Hearing Loss: Impact, Policy Implications, and Future Directions

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Introduction

Our senses serve as a window to the world, allowing access to essential information that underpins daily functioning. As one sensory domain, hearing is critical to an individual's ability to communicate, interact with others, perceive dangers, and feel connected to the environment (Dalton et al. 2003; Kochkin & Rogin, 2000; National Council on Aging [NCOA], 1998). Loss of hearing is found to impact quality of life and relationships with family and friends (Ciorba, Bianchini, Pelucchi, & Pastore, 2012; Dalton et al, 2003; Kochkin & Rogin, 2000; Kramer, Allessie, Dondorp, Zekveld, & Kapteyn, 2005); the ability to remain engaged in preferred activities and work (Goldstein, 2011; Kochkin, 2007b, 2010; NCOA, 1998; Stam, Kostense, Festen, & Kramer, 2013); cognitive and physical functioning (Genther, Frick, Chen, Betz, & Lin, 2013; Lin, 2011; Lin & Ferrucci, 2013; Valentijn et al., 2007); and the ability to understand health care instructions (Pacala & Yueh, 2012; Pope, Gallun, & Kampel, 2013).

Because hearing loss affects over 50% of persons age 65 and older with its prevalence increasing with age, it must be considered a significant health care concern (Bainbridge & Wallhagen, 2014). Yet many individuals who might benefit from amplification do not use it or delay seeking assistance for over five years, and most health care practitioners neither screen for hearing loss nor refer for follow-up evaluations (Kochkin, 2004; National Institute on Deafness and Other Communication Disorders [NIDCD], 2010a; Wallhagen & Pettingill, 2008). The purpose of this issues brief is to highlight: the significance of hearing loss in older adults, including its impact on health and safety; the barriers to treatment; and potential future directions and options. The emphasis is on the implications the identified issues have for Medicare and Social Security.

Impact of hearing loss on societal engagement

Hearing is a complex, multi-process sense and ultimately occurs when the brain receives and interprets sounds from the environment (Bagai, Thavendiranathan, & Deksky, 2006). This, however, necessitates adequate and accurate receipt of sound signals. Age related hearing loss, or Presbycusis, is a form of sensoryneural hearing loss that generally starts with a decrease in the ability to hear high

frequency sounds (Bagai et al., 2006). Consonants, such as “t” or “s”, are high frequency sounds while vowels, such as “a” or “i”, are low frequency sounds. Consonants make language understandable; they assist in differentiating words such as “dime” and “time” or “sing” and “thing”. On the other hand, low frequency sounds are more audible than high frequency sounds. Thus, persons with age related hearing loss often note that others “mumble” or don’t enunciate clearly or state that they can hear but don’t understand. This emphasizes a key point - hearing loss is not a decrease in sound as might be experienced when wearing ear plugs but a distortion of sound transmission.

Understanding in the presence of background noise, in settings with significant reverberations, and when individuals speak with an accent are especially problematic. As hearing loss progresses, low frequency audibility is often affected. These changes have significant implications for an individual’s ability to participate in work or other social activities and increase the risk of an individual misinterpreting what is perceived.

Significance and Impact of Hearing Loss

Impact on work and societal-related activities

Hearing loss impacts an individual’s work life in several inter-related ways – it makes participating in the work environment challenging, especially if the work entails meetings, using the phone, or communicating with clients and other personnel (Boulton, 2013; Ross, 2011). At the same time, about 60% of those with some hearing loss are in a work or educational setting (Ross, 2011). Although there are adaptations that can be made to facilitate continued work in these settings, individuals may not wish to acknowledge their loss because of concerns about keeping their job. This is not an unrealistic concern; data support that persons with hearing loss earn less than those without hearing loss, are more likely to be unemployed, and experience work discrimination (Kochkin, 2010; Bowe, McMahon, Chang, & Louvi, 2005; McMahon, Kifley, Rochtchina, Newall, & Mitchell, 2008). For example, in a survey of more than 40,000 households, Kochkin (2010) found a $14,100 income differential between subjects with mild vs. severe hearing loss, and that individuals with untreated hearing loss could lose upwards of $30,000 annually.

Occupations that involve the need to hear signals and directions in difficult situations, such as firefighters or security personnel, may be especially impacted and data support that individuals in these roles may be concerned about acknowledging the loss or using adaptive devises because they risk being released from service (Goldstein, 2011; Ross, 2011; Stam et al., 2013). While few data are available to

accurately quantify the negative impact of hearing loss on earning capacity, especially after the age of 65, an early study estimated that the cost per person of obtaining a severe or profound hearing loss at age 65 years or older was associated with lifetime costs of $43,000 (Mohr et al. 2000). Those who acquired their hearing loss before retirement were estimated to earn only 50% to 70% of what their non–hearing-impaired peers would earn, thus losing between $220,000 and $440,000 in earnings over their working life, depending in part on the age of onset of the hearing loss. These estimates were partly based on lower workforce participation and reduced wages as compared with those without this degree of hearing loss. Cost estimates for older adults included medical costs such as hearing aids and health care visits but did not include possible costs related to assistive living expenses.

Work place discrimination has far reaching implications for older persons. First, the negative earning potential during key years of productivity influence both retirement benefits and contributions to Social Security (Social Security Administration, 2013). Second, with increasing longevity, reduced savings from the recession, and pressures to increase the retirement age at which one qualifies for full Social Security benefits, older adults are remaining in the work force longer (Purcell, 2007). Hearing loss reduces their capacity to do so and remain productive. Continued employment is positive because it both maintains on-going contributions to Social Security and creates less demand on current Social Security payments.

In addition to impacting work capacity, hearing loss influences an individual's involvement in volunteer activities because of difficulty with communication. Volunteerism has been shown to influence health and well-being in many individuals but can also provide a societal benefit by allowing older retired individuals to continue to utilize their skills and knowledge to benefit a range of services (Butrica, Johnson, & Zedlewshi, 2009; Jenkinsen et al., 2013; Poulin et al., 2013).

Impact of hearing loss on health and well-being

Hearing loss has been shown to influence health and well-being in multiple ways and across multiple domains. Although not mutually exclusive, areas of noted concern include the impact of hearing loss on psychosocial and physical functioning, safety, and personal relationships.

Hearing loss and safety: Age-related hearing loss influences an individual's ability to hear warning signals such as sirens, smoke alarms, disaster warnings, on-coming cars, and phones. Escaping from hotels and other locations can be delayed when warnings go unheard (FEMA, 1999). In large scale disasters, those with hearing loss may not be aware of or able to understand warnings and may need specific types of

adaptive information. Of note, a kit has been developed that specifically focuses on persons with hearing loss but has not been studied for its impact and it does not yet appear to have wide spread distribution (Go/Stay/Kit, 2013). Importantly, hearing loss can be a factor in child safety when older persons serve as childcare resources for their families (Kochkin, 2007c) and either do not hear a safety warning or do not hear the child's cry for help. Similarly, driving or walking safely can be affected when individuals do not hear on-coming cars (Hickson, Wood, Chaparro, Lacherez, & Marszalek, 2010).

An additional safety concern relates to its impact on health and health outcomes. Many older persons with hearing loss misunderstand or misinterpret what is said. Although not well studied, these misinterpretations can affect communication within health care settings and in transitions between health care settings. Hearing loss can also influence diagnostic accuracy and individuals with hearing loss are sometimes thought to have cognitive impairment when they do not respond or respond inappropriately to questions. Recent data support the lack of recall after discharge of information provided in an acute care setting (Engel et al., 2012; Sanderson, Thompson, Brown, Tucker, & Bittner, 2009). While hearing acuity and the effects of hearing loss on this lack of recall was not explored, recent data document the impact of hospital noise on recall and understanding (Pope et al., 2013) and suggest that hearing loss impacts the recall of complex medication information (DiDonato**,** Surprenant**,** Neath**,** 2013, poster). Data are needed on the ways in which interventions can facilitate communication in ways so as to promote understanding of and adherence to health care regimens. Several individual Hearing Loss Association State Chapters have created hospital kits that individuals can use when entering a health care system but, although most Chapters are willing to share the kits, they currently have not been widely distributed or studied (e.g. http://www.swedish.org/patient-visitor-info/accessibility/printable-communication-aids).

Hearing loss and health: A range of studies have documented the psychosocial and physiological impact of hearing loss although more data are available on its psychosocial impact with studies often done within the context of an audiometric assessment and hearing aid benefit evaluation. However, whether assessed using audiometry or self-report, hearing impairment has been consistently associated with lower self-reported physical functioning (for example, Dalton et al., 2003; Strawbridge, Wallhagen, Shema, & Kaplan, 2000), and lower levels of reported quality of life (Dalton et al., 2003; Chia et al., 2007; Kochkin & Rogin, 2000), although the latter is more strongly related to specific measures of hearing related activities (Chou, Dana, Bougatsos, Fleming, & Beil, 2011). In the study by Wallhagen and colleagues (2000), data from the Alameda County Study were used to explore the impact of self-

reported hearing difficulty, even with a hearing aid; hearing and understanding words in a normal conversation; hearing words clearly over the telephone; and hearing well enough to carry on a conversation in a noisy room. Findings were divided into three categories: no hearing impairment, a little hearing impairment, and moderate or more hearing impairment. Compared with those reporting no impairment, physical functioning, mental health, and social functioning decreased in a dose-response pattern for those with progressive levels of hearing impairment. Hearing loss has also been associated with an increased incidence of falls (Lin & Ferrucci, 2013) and hospital admissions (Genther et al., 2013), each of which can lead to further disability and health care utilization.

Additional data, although still generally from self-reported data, support the adverse impact of difficulty hearing on physical functioning as well as mortality and strengthen the association by documenting its impact internationally. Yamada and colleagues (2011) studied the impact of self-reported hearing difficulty across three years in a Japanese cohort of older adults (≥65) and found that those reporting a lot of difficulty hearing, even with a hearing aid, had a greater risk of dying or becoming dependent in activities of daily living than those reporting no difficulty hearing. In a study using data from several large longitudinal data bases in Australia, Lopez and colleagues (2011) investigated the impact of both self-reported vision and hearing impairment in older adults aged 76-81 years of age across approximately six years. Those reporting greater levels of hearing impairment found an increased risk for falls as well as for declines in scores on the physical and mental components of the SF-36 for both men and women. Finally, Öberg and colleagues (2012) investigated self-reported hearing difficulties as well as the use of hearing aids and related outcomes and their relationship to demographic, cognitive, psychosocial, and health variables in persons 85 years of age and older in Sweden. They used two self-reported items on hearing difficulty with four response categories but without "with or without a hearing aid" as part of the question. Those with a score of three or more were considered to have hearing impairment. Participants who reported hearing difficulty but who did not have hearing aids were found to have worse general health mental health. Of note in this study, those who did use hearing aids were found to benefit from their use. In fact, the authors noted that, when used, their hearing aid outcomes were similar to those of a younger group.

Although hearing loss was noted to be associated with altered cognitive functioning years ago (Lindenberger & Baltes, 1994; Baltes & Lindenberger,1997), this relationship has become a greater focus of concern with more recent data linking hearing loss with both self-reported lower cognitive functioning and dementia (Lin, 2011; Lin, Metter, O'Brien, Resnick, Zonderman, & Ferrucci, 2011; Wallhagen, Strawbridge, Shema, 2008). In a cross-sectional analysis of the Baltimore Longitudinal Study

of Aging (BLSA), Lin, Ferrucci, Metter and colleagues (2011) investigated the association between hearing impairment, measured audiometrically and calculated as a pure tone average (PTA) across 0.5, 1, 2, and 4 kHz, and memory and executive functioning. Higher levels of hearing loss were significantly associated with lower scores on measures of mental status, memory, and executive function. Similarly, in a study using the National Health and Nutrition Survey data, Lin (2011) found an association between audiometrically assessed hearing loss and lower scores on the Digit Symbol Substitution Test, a measure of executive function and psychomotor speed. Finally, in a longitudinal analysis of data of persons participating in the BLSA who were dementia free in 1990 or 1994, Lin and Colleagues (Lin, Metter, et al, 2011) found that hearing impairment, assessed audiometrically, was associated with increased odds of incident dementia. In these analyses, increasing levels of hearing impairment (mild, moderate or severe) were associated with increasingly higher odds. Given the cost of care for persons with dementia and the increasing prevalence of cognitive impairment with age, identifying risk factors that might be amenable to intervention is of significant concern. Although the data linking hearing loss and cognitive decline and dementia are still associational and no studies are available supporting the beneficial effects of hearing aids, further studies are warranted, especially to assess whether early intervention before hearing loss becomes significant may be beneficial.

Remaining engaged in activities has been associated with what has been termed “successful aging” (Havinghurst, 1961; Rowe and Kahn, 1997; Ryff, 1989) and, as noted earlier, hearing loss directly impacts the ability to easily and effectively stay involved in meaningful activities and personal relationships. Personal relationships may be especially affected. Thus, studies have documented the impact of hearing loss on spouses (Kramer et al., 2005; Wallhagen, Strawbridge, Shema, Kaplan, 2004) although the effects may be more important for wives than for men (Wallhagen et al., 2004; Ask, Krog, & Tambs, 2010). Additionally, although there were several early studies suggesting a negative impact of hearing loss on a caregiver (Kuzuya & Hirakawa, 2006), no recent studies appear to have addressed this concern. Such studies may be important to assess the effects of interventions to improve hearing and communication on subsequent admission to a long-term care setting.

The cost of hearing loss to the health care system and society in terms of lost productivity, injury, and health care utilization has not been well defined but data suggest that it may be significant (Mohr et al., 2000). Greater and more effective use of the newer and more refined hearing aids along with the use of aural rehabilitation strategies could be effective in reducing health care and societal costs as well as the personal costs of hearing loss for older adults and their families.

Barriers to the Treatment of Hearing Loss

Given its significant impact, it might be assumed that older adults and health care practitioners would identify hearing loss as an essential health care concern. However, multiple barriers minimize the extent and effective use of hearing health care services. These include: the cost of hearing aids; lack of coverage of hearing health care services and hearing aids by Medicare and most other forms of insurance; and lack of agreement across the hearing services community about payment approaches. Barriers also include the stigma associated with hearing loss; the fact that hearing loss comes on slowly which limits initial awareness; lack of knowledge of alternatives to hearing aids; lack of knowledge of and appreciation for hearing loss by health care practitioners and lack of screening; and the prioritization of other health-related concerns by both individuals with hearing loss and their health care providers.

Cost, lack of coverage, bundled services, and inter-professional disagreement about approaches to covering hearing health care services

Three major factors determine whether Medicare will cover a service. It has to fall within a defined Medicare benefit category, be reasonable and necessary for diagnosis or treatment, and not be statutorily excluded from coverage. When Medicare was enacted in 1965 it was designed especially to cover acute illnesses and hospital-related care; hearing health care services were statutorily excluded (Social Security Act § 1862(a)(1), 1965) unless they were determined to be "medically necessary." Although legislation to change Medicare to allow for such services was introduced as early as 1977 when Claude Pepper submitted H.R. 1127 (1977), this and all subsequent legislation have not made it out of Committee for consideration by the full House of Representatives. Concerns expressed usually relate to the costs to Medicare that such services would incur. Unfortunately, for older adults, such lack of coverage has remained a barrier to access (Knudsen, Oberg, Nielsen, Naylor, & Kramer, 2010; Kochkin, 2007a; NCOA, 1999). Since many other health insurance programs use Medicare as a model for such coverage, lack of insurance coverage is fairly far reaching. Further, although Medicaid can provide hearing aid and hearing services coverage, such coverage usually focuses on children. Whether Medicaid covers hearing services for adults and what those services are remains highly variable across the states (Kaiser Family Foundation, 2010). In addition, changes that are being considered in several states are viewed with significant concern by hearing health care professionals who believe that decreases in payment will force many to stop providing services to persons with this coverage (California State Controller's Office, 2012; Lindsey, 2013).

Given lack of insurance coverage, hearing aids are often viewed as very costly, especially when benefits are not perceived as balancing the cost. However, one reason for the cost of hearing aids is that their cost is often "bundled" in with all hearing health care services, such as the fees associated with the assessments, fittings and adjustments (Sjoblad & Winslow, 2011; Strom, 2012). Although this allows for the individual to return for needed alterations that promote appropriate use, persons receiving hearing aids are often unaware of the extent of the coverage and perceive this as the cost of the hearing aids themselves. Further, adapting to hearing aids requires time because the individual has to relearn how to listen and get used to sounds that have not been heard for a long time. Aural rehabilitation is designed to assist individuals acquire these skills and is recommended to be included in the audiologic services provided but is often either not provided or provided at a minimal level (Sweetow, & Sabes, 2010). Lack of adequate assistance in adapting to the hearing aids and re-learning how to listen and hear can minimize the real and perceived benefits of hearing aids and discourage their use.

At the same time, professionals providing hearing services are generally not supportive of changing Medicare to cover hearing aids, and they differ across professional groups (Table 1, Organizations/Associations) regarding ways to address the cost of hearing services (see Table 2 for synopsis). The one agreed upon approach is the use of a tax credit for hearing aid purchase. The various options are further developed below.

Stigma, slow onset, and lack of screening

Hearing loss tends to come on slowly so that individuals are often initially unaware of their hearing loss especially because they continue to hear low-frequency sounds and thus feel others mumble or don't enunciate clearly (NIDCD, 2010b). They can also compensate in ways that initially minimize the impact by asking others to repeat, avoiding difficult listening situations, and filling in what is said based on context (Andersson, Melin, Lindberg, & Berit, 1996; Kochin & Rogin, 2000). This can lead to misunderstandings, some of which may go unrecognized by the individual him or herself. Spouses or partners often contribute to the individual's ability to underappreciate the loss by providing the missed information and adapting to the individual's needs (Scarinci, Worrall, & Hickson, 2008). Further, the fact that hearing loss and hearing aids are also often perceived as stigmatizing and are associated with being old and disabled (Southhall, Gagne, Jennings, 2010; Kochkin & Rogin, 2000; Wallhagen, 2010), contributes to the denial of hearing loss, minimization of its impact, and delay of seeking help.

Screening for hearing loss in primary care settings during routine exams would promote awareness of hearing loss but there is a general lack of knowledge of and appreciation of hearing loss by health care practitioners and routine screening is rarely accomplished (Cohen, Labadie, & Haynes, 2005; Kochkin, 2005; Wallhagen & Pettingill, 2008). Further, practitioners usually prioritize other health-related concerns over hearing loss and thus rarely address it or refer patients for follow-up (Cohen et al., 2005). Because it is an invisible problem and individual face-to-face conversations are the easiest for individuals with hearing loss to manage, problems with hearing are not routinely identified during health exams unless the loss is significant.

Opportunities and Future Directions

Although there are significant barriers to the incorporation of hearing health care services into general practice and to the promotion of better utilization of those services that are available, the time may be right for significant progress to be made. First, the increasing numbers of "baby boomers" becoming eligible for Medicare are more technology savvy than prior generations (American Association of Retired Persons, 2009) and may significantly increase the demand for hearing services. Second, the need for individuals to remain in the work force longer and to continue to contribute to both Social Security and Medicare emphasizes the need to assure that these individuals can remain actively engaged Purcell 2007), which in turn requires adequate hearing. Third, hearing aid technology and other assistive listening devices have become much more sophisticated, allowing for better matching between the hearing needs of a given individual and the resources available (Kaplan-Neeman, Muchnik, Hildesheimer, & Henkin, 2012). Finally, a range of possible payment options can be considered to address the concerns of the various stakeholders involved, including relatively low-cost environmental modifications. These are outlined further below.

Hearing aid tax credit

Most professional and consumer organizations support a bill that has been introduced to provide a tax credit for the purposes of buying a hearing aid (H.R. 1317, 2013; S. 1694, 2013; Hearing Aid Assistance Tax Credit Act, sponsored by Representative Latham, R-IA and Senator Harkin, D-IA). This has generally been limited to small amounts, such as $500, and is further restricted to those with incomes of less than $200,000. This tax credit, however, does not address the actual cost of the hearing aid, improve the services offered, or assist those who currently do not pay taxes. If an "earned income tax" component was added it would broaden the range of persons who might benefit but the actual need

addressed is small. This legislation, which does not alter the current service delivery model or address the cost of the hearing aid or hearing services, is supported by practitioners in the hearing specialties.

Remove the statutory denial of services from Medicare

Legislation designed to amend Title XVIII of the Social Security Act to cover hearing aids and hearing services, such as those introduced in 2009 by Senator Sherrod Brown (D-OH) and Representative Gus Bilirakis (D-FL) (S. 1837, 2009; H.R. 504, 2009; Medicare Hearing Enhancement and Auditory Rehabilitation [HEAR] Act), and one recently introduced by Representative Matt Cartwright (D-PA) (H.R. 3150, 2013, Help Extend Auditory Relief [HEAR] Act), could be reconsidered but would need to be accompanied by a significant effort to promote their passage. Given prior experience, chances of passage in the current health care environment are unlikely, given concerns about cost. In fact, the Govtrac.us web site's prognosis for the H.R. 3150 was "0% change of being enacted" (https://www.govtrack.us/congress/bills/113/hr3150). Such bills are also generally opposed by most of the hearing specialty organizations because of concerns about the limitations Medicare could place on their ability to cover the cost of their services.

An alternative is to support a bill recently introduced by Representative Bilirakis (H.R. 2330, 2013; Medicare Services Audiology Enhancement Act). This piece of legislation would change Medicare law to allow coverage of hearing assessments and treatments by audiologists. Under current law, Medicare can only reimburse audiologists for diagnostic assessments and not for the treatment services they provide, even though the services are reimbursed when provided by other Medicare practitioners. This bill is supported by the American Speech-Language-Hearing Association (ASHA) and the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS), which is composed of physicians (Kirkwood, 2013).

Coverage of rehabilitative services could potentially minimize the need for "bundling" of costs and lead to greater transparency in the cost of a hearing aid. It could also promote greater attention to the provision of aural rehabilitation that can enhance adjustment to hearing loss, the development of better listening and communication skills, and the appropriate use of and adaptation to hearing aids (http://www.asha.org/public/hearing/Adult-Aural-Rehabilitation). Aural rehabilitation should be viewed as an essential component of a comprehensive hearing health care service. Other hearing health care specialists organizations, such as American Audiology Association and the Association of Doctors of Audiology, are currently not in favor of this bill because it preserves the need for an individual to have a referral from a physician and is perceived as not allowing them to "op-out" of Medicare assignment,

thus preventing them from billing over the amount allocated by Medicare (Kirkwood, 2013). The current Medicare coverage is perceived as inadequate. Amendments to the bill could take these demands into consideration if there was a requirement that the consumer be made aware of the potential charges and signs a waiver, but this would not necessarily encourage lower hearing aid charges. ENT physicians, however, do not support direct access and wish to maintain the referral provision. The bill has not moved out of Committee.

The Federal Employees Health Benefits Program mandates that health insurance companies bidding to be included as an option provide coverage for hearing health care services but these benefits vary widely as there is not a standard amount (Foehl, 2008). Unless individuals consider hearing loss when looking for a health plan there will be minimal pressure to expand coverage and promote the use of hearing health care services. Similarly, although Medicare Advantage plans sometimes cover hearing health care services, there are no standards (Shanor, 2013). However, mandating some form of coverage but providing flexibility might encourage competition and a broader range of options and might be acceptable to a wider group of hearing professionals. Given the changes occurring with the Affordable Health Care Act, it may be helpful to use data on the effectiveness or constraints of the Federal Employees plan to explore flexible options to inform approaches to enhancing the ACA, including adding hearing health care services to the list of essential health care benefits.

Clarify the cost of hearing health care services and support new models of care

Greater cost transparency could be achieved by the unbundling of fees. This approach has been taken by a number of audiologists and promoted by several hearing specialist organizations (Sjoblad & Winslow Warren, 2011; Sweetow, 2009a, 2009b). While this may not initially lead to lower costs, individuals and families would be more aware of what their payments covered and could purchase "packages" that might fit their needs. There is concern that this could promote less use of services needed to adjust and refine the fit of the hearing aid because this would entail an additional cost. However, it could encourage a greater focus on education about hearing loss and why adjustments and aural rehabilitation are needed. It also might further encourage the development of more cost effective models of care. These models, designed to allow individuals to obtain the least expensive hearing aids to meet their needs, are mainly focused on persons with mild or moderate hearing loss. Examples of these programs include those that allow individuals to assess their hearing loss on line and order pre-selected hearing aids; to submit hearing evaluations and get hearing aids by mail; or to have access to low cost

hearing aids initially designed to provide less expensive options for countries with fewer resources, such as Project Impact, (www.project-impact.net).

It is not clear how the programs just discussed will assist those with more complex types of hearing loss or who need greater amplification. What is important to monitor, and is of concern to most hearing health care specialist, is whether such services lead to the under identification of other serious otologic problems. Further, if hearing devices are not adjusted to the type of hearing loss individuals are experiencing, they may not use them and become even more resistant to additional assessments or the use of hearing aids. Given the extensive range of technology available and the ability of hearing professionals to customize the amplification to fit the individuals' hearing loss, further study is needed about the persons who best benefit from various levels of hearing technology. In any case, hearing aids are rarely the solution by themselves, especially because their effectiveness is affected by surrounding environmental sounds, the acoustics of the room, and the distance of the speaker from the person with hearing loss (Martin & Clark, 2000). Additional assistive listening technology is often needed to promote a better signal to noise ratio in order to facilitate hearing. That is, the emphasis is on enhancing the strength or loudness of the sound one desires to hear in comparison to any other interfering or background sound. Various ssistive listening devices are now available that, although not falling within the category of hearing aids and thus not regulated by the FDA, can be used to facilitate hearing. These include a variety of personal amplifiers as well as aps designed for smart phones.

Promote hearing loss as a health concern

Another strategy is to promote hearing loss as a public health issue and disseminate information to enhance awareness of the significance of hearing loss, its impact and strategies for treatment that include alternatives to hearing aids. Although age-related hearing loss is extremely common, there is a pervasive lack of awareness of and knowledge about hearing loss and approaches to its treatment (Agrawal et al., 2008; Bagai et al., 2006; Boulton, 2013; Chu et al., 2011; Cohen et al., 2005; Kochkin, 2005). Because it is not addressed in routine health evaluations, many older adults, as well as professionals, attribute hearing loss to normal aging rather than seeing it as a condition that influences a range of psychosocial and physical health concerns (Kochkin, 1999; NCOA, 1999; Wallhagen & Pettengill, 2008; Williamson & Fried, 1996). A broad-based public information initiative designed and implemented by an inter-professional and consumer-led group could enhance the visibility of hearing loss and promote its acceptance as an important health concern. Activities could leverage the awareness campaign carried out by the Hearing Loss Association of America through its Walk4Hearing events

(http://hlaa.convio.net) which, while helpful, currently do not receive the visibility necessary to gain the type of traction needed. Public service announcements and the engagement of local health care practitioners, along with information disseminated through senior centers and the Aging Network (www.n4a.org), might also be used to reach the target audience. This educational campaign could include information on hearing loss, the fact that it involves a distortion of sound, the value of early treatment, the need to adjust to hearing aids, the need for other assistive devices in addition to hearing aids in key situations, and the fact that hearing aids are not the only option. Additionally, education would focus on the importance of hearing to an individual's safety.

A special initiative could focus specifically on health care practitioners and other health care workers who know very little about age-related hearing loss. Greater attention needs to be given to hearing loss in current medical and nursing curricula as well as in both in-person and on-line continuing education programs. Questions built into competency exams for health care practitioners would promote greater attention to the need to know such information. However, additional attention must also be given to persons working in long- term care settings where the prevalence of hearing loss is very high and the knowledge of the direct care workers on how to care for persons with hearing loss or manage their hearing aids is extremely lacking (Cohen-Mansfield & Taylor, 2004; Garahan, Waller, Houghton, Tisdale, & Runge, 1992). The need for this education is emphasized by the awareness that older persons, especially in long-term care settings, are often misdiagnosed as cognitively impaired when they are actually hearing impaired (Ohta, Carlin, & Harmon, 1981; Valentjin et al., 2005).

Promote hearing friendly environments

Currently, although the aesthetics and environmental impact of a building, development, or outdoor entertainment area are the focus of much discussion, minimal consideration is given to the way in which an environment supports successful communication. However, the promotion of hearing-friendly environments could have a wide-ranging impact and enhance communication passively for those with and without hearing loss (Hull, 2011). Considerations should include use of acoustical designs; incorporation of induction loops into buildings for use by persons with hearing aids that have telecoils, especially in settings used as public spaces and/or designed to provide entertainment; and evaluation of designs for unintended consequences in terms of hearing accessibility (too many or too few reverberations). Such considerations would both facilitate access and enhance awareness of the importance of hearing. This could involve working with architects and building such design considerations into their curriculum. In contrast, the current focus is not on maximizing the hearing-

friendly nature of environments but rather on enhancing their ability to generate noise. Restaurants are intentionally made so that their acoustics are harsh and maximize reverberations and sound. Sports arenas are competing to be the noisiest and actively solicit the fans to shout louder and generate more noise (http://espn.go.com/nfl/story/_/id/10071653/seattle-seahawks-fans-set-stadium-noise-record). The long-term effects on the participants have not been studied but the emphasis on loudness raises concerns about the future and the potential for more wide spread noise-induced hearing loss.

Efforts to more fully incorporate induction loops or other assistive listening devices in airports and captioning for internet access as well as movies need to be encouraged and supported. Consideration has to be given to the fact that most adult persons with hearing loss do not sign and need captioning rather than a sign language interpreter to hear. Examples of the benefits of induction loops for successful hearing can be found from houses of worship (http://www.youtube.com/watch?v=_3XoVrUjfaY), taxis (http://www.youtube.com/watch?v=YzvejjipQy0), and subways (http://www.youtube.com/watch?v=Ahbz0VvlZF0).

In addition, strategies to enhance safety in the event of a disaster need to be further refined and broadly publicized. Although hotels are supposed to have special rooms and/or services for persons with disabilities, persons with hearing loss have expressed that these may not be located by the hotel personnel (personal communication, 2013). For safety in health care settings, hospital kits have been designed as noted above but have tended to be location specific and not widely distributed or advertised. This is also true of kits to use in the event of a disaster. The impact of various safety interventions needs further evaluation and refinement.

Summary

Hearing loss is an extremely common chronic condition, especially in older adults. Although data support its negative impact on health and well-being, hearing loss is generally underappreciated as an important health related problem. Multiple barriers minimize the current use of hearing health care services, including lack of Medicare coverage for hearing aids and aural rehabilitative services. However, the time may be right for significant progress to be made in addressing hearing loss as a public health issue and considering a range of policy options that would facilitate the use of hearing health care services, including aural rehabilitation. Options include legislation that allows Medicare to cover services, promoting hearing loss as a public health issue, enhancing awareness and knowledge of hearing loss and its importance, promoting the development of hearing friendly environments,

supporting new models of hearing health care delivery, and supporting additional research focused on risk factors for hearing loss and strategies to minimize its impact. Issues addressed by research could include studies on: the potential contribution of ototoxic medications that are given in low doses across a long time, such as diuretics, and their interaction with or synergistic effects on age related-hearing loss; the impact of hearing aids on cognitive and physical functioning; the benefits of alternative forms of treatment and the use of personal amplifying equipment; how to incorporate cost effective screening and education into primary care setting to enhance early identification and treatment; and further documenting the cost to society of hearing loss in older adults. The benefits derived from investment in these areas could be seen in enhanced well-being as well as cognitive and functional health, longer work force participation, and greater involvement in volunteer activities.

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