss is receiving greater recognition in clinical care [1,2] as one of the most common chronic conditions [3]. Physicians, as they grow older, face the potential impact of personal hearing loss on their professional duties. Clinicians must communicate effectively with patients, staff, and colleagues, often in situations of background noise or by telephone. The interference of hearing loss with a physician's daily clinical encounters can lead to fatigue and psychological distress [4]. Despite advances in diagnostic technology [5], the ability to auscultate a patient's heart and lungs using a stethoscope remains the basic occupational skill for physicians who could be affected by hearing loss.

Not much is known about the hearing of physicians. Physical examinations for medical school and residency training do not routinely include audiometric testing. The scientific literature on this topic consists largely of case reports of medical students or physicians coping with severe congenital hearing loss [4,6] or resources for physicians who are hard of hearing [7]. The purpose of our study was

A portion of these results was presented at the Connecticut Academy of Family Practice Annual Scientific Symposium, October 2004.

The 3M Corporation, St. Paul, MN, donated several stethoscopes and the Aearo Corporation, Indianapolis, IN, donated a supply of hearing protectors as incentives for subject recruitment. None of the authors have any affiliation with these companies.

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0196-0709/$ – see front matter © 2006 Published by Elsevier Inc.
doi:10.1016/j.amjoto.2005.05.014

Table 1
Demographics of the study subjects (N = 107)

Characteristics	
Male [n (%)]	62 (58)
Age [y; mean (SD, range)]	42.8 (18.8, 24–82)
Race [n (%)]	
White	67 (63)
African American	18 (17)
Asian	21 (20)
Specialty [n (%)]	
Family practice	47 (44)
Internal medicine	48 (45)
Other	12 (11)
Years since medical school [y; mean (SD)]	13.8 (12.6)
Percentage of time spent in patient care [%; mean (SD)]	73.9 (29.7)

to evaluate the subjective and audiometric hearing status of a group of physicians.

2. Methods

We recruited volunteer subjects at 2 annual scientific conferences for internal medicine and family medicine state medical societies. Attendees at the conferences included medical students, residents, and physicians in practice or in teaching positions. The Yale University School of Medicine's Human Investigation Committee approved the study instrument and protocol. Subjects were asked if they wished to participate in an anonymous study of hearing status and, after giving verbal consent, completed a short written questionnaire and then underwent audiometric testing. The questionnaire included information about demographics and type of practice information, risk factors for hearing loss, self-perceived hearing status, and perceived difficulty with patient care owing to hearing loss. Prior to implementation, the questionnaire underwent pretesting and further revision with a focus group of physicians.

After completing the questionnaire, subjects had pure tone audiometry performed by an audiologist or audiometric technician in a mobile testing van in compliance with American National Standards Institute test environment specifications [8]. Pure tone thresholds were recorded at 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hz in each ear. Subjects were given a copy of their hearing test and advised to seek medical follow-up if the hearing test indicated an abnormality.

Questionnaire and hearing test data were entered into a Microsoft Access database, checked for completeness and consistency, and then exported into a Statistical Analysis Software Release 8.02 program (Statistical Analysis Software Institute, Cary, NC) for further analysis. We performed univariate analysis on continuous variables and frequency tables for categorical variables. We converted responses to scaled questions into an ordinal scale. We calculated binaural averages for each frequency and averaged audiometric results across ears for the lower frequencies of 500, 1000, and 2000 Hz as well as the higher frequencies of 3000, 4000, and 6000 Hz. We defined *hearing loss* as a hearing threshold at any frequency of 30 dB or higher [9]. We defined *binaural hearing impairment* as having average hearing thresholds higher than 25 dB for the frequencies of 500, 1000, 2000, and 3000 Hz in at least one ear [10]. For different age groups, we analyzed audiometric hearing status, prevalence of

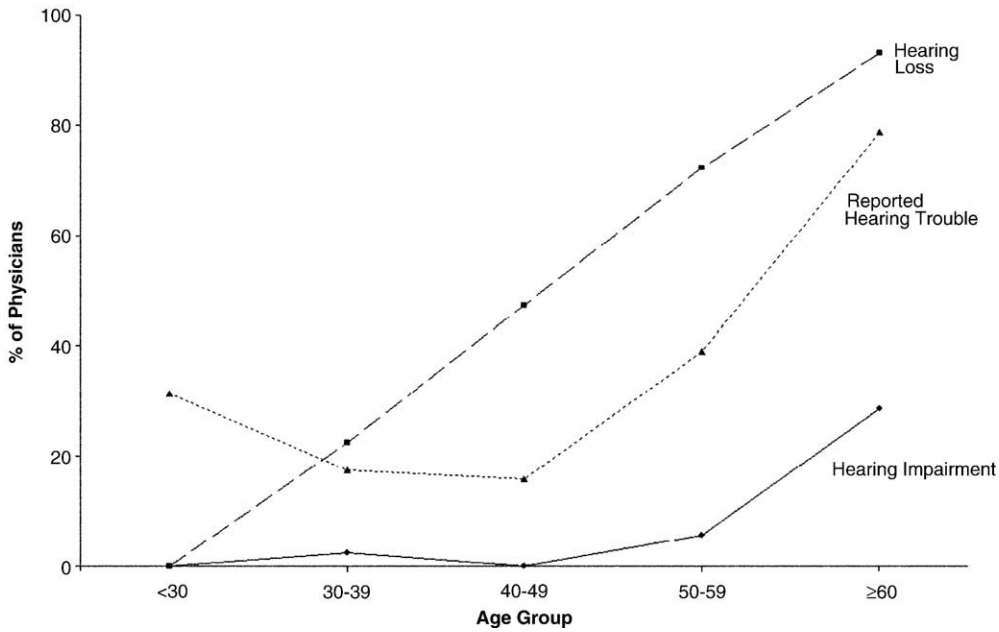

Fig. 1. Prevalence of physician hearing loss, reported hearing trouble, and hearing impairment by age group.

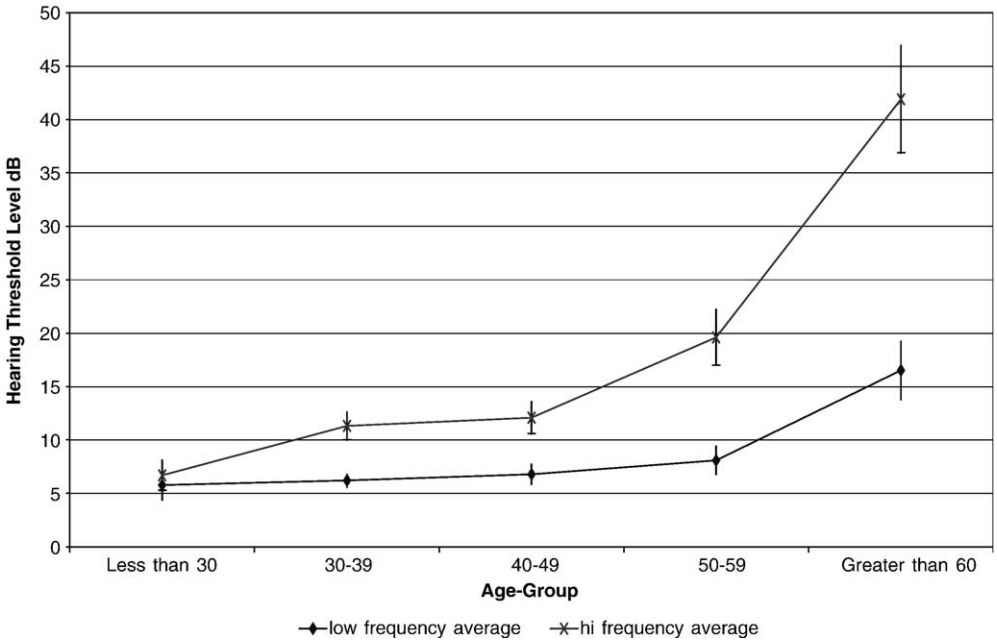

Fig. 2. High- and low-frequency hearing threshold averages by age group.

perceived hearing difficulties, and reported noise exposures. To identify significant predictors of hearing difficulty, we first performed bivariate logistic regression analyses and then tested independent variables in a multivariate logistic regression model using a backward elimination procedure and a selection criterion of $P \leq .05$.

3. Results

3.1. Demographics

A total of 107 physicians and medical students completed the questionnaire and audiometric testing. Table 1 shows the demographics of the study population.

Most of the respondents were family physicians or internists, with an average age of 42.8 years (SD, 13.9 years; range, 24–82 years), who spend an average of 73.9% (SD, 29.7%) of their time in clinical activities. Only 2 subjects reported hearing loss during childhood, and none of the subjects reported using an electronic amplified stethoscope or a hearing aid on a regular basis.

3.2. Hearing loss by age group

Fig. 1 shows the prevalence, by age group, of audiometric hearing loss, binaural hearing impairment, and reported hearing trouble. For the physicians older than 60 years, the prevalence of hearing loss approached 100%. Binaural hearing impairment remained rare among the sample except in the oldest age group.

As Fig. 1 shows, the proportion of physicians with hearing loss who also reported trouble with their hearing increased with age. Audiometric hearing loss was significantly associated with reported hearing trouble ($P = .003$), yet overall, 46% of the subjects meeting the audiometric definition of hearing loss reported that their hearing was good.

3.3. High- and low-frequency average hearing thresholds

Fig. 2 shows the mean and SE for the average hearing thresholds at the lower frequencies of 500, 1000, and 2000 Hz and the higher frequencies of 3000, 4000, and 6000 Hz for physicians in each age group. Both averages showed a trend toward worsening (increasing thresholds) with increasing age ($P < .0001$). Although the low-frequency average remained within the normal range (<25 dB) in all age groups, the average high-frequency hearing of the older physicians exceeded it.

3.4. Communication and stethoscope use

Table 2 shows the association between age, sex, and hearing level at different frequencies and reported difficulty with communication or stethoscope use. In the bivariate

Table 2
Predictors of communication and stethoscope difficulty: unadjusted model

	Communication difficulty		Stethoscope use: heart sounds		Stethoscope use: lung sounds	
	β	P	β	P	β	P
500 Hz	−.06	.0001	−.01	.40	−.02	.11
1000 Hz	−.05	.0012	−.01	.38	−.02	.14
2000 Hz	−.04	.005	−.01	.35	−.01	.19
3000 Hz	−.02	.001	−.01	.28	−.002	.71
4000 Hz	−.02	.01	−.01	.23	−.007	.18
6000 Hz	−.02	.01	−.004	.48	−.005	.32
8000 Hz	−.01	.02	−.005	.38	−.004	.37
Age	−.02	.007	<.002	−.75	−.008	.20
Sex	−.24	.33	−.21	.29	.21	.20

analysis, there was a significant association between increasing age and perceived difficulties with communication with patients, staff, and colleagues (P = .007). There were also significant associations between communication difficulties and hearing thresholds at a number of frequencies. Sex was not an independent predictor of reported communication difficulty. In the multivariate adjusted analysis, only age (P = .04) and hearing threshold at 500 Hz (P = .01) remained significant predictors of communication problems.

As Table 2 demonstrates, increasing age was not a predictor of stethoscope difficulties. There was also no significant association between hearing threshold levels at individual frequencies and self-reported difficulty hearing either heart sounds or lung sounds.

3.5. Noise exposures

Fig. 3 depicts, for the different age groups, the prevalence of reported exposures to sources of loud noise.

Although use of rifles or shotguns or history of military service was uncommon, physicians reported a high prevalence of exposure to other loud noise sources, mostly related to recreational activities. Younger subjects were more likely to report significant exposure to loud music; older subjects reported a greater amount of exposure to noise from lawn equipment.

3.6. Hearing protection

In response to the question "When you are around loud noise, do you wear hearing protection?", 6% of the respondents answered "always," 42% answered "sometimes," and 51% answered "never." Younger physicians were significantly less likely to report using hearing protection (P = .002).

4. Discussion

This study found that older physicians were more likely to demonstrate evidence of hearing loss and more likely to report difficulties with communication owing to hearing problems. At the same time, we did not find a clear relationship between self-reported problems with stethoscope use and either age or measured hearing levels. Many physicians with hearing loss described their hearing as good. Physicians reported exposure to recreational sources of loud noise but low rates of hearing protection use, especially among younger physicians.

This study recruited a convenience sample of busy attendees at a professional meeting. The time requirement for audiometric testing put a limit on the number of persons who could be tested at any time, and other conference activities created schedule conflicts for greater enrollment. It is possible that physicians who volunteered for the study were more concerned about their hearing than nonparticipants and therefore the sample could have overestimated the prevalence of hearing problems. Alternatively, physicians with symptomatic hearing loss could have been reluctant to participate. The study design was anonymous in an attempt to minimize selection bias, and the sample included individuals with significant hearing loss, especially at high frequencies. Therefore, we believe that our data provide useful insight into issues surrounding physicians and hearing loss, although larger studies in the future would be helpful to confirm these preliminary findings.

The 2 major causes of acquired hearing loss are noise-induced hearing loss and age-related hearing loss (presbycusis). Both conditions cause a high-frequency sensorineural loss hearing loss that begins in frequencies from 4 to 8000 Hz and gradually extends to lower frequencies. The causes of

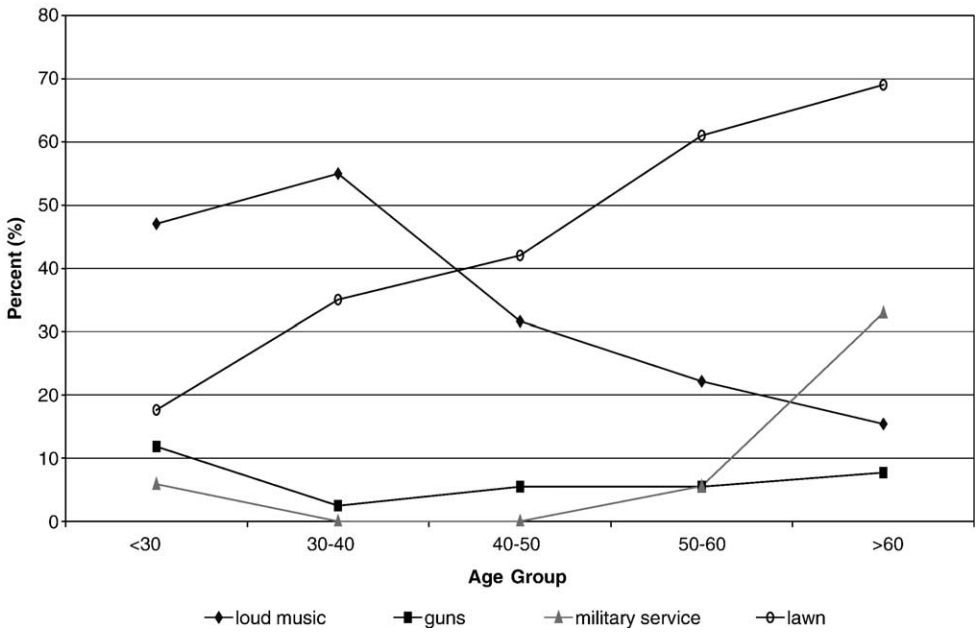

Fig. 3. Noise exposures by age group.

presbycusis remain poorly understood. Noise-induced hearing loss, which affects more than 10 million Americans, is a preventable condition [11], yet the prevalence of hearing loss in older Americans may be increasing owing to noise and other environmental factors [12]. It is likely, therefore, that both presbycusis and cumulative noise exposures contributed to the hearing loss detected in this sample.

Hearing is a complex sensory function that involves accurate perception of sounds at a variety of frequencies as well as cognitive processing of auditory information. The human ear can perceive sounds over the frequency range of 20–20,000 Hz. Typical audiological testing evaluates frequencies of 8000 Hz and lower that are important for speech and other functioning. Spoken vowels are lower-frequency sounds less than 2000 Hz, whereas consonants, crucial for speech discrimination, can involve higher frequencies in the 3000–4000-Hz range. Therefore, both low- and high-frequency hearing sensitivities are important for optimal speech reception. In the presence of background noise, speech discrimination becomes more difficult with any degree of hearing loss and difficulty has been reported at hearing thresholds of 15 dB [13]. The fact that communication problems were the most commonly reported hearing problem is consistent with the high-frequency loss found with increasing age in our survey.

The lack of correlation between pure tone hearing thresholds and reported stethoscope difficulty may have been caused by several factors. Over years of clinical encounters, a physician's ear could become attuned to cardiac and lung sounds that an untrained ear with the same degree of hearing sensitivity could not detect or recognize. The stethoscope itself acts to amplify sounds and reduce background noise, thereby potentially compensating for mild hearing deficits. Furthermore, many stethoscope sounds such as bronchial breath sounds and S3 and S4 are in the low-frequency range [14], where the average hearing of physicians in our sample was within normal limits. However, some sounds of interest occur at higher frequencies. Vesicular breath sounds extend to 1000 Hz in subjects with healthy lungs. Wheezes have a frequency range of approximately 100 to higher than 2000 Hz [15]. Aortic or pulmonary ejection sounds, ejection clicks of mitral valve prolapse, early diastolic murmurs of aortic regurgitation, and pulmonary hypertensive regurgitation are other examples of high-frequency sounds.

Further studies of the relationship between aging, hearing sensitivity, and stethoscope auscultation ability would be helpful to elucidate the roles of each factor. Such studies could assess the hearing ability at thresholds lower than 500 Hz, determine ability to recognize standardized recordings of heart and lung sounds, and enroll individuals with a wide range of ages and degrees of hearing loss.

A less reassuring explanation for the low rate of reported stethoscope problems could be lack of awareness or denial. This study found that half of the physicians with at least some degree of hearing loss reported that their hearing was good. Other studies have found poor agreement between self-perceived and measured hearing loss in working populations [9]. Presumably, this is caused in part by the subtle onset of hearing loss and the ability of compensatory mechanisms (eg, using the better ear) to overcome a mild deficit. Self-reported hearing difficulties may be a good predictor of need for a hearing aid [16], yet denial of personal hearing difficulties is a phenomenon encountered frequently in patients with even severe hearing loss [17], related perhaps to the stigma associated with the condition.

Noise-induced hearing loss is considered to be the greatest preventable cause of acquired adult hearing loss. There are currently efforts to raise awareness regarding noise-induced hearing loss as a public health issue [18]. In our physician sample, exposures to loud noises outside of work were common, yet many physicians, especially in the younger age groups, reported low rates of use of hearing protection when exposed to loud noise. This is consistent with other studies showing lower-than-recommended rates of personal health promotion activities among physicians [19]. As physicians increasingly face the challenge of successful aging both for themselves and their patients [20], appropriate personal use of hearing protection would be one way to promote hearing health throughout their professional career and beyond.

Acknowledgments

We thank the Connecticut Academy of Family Physicians and the Connecticut chapter of the American College of Physicians for their cooperation with this survey. Elizabeth Malarney assisted with questionnaire design and administration, Maria Slade provided data entry services, and Deron Galusha gave technical assistance. PMR, OT, and OA wrote the manuscript and PMR, MDS, and KS performed the statistical analyses.

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