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Awareness, Perceptions, and Literacy Surrounding Hearing Loss and Hearing Rehabilitation Among the Adult Population in the United States

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Objective: To characterize current awareness, perceptions, and literacy surrounding hearing loss among the adult population in the United States.
Study Design: National cross-sectional survey study.
Setting: United States.
Patients: Adults between 50 and 80 years of age in the United States.
Results: Survey respondents included 1,250 adults between the ages of 50 and 80 years, including 500 who indicated at least moderate hearing loss and were using hearing aids and 750 who denied having hearing loss and were not using hearing aids.
Only 9% of patients were able to correctly identify what constitutes a ''normal'' or ''average'' range for hearing. By comparison, a ''normal'' range of values for vision, blood pressure, and total cholesterol were identified correctly by 93%, 85%, and 52% of the 1,250 surveyed adults, respectively. When asked to rank the importance of addressing hearing loss within the context of 10 other common health conditions, hearing loss was ranked third to least important. When considering annual health maintenance, respondents indicated they were ''very likely'' to have an annual physical exam (72%), a cholesterol test (70%), an eye exam (66%), and bring their pet to a veterinarian (59%) over twice as frequently as having their hearing evaluated (27%).
When evaluating awareness surrounding associations between hearing loss and other health and social issues, less than one-fourth indicated strong awareness about links between hearing loss and depression, employability and income, fall risk, dementia, and type 2 diabetes. While most patients acknowledge the potential impacts of hearing loss on safety, quality of life, and health, less than half believe that hearing loss is treatable and less than 20% believe that hearing loss is preventable.
Conclusion: Despite widespread literacy of what constitutes normal vision, blood pressure, and total cholesterol levels, respondents exhibit substantially poorer understanding of ''normal'' hearing levels. Most adults believe that few treatment options exist for the management of hearing loss. Underlying the uniformly limited literacy surrounding hearing loss and its treatment options is the adult population's lack of appreciation for the long-term health sequelae of untreated hearing loss. **Key Words:** Cochlear implantation—Deafness—Hearing loss—Sensorineural hearing loss.

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Hearing loss ranks among the most prevalent and undertreated disabilities worldwide (1–3). Recent epidemiological data report that 1 in 8 United States adults and more than two-thirds of persons over the age of 70 suffer from varying degrees of hearing loss (4). The estimated prevalence of hearing loss is expected to continue to rise, reflecting an aging population and increasing life expectancy in Western countries. Beyond immediate sequelae,

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such as impaired communication and safety concerns, untreated hearing loss has been linked to depression, social isolation, poor quality of life, reduced educational achievement and employability, heightened fall risk, and premature mortality, among other downstream consequences (5–8). Furthermore, the 2017 Lancet Commission on Dementia identified midlife hearing loss as the single largest modifiable risk factor for later-life cognitive impairment and dementia (9,10).

Despite evidence implicating untreated hearing loss as a major health risk, hearing loss remains underdiagnosed and undertreated in the United States and worldwide. Current estimates indicate that only approximately 20% of United States adults with hearing loss utilize hearing aids, and less than 10% of adults who meet even the most conservative criteria for cochlear implantation (e.g., bilateral severe to profound sensorineural hearing loss, less than 50% sentence perception score in the candidate ear, and less than 60% in the binaural best-aided condition) actually underwent implantation (11–19). Paradoxically, hearing aid utilization in adults with severe to profound hearing loss exceeds 70%; a level of impairment that is not sufficiently treated with hearing aids and where cochlear implantation is recommended (18,20). These observations support that *inadequately* treated hearing loss—not only untreated hearing loss—comprises the predominating profile of prospective cochlear implant (CI) candidates.

Several driving factors have been implicated with regard to underutilization of hearing aids and CIs by adults in the United States and other developed countries including: poor awareness among the general population and healthcare professional surrounding the consequences of untreated hearing loss; lack of routine hearing screening protocols for at-risk adults; misconceptions regarding device candidacy and risks versus benefits of intervention; and access to specialized healthcare in underserved populations and geographical regions (18,20,21).

Unlike many other health disorders such as vision loss, diabetes, high cholesterol, hypertension, and prevalent cancers (e.g., breast, prostate, colon cancer), there are no large-scale awareness campaigns or established screening protocols addressing hearing impairment. Instead, hearing loss is often viewed as an unpreventable nuisance or inevitable benign process of aging, rather than a significant health risk that may be effectively rehabilitated. The objective of the current study is to ascertain awareness, perceptions, and literacy surrounding hearing loss and hearing rehabilitation among the adult population in the United States.

METHODS

An online quantitative survey (Supplementary Appendix, Table 1, http://links.lww.com/MAO/B411) was sent to a convenience sample of United States adults between the ages of 50 and 80 years from May 5 to May 13, 2019. Among respondents, 500 were adults who self-reported the diagnosis of at least moderate hearing loss and were currently using hearing aids, and 750 were adults who indicated that they not been diagnosed with hearing loss and were not using hearing aids (Supplementary Appendix, Table 1, Question 5, http://links.lww.com/MAO/B411). The overall survey response rate was 26.31% and the overall conversion rate was 21.12%. Respondent data were weighted to reflect region, age, gender, and hearing loss among this demographic in the United States based on U.S. Census data. Other variables (e.g., employment, race) were allowed to fall naturally within this controlled sampling frame. The survey was funded by Cochlear Ltd. (Sydney, Australia) and performed by an independent research and analytics firm, PSB Insights LLC (Washington, DC).

RESULTS

Respondent Demographics

Survey respondents included 1,250 adults between the ages of 50 and 80 years; 500 indicated at least moderate hearing loss (40% moderate, 48% moderately severe, 10% severe, and 3% profound) and were using hearing aids, while 750 denied having hearing loss and were not using hearing aids. Demographics of the respondents are presented in Table 1.

Defining Hearing Loss

Only 9% of respondents were able to correctly identify what constitutes a ''normal'' or ''average'' range for hearing; the 500 adults with hearing loss were only slightly more likely to select the correct response compared to the 750 adults without hearing loss (11% vs. 8%). By comparison, a correct ''normal'' range of values for vision, blood pressure, and total cholesterol were identified by 93%, 85%, and 52% of respondents (Table 2).

Prioritization of Hearing Health

When asked to rank the importance of addressing hearing loss within the context of 10 other common health conditions, including cancer, heart disease, high blood pressure, obesity, Alzheimer's disease, diabetes, vision loss, chronic obstructive pulmonary disease, arthritis, and asthma, hearing loss was ranked third to least important (Table 3). When considering annual health maintenance, respondents indicated they were ''very likely'' to have an annual physical exam (72%), a cholesterol test (70%), an eye exam (66%), and bring their pet to a veterinarian (59%) over twice as frequently as having their hearing evaluated (27%) (Table 4, Supplementary Appendix, Table 2, http://links.lww.com/MAO/B411). Separate survey questions seeking pairwise comparisons between the frequency of hearing tests and veterinarian visits, eye exams, dental check-ups, and cholesterol testing are presented in Supplementary Appendix, Table 3, http://links.lww.com/MAO/B411.

When respondents were asked when the last time their hearing was checked, the most frequent response was ''longer than 10 years ago'' (22%); among subjects with hearing loss, the most frequent response was ''in the past 6 months'' (36%), and in total 64% had their hearing checked within the past 12 months (Table 5). The most commonly cited reasons for not pursuing a hearing test more often was ''I do not think I am currently experiencing hearing loss'' (47%) and ''my healthcare provider has

TABLE 1. *Demographics for sample of United States adult population*

Demographics[a]	All n = 1,250	With Hearing Loss n = 500	Without Hearing Loss n = 750
Age in years	62 (55–69)	66 (59–72)	61 (55–67)
Gender			
Male	48	66	42
Female	52	34	58
Geographic region			
Northeast	18	18	18
Midwest	22	22	22
South	37	37	37
West	22	22	22
Race			
White	88	91	87
All others	12	9	13
Highest level of education			
Grade or middle school	1	1	2
Still attending high school	<1	0	<1
High school graduate	35	28	37
Associate's or technical degree	24	26	23
Bachelor's degree	27	27	27
Master's or doctorate degree	13	19	11
Don't know/refused	<1	0	<1
Employment status			
Employed, working outside the home	28	24	29
Employed, working at home	4	3	5
Student	<1	1	<1
Not currently employed/retired	58	66	56
Other	8	7	9
Don't know/prefer not to answer	1	0	1
Covered by health insurance			
Yes	95	99	94
No	5	1	6
Not sure	<1	0	<1
Currently using glasses or contacts			
Glasses	71	74	70
Contacts	2	1	2
Both	6	7	6
Neither	21	17	22
Own a pet			
Yes	63	64	62
No	37	36	38

[a]Demographics summarized with median (IQR) or percentages.

never mentioned getting my hearing tested'' (30%) (Table 6).

Awareness and Perceptions Surrounding Hearing Loss, Prevention, and Treatment

When evaluating awareness surrounding associations between hearing loss and other health and social issues, less than one-fourth indicated strong awareness about links between hearing loss and depression, employability and income, fall risk, dementia, and type 2 diabetes (Table 7). While most respondents acknowledge the potential impacts of hearing loss on safety, quality of life, and health, only 38% believe that hearing loss is treatable and only 17% believe that hearing loss is preventable (Table 8). Data surrounding hearing loss prevention related to noise exposure is presented in Supplementary Appendix, Table 4, http://links.lww.com/MAO/B411.

Regarding vision loss prevention and treatment, 67% of respondents were apt to wear corrective lenses, compared to 40% who would consider using hearing aids. Respondents were asked to score satisfaction with glasses or contacts and hearing aid performance on a scale of 1 to 10, with 1 indicating not at all satisfied, 5 indicating neutral, and 10 indicating extremely satisfied, resulting in median satisfaction scores of 8 for both glasses or contacts and hearing aid performance. In total, 87% of respondents indicated at least some level of satisfaction with glasses or contacts (i.e., a score of 6 or higher) compared to 79% for hearing aid performance, with 24% and 15%, respectively, indicating they were extremely satisfied (i.e., a score of 10). Those with hearing loss were

TABLE 2. *Knowledge of ''normal'' or ''average'' health metrics*

Responses[a]	All	With Hearing Loss	Without Hearing Loss
Vision			
50/50	2	1	2
25/25	3	4	3
20/20	93	94	93
Don't know/not sure	2	1	2
Blood pressure			
160/120 mm Hg	3	3	3
90/50 mm Hg	3	3	3
120/80 mm Hg	85	88	84
Don't know/not sure	9	6	10
Total cholesterol			
>250 mg/dL	4	5	3
201–250 mg/dL	9	6	10
<200 mg/dL	52	58	50
Don't know/not sure	35	31	37
Hearing			
50/50	10	11	9
25/25	3	4	2
20/20	9	11	8
Don't know/not sure	79	74	80

[a]Responses summarized with percentages.

TABLE 3. *Most important health condition to manage (hierarchy of health conditions)*

Responses[a]	All	With Hearing Loss	Without Hearing Loss
Cancer	39	41	38
Heart disease	18	15	19
High blood pressure	9	7	10
Obesity	7	4	8
Alzheimer's/dementia	7	9	6
Diabetes	6	7	6
Vision loss	6	5	6
Chronic obstructive pulmonary disease	4	4	4
Hearing loss	2	6	1
Arthritis	2	2	2
Asthma	1	1	1

[a]Responses summarized with percentages.

TABLE 4. *Likelihood of prioritizing health conditions and life activities in the next 12 months*

Responses[a]	All	With Hearing Loss	Without Hearing Loss
Have an annual physical	72	85	67
Have cholesterol checked by a doctor	70	81	66
Have my eyes checked by a doctor or optometrist	66	79	61
Take my pet to the vet[b]	59	67	56
Go to a crowded space, such as a restaurant or party	57	64	55
Have a mammogram or prostate exam	45	46	45
Take a nature walk/hike	44	50	42
Take a loved one to the doctor	37	49	33
Go on a diet or start an exercise regimen	28	30	27
Have my hearing checked by a doctor or audiologist	27	64	15
Attend a concert	20	20	19
Listen to a podcast	15	15	15

[a]Responses of ''very likely'' summarized with percentages.
[b]Only asked of pet owners.

TABLE 5. *Timing of last hearing test*

Responses[a]	All	With Hearing Loss	Without Hearing Loss
In the past 6 months	11	36	3
In the past year	12	28	6
In the past 2 years	16	24	13
In the past 5 years	12	7	14
In the past 10 years	6	3	7
Longer than 10 years ago	22	1	28
Never	9	<1	11
Cannot recall	13	<1	17

[a]Responses summarized with percentages.

TABLE 6. *Reasons for not having hearing evaluated more often*[a]

Responses[b]	All	With Hearing Loss	Without Hearing Loss
I do not think I am currently experiencing hearing loss	47	<1	55
My healthcare provider has never mentioned getting my hearing tested	30	5	34
I have other health priorities	20	18	20
I get my hearing checked as recommended by my doctor	18	50	13
I do not know if my insurance covers hearing tests	17	5	19
I cannot afford hearing aids	11	15	11
Hearing loss is a natural part of aging	10	9	10
Don't know/not sure	10	16	9
I do not know where to go to get my hearing checked	5	1	5
I am afraid to learn if I am experiencing hearing loss	2	2	2
I do not want to wear a hearing aid even if I have confirmed hearing loss	2	3	1
I am too young to get my hearing tested	1	1	1
I am embarrassed to ask about getting my hearing tested	1	2	1

[a]Asked of the subset of respondents who do **not** evaluate and discuss results of hearing with a doctor ''twice a year or more'' or ''once a year''.
[b]Responses summarized with percentages.

more likely to consider using a hearing aid or visit a hearing specialist, but only 1 in 4 would consider undergoing surgery for a hearing implant (Table 9).

DISCUSSION

Given the growing number of reports linking potential long-term health ramifications with untreated hearing loss in adults, the importance of hearing loss literacy has received greater attention in the medical literature in recent years (2,9). The current work illustrates the disproportionately limited understanding of hearing loss compared to other common medical conditions among the United States adult population. For instance, whereas the majority (85%) of respondents demonstrated understanding of ''normal'' ranges for vision and blood pressure, only approximately 10% reported knowing ''normal'' ranges for hearing. Moreover, although most respondents acknowledged that hearing impairment impacts quality of life, less than one-fourth of respondents recognized that hearing loss is linked with long-term negative health sequelae such as depression and dementia. Compounding the lack of knowledge regarding implications of untreated hearing loss, less than half of the respondents in the current work recognized that hearing loss is treatable.

The limited knowledge around hearing loss and potential treatment options in this sample of the adult population aligns with prior reports of low hearing rehabilitation utilization nationally. Hearing aid prevalence among

TABLE 7. *Knowledge of link between hearing loss and other health and social issues*

Responses[a]	All	With Hearing Loss	Without Hearing Loss
Linked to increased risk for depression	23	35	19
Linked to reduced income/job opportunity	22	35	18
Linked to an increased risk of falling	18	28	15
Linked to increased risk for dementia	10	18	7
Linked to increased risk for type 2 diabetes	6	9	4

[a]Responses of ''very aware'' summarized with percentages.

TABLE 8. *Impact of hearing loss on health, safety, and quality of life*

Responses[a]	All	With Hearing Loss	Without Hearing Loss
Hearing loss can impact one's personal safety	69	75	67
Hearing loss impacts the quality of one's life	63	71	61
Hearing is important to my overall health	59	63	57
Hearing loss can lead to social isolation	55	64	51
Hearing loss is treatable	38	48	34
Hearing loss is a normal part of aging	22	19	23
Hearing loss is preventable	17	15	18

[a]Responses of ''strongly agree'' summarized with percentages.

those with measurable hearing loss ranges from 10% to 34%, with a more recent estimate of 21% in 2015 (11–17). Importantly, this number may be higher across the general population including untested individuals, as those with mild hearing loss are less likely to self-report hearing difficulty and thus less likely to seek care and hearing rehabilitation (22). Despite reports of high patient satisfaction, 31 M hearing aid candidates (defined as those with a pure tone threshold between 25 and 90 dB) went untreated in the United States in 2015, a number that continues to grow by nearly 700,000 annually (16,17,23).

Similarly, despite readily available technology to treat severe to profound hearing loss with CIs, CI utilization among the eligible United States population is low. While CIs were historically reserved for individuals with bilateral profound hearing loss, improved technology and surgical techniques have expanded CI candidacy to include individuals with residual hearing, asymmetric hearing loss, and single-sided deafness (24). CI utilization in the United States has been estimated between 2.1% and 12.7% using expanded and traditional criteria, respectively. Moreover, despite expanding candidacy criteria, the audiometric profile of CI recipients has remained largely stable over recent decades, with most CI recipients experiencing years of inadequately treated hearing loss and approaching binaural deafness before eventually receiving an implant (25–27). Similar to the hearing aid population, although there has been an increase in absolute numbers of CI users over time, new CI candidates outnumber new CI recipients annually. Consequently, the untreated CI candidate population continues to grow by about 20,000 individuals annually, adding to the existent backlog of approximately 1.3 M individuals in 2015 (17).

Multiple etiologies exist behind the observed disproportionalities among respondents' understanding of ''normal'' hearing compared to other common disorders. The largest factor likely underlying this observation surrounds poor general knowledge about long-term negative health sequela of hearing loss beyond it simply constituting an expected sequela of senescence and social interaction annoyances (20). Unfortunately, limited appreciation for long-term negative health sequelae provides little impetus for patients to actively seek identification and treatment of their hearing loss (28). The current work's observation that respondents are roughly twice as likely to take their pet to the veterinarian than have their hearing checked supports this assertion. Over 75% of respondents in the current work reported no recognition that hearing loss was associated with other significant health conditions such as depression, dementia, and type 2 diabetes. Because most patients rely principally on their primary care physicians for information regarding their medical conditions (20), a significant educational burden is placed on front-line providers who ultimately do not treat most adult hearing disorders (29). Unfortunately, past work showed that only 15% of primary care providers regularly screen for hearing loss among their patients (18). Because the majority of patients do not voluntarily bring up hearing health concerns during routine office visits, in our current system, the onus to identify subjective hearing loss rests chiefly

TABLE 9. *Steps used to restore (for those with hearing loss) or protect/preserve (for those without hearing loss) hearing health*

Responses[a]	All	With Hearing Loss	Without Hearing Loss
Listen to music at a lower volume	58	37	65
Avoid loud spaces	54	40	59
Use hearing protection (e.g., earplugs, earmuffs, etc.)	53	42	57
Visit hearing specialist for regular checkups	52	62	49
Wear a hearing aid	40	83	25
Avoid using ear buds	33	28	34
Avoid using white noise machines	25	24	26
Undergo surgery for a hearing implant	12	24	8
Don't know/not sure	6	5	6
None of the above	4	3	4

[a]Responses summarized with percentages.

on primary care providers (29). Although a growing educational emphasis has been placed on hearing loss and its treatment across primary care literature in recent years, it is likely that lack of identification, patient education, and referral by front-line providers constitutes a major area of improvement moving forward (2,18,21,30).

Beyond limited patient education and referral to hearing healthcare professionals, several barriers inherent to existing screening and detection paradigms also influence the responses observed in the current work. Only 56% of respondents with and 14% without hearing loss reported undergoing yearly evaluation of their hearing status. These observations are corroborated by the 2014 National Health Interview Survey where—of 40.3 M adults with self-reported hearing loss—12.9 M (32%) had never seen a healthcare professional regarding their hearing loss and over 11 M (27%) had never previously undergone formal audiometric testing (28). Although screening programs for hearing loss have been universally adopted and equally successful for the pediatric population, no similar program exists for adults despite viable options available (31). In spite of the United States Preventative Task Force recently offering no recommendation for screening programs for either impaired visual acuity or hearing loss in older adults based on insufficient evidence, over twice as many respondents in the current study indicated that they would have their doctor or optometrist check their vision within the next year than have a doctor or audiologist check their hearing. This suggests that if these respondents appreciated the importance of audiometric screening (based on long-term health implications such as increased risk for the development of dementia, for example) (9) as comparable to early detection of vision loss, then most would be willing to undergo regular hearing evaluation. Furthermore, recent efforts have demonstrated the efficacy of remote audiologic screening tools that can help circumnavigate the burdensome in-person screening process and work well within the evolution towards telemedicine.

While the current work focuses on challenges regarding awareness, perceptions, and literacy surrounding hearing loss among the adult population in the United States, there are many other foundational challenges in advancing good healthcare practices and public policy on hearing care that need to be addressed including: lack of routine screening for at risk adults over 50 years of age; limitations in access to accurate, meaningful, and readily interpretable diagnostic testing; low referrals from primary care for hearing health services; lack of adequate reimbursement for hearing health services; low consumer and hearing care professional awareness of cochlear and other auditory implants; and lack of consistent models for hearing aid and CI candidacy and aftercare. To be successful, proposed countermeasures must address these root causes in multiple domains including process, evidence, education, and policy.

There are several important limitations of the current work. First, survey data are inherently influenced by respondents' susceptibility to recall bias. For instance, the act itself of taking a survey about hearing loss likely influences responses to questions such as the likelihood of undergoing hearing evaluation in the next year, especially among those with reported hearing loss. The extent to which recall bias influences the primary conclusions of the current work—that is, the uniformly poor understanding of ''normal'' hearing compared to other common medical conditions, the limited understanding of long-term sequelae of untreated hearing loss, and the lack of appreciation about potential treatment options—are presumably less as these questions chiefly deal with what respondents currently know rather than past or future behavior. In addition, the questionnaire used in this study has not been previously validated. The question set was developed in collaboration with a research firm; each of the questions was reviewed by a team of clinicians and researchers. In this way, the authors ensured the wording was clear and the questions were clinically relevant. To the best of our knowledge, currently there are no validated surveys that addresses these specific and novel questions. Another important limitation surrounds the accuracy of respondents' perception of their hearing impairment. Unlike other diseases where patient-reported symptoms correlate with diagnoses, self-reported hearing loss has not only demonstrated a low sensitivity in detecting true hearing impairment, but may serve as a barrier to hearing aid utilization in individuals with self-perceived normal hearing (22,32,33). For example, people with hearing loss may turn up the television or ask others to speak louder, whereas people with vision loss do not have similar compensatory mechanisms that may render vision loss more readily apparent to the affected individual. In these ways, inaccurate self-reporting of hearing loss severity likely introduces some error into measurements comparing respondents with and without hearing loss. Finally, respondents in the current work largely self-identified as ''White, Caucasian, European, or European-American'' and were predominantly under the age of 65 years. While this study weighted respondent data for age, sex, and region, other variables such as employment and race were allowed to fall naturally within this controlled sampling frame. Prior research has demonstrated that non-White and elderly patients may experience unique disadvantages surrounding hearing health literacy and treatment utilization (25,26,32,34). In this way, it is likely that hearing health literacy rates surrounding the survey questions of the current work would be likely even poorer if extended to the entire United States population. Future studies may include a general population sample to understand differences among the broad adult population or set quotas for data by race to more completely elucidate the influence of this characteristic.

CONCLUSION

Despite widespread literacy of what constitutes normal vision, blood pressure, and total cholesterol levels, respondents exhibit substantially poorer understanding

of ''normal'' hearing levels. Most respondents believe that few treatment options exist for the management of hearing loss. Underlying the uniformly limited literacy surrounding hearing loss and its treatment options is the adult populations' lack of appreciation for the long-term health sequelae of untreated hearing loss. Concerted efforts to improve providers' and patients' understanding of the importance of treating hearing loss would likely lead to heightened patient awareness in recognizing abnormal hearing and motivation to pursue rehabilitation of hearing loss.

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