

# Hearing and Health Outcomes: Recognizing and Addressing Hearing Loss in Hospitalized Older Adults

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## ABSTRACT

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As age increases, the prevalence of hearing loss significantly increases, reaching up to 89% of those 80 years and older. Hearing loss in older patients is often unrecognized and its consequences are often underappreciated. Hearing loss can interfere with the ability to exchange important health information and to participate in health care decision-making. Hearing loss during hospitalization increases the risk of misdiagnosis. There is a lack of empirical data regarding prevalence and recognition of hearing loss in hospitalized older adults. In this article, we describe a variety of negative outcomes that may result when older inpatients are functioning with unrecognized hearing loss.

**KEYWORDS:** Hearing loss, inpatients, health care decision-making, unrecognized hearing loss

**Learning Outcomes:** As a result of this activity, the participant will be able to (1) list three negative outcomes associated with unrecognized hearing loss in older adults; (2) give examples of communication difficulties described by hospitalized adults who have hearing loss; (3) list negative outcomes associated with hearing loss in older hospitalized adults.

Hearing loss is the third most reported chronic condition in the United States.<sup>1</sup> In a study analyzing data from the 2005 to 2006 cycles of the National Health and Nutrition Examination Survey (NHANES), the preva-

lence of hearing loss in those ages 70 and over was 63.1%.<sup>2</sup> Lin et al reported the prevalence of hearing loss significantly increased with age and reached 80.6% in those age 85 years and above.<sup>2</sup> Likewise, Cruickshanks et al reported that

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hearing loss increased greatly with age and reached a prevalence of 89.5% in those aged 80 years and older.<sup>3</sup> In general, these prevalence data have been collected on typically functioning, community-dwelling older adults, via participation in actual hearing tests or via responses to surveys. Despite the high prevalence of hearing loss in older adults, the condition remains largely unrecognized and underappreciated in older adults across community settings and potentially during hospital stays.<sup>4-6</sup>

Along with prevalence data on this population, there is a growing literature describing the varied effects of untreated hearing loss on an individual's function and potential for successful aging. Hearing loss negatively impacts psychosocial health and cognitive functioning.<sup>7-9</sup> Hearing loss can affect a person's quality of life and overall ability to function.<sup>10</sup> Persons with hearing loss have more physician visits and may have more hospital visits.<sup>11-13</sup> Genther et al analyzed two cycles of the NHANES data to examine the association between hearing loss and hospitalization in individuals age 70 and above.<sup>14</sup> These results, published in 2013, showed that those with audiometrically confirmed hearing loss had more hospitalizations than those with normal hearing sensitivity. Later, Genther et al conducted a prospective study that examined audiometry results and quantification of documented hospitalization episodes.<sup>15</sup> The results showed that hearing loss was associated with a higher incidence and annual rate of hospitalization in community-dwelling older adults. Additionally, older adults with hearing loss experience more difficulties and delays in accessing health care,<sup>16</sup> compared with their normal-hearing peers. Delay in health care access could potentially contribute to a higher number of hospital admissions for older adults who have hearing loss.

**POTENTIAL IMPACT OF HEARING LOSS IN THE HOSPITAL ENVIRONMENT**

Given the associations between hearing loss, health, and hospitalizations in older adults, it is reasonable to consider the impact of hearing loss on inpatient hospital experiences and outcomes. Aside from the goal of achieving the best possible outcomes from a hospital stay, hospital administrators have an array of associated risks of which they should be aware. These risks are listed in Table 1 and further explained here.

First, hearing loss increases the risk of medical misdiagnosis,<sup>17,18</sup> potentially resulting in longer and more expensive length of stay. For Medicare patients, where reimbursement is fixed based on diagnosis, hospitals must strive for the most efficient diagnosis and treatment, including the shortest possible length of stay. Second, hearing loss has been associated with an increase in the probability of falls.<sup>19,20</sup> Fall prevention for inpatients is a high priority in hospital cost containment plans. By identifying patients with hearing loss, it may be possible to reduce associated fall risks in the hospital. A third reason for attention is that the Americans with Disability Act (ADA) mandates communication accessibility for hospitals and other medical facilities.<sup>21</sup> Administrators aim to avoid violations of the ADA regulations, which can result in costly lawsuits and unsatisfactory public relations. Consideration of hearing accessibility beyond the use of a sign language interpreter is necessary, because the vast majority of inpatients with hearing loss are strictly aural/oral communicators. Finally, poor provider-patient communication has the potential for the misunderstanding of health choices, discharge instructions, and medication directions. These miscommunications have the potential to result in poorer adherence to discharge instructions and possible unplanned readmission. Unplanned readmission within 30 days is

**Table 1 Rationale for Hospital Administrators to Address Hearing Loss in Older Inpatients**

Risk	Potential Undesirable Outcome
Misdiagnosis <sup>17,19</sup>	Longer length of stay, higher cost
Increased falls <sup>19,20</sup>	Complication/extension of stay, higher cost
Lack of communication accessibility <sup>21</sup>	Americans with Disability Act violation
Risk to physician-patient communication <sup>23-26</sup>	Lower postdischarge adherence, readmission

considered an adverse event representing poor quality and high hospital expense when Medicare patients are involved.

The capacity to receive verbal information is compromised in patients with hearing loss. Inpatients with hearing loss are at an increased risk for miscommunications because of adverse noise conditions in the typical hospital listening environment.<sup>4,22-24</sup> Pope et al conducted a study on inpatients at a veterans hospital, examining patients' ability to identify and recall high-context and low-context speech against a background of simulated hospital noise.<sup>25</sup> Results showed that patients with hearing loss may have less success in hearing, understanding, and remembering new information in the hospital compared to those with normal hearing. These authors suggested that patients who do not hear and understand information exchanged during hospitalizations could potentially be at a higher risk for readmission.

Poor physician-patient communication is associated with a limited quality of health care decision-making.<sup>26</sup> Active patient participation in health care decision-making is essential to optimal patient outcomes and is a goal of the U.S. Department of Health and Human Services.<sup>27</sup> This is of particular importance in the hospital environment, where medical decisions need to be made quickly and family members are not always present to support communication interactions. Patients with hearing loss are at risk for communication breakdowns during the exchange of health information while hospitalized.<sup>5,24,28-30</sup> Fook et al evaluated the impact of hearing loss on communication between older patients and medical staff (physicians and nurses).<sup>28</sup> Twenty-two percent of patients rated communication with their doctor as poor, very poor, or unsatisfactory. With the addition of voice amplifiers and acetate cards informing staff of patients' hearing loss, there was a significant improvement in the perception of communication, with only 6% of patients reporting poor or unsatisfactory communication with their doctor. Prior to the addition of voice amplifiers and informational cards, there was a significant difference between patients' perception of communication with nurses and that of doctors. Nurses scored significantly better than doctors. However, with

the introduction of the voice amplifiers and cards, there was no significant difference in perception of communication with nurses versus doctors.

Mulley and Ng conducted a survey with 53 hearing aid users attending an audiology clinic to determine if hearing loss led to difficulties during recent hospitalizations.<sup>31</sup> Sixty-two percent of the respondents described problems during hospital visits that included difficulty following directions and interference from background noise. Other complaints described physicians speaking at a rapid rate while not facing patients, shouting questions, and assuming that patients had comprehended their message. Given the communication barriers that arise for older inpatients, it is clear that hearing loss may contribute to reduced participation in the medical decision-making process.

## HEARING LOSS AND POTENTIAL HOSPITAL COMPLICATIONS

In hospitalized older adults, hearing loss has been identified as a significant risk factor for developing delirium.<sup>32</sup> According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition criteria for delirium, the main features are: disturbance in attention and awareness, acute development and tendency to fluctuate, and additional disturbances in cognition.<sup>33</sup> In older adults, delirium is the most frequent complication of hospitalization,<sup>34,35</sup> and it occurs in 11 to 42% of hospital admissions.<sup>36</sup> *Incident delirium* refers to delirium that occurs following hospital admission and can develop at any time during hospitalization. Incident delirium is certainly an undesirable hospital complication because it is associated with increased morbidity and mortality, increased length of stay, and increased institutionalization upon hospital discharge.<sup>37-39</sup>

Another potential complication for older inpatients is an accidental fall. Evidence suggests an association between hearing loss and falls among older adults.<sup>20</sup> Lin et al examined the relationship between hearing loss and fall history from participants in the NHANES data set (2001 to 2004).<sup>20</sup> Similarly, Kamil et al studied a large cohort of older adults age 70 to 79.<sup>40</sup> Data from audiometry and self-reported

number of falls were used in analyses to investigate whether hearing loss was associated with frailty and falls. Results indicated that those participants with moderate or greater hearing loss had greater odds of falling over time, compared to those with no hearing loss. These results showed that greater hearing loss was independently associated with self-reported falls in the preceding year. These findings were consistent with those of Lopez et al and Viljanen et al demonstrating that the consequences of hearing loss are not necessarily restricted to communication ability alone, but also to patient safety.<sup>41,42</sup>

### **HEARING LOSS: LARGELY UNDERRECOGNIZED AND UNDERADDRESSED**

Hospital staff often lack the formal training and skills needed to recognize and to communicate effectively with patients with hearing loss.<sup>22</sup> Studies have addressed both the lack of hospital staff's awareness of hearing loss within the patient population and inadequate training in communication strategies.<sup>29</sup> The invisible nature of hearing loss is particularly challenging to hospital care providers.<sup>43</sup> Heron and Wharrad investigated nursing staff's ability to accurately identify the presence and degree of hearing loss in older patients.<sup>22</sup> Nurses' judgments as to the presence of hearing loss were compared with the results of audiometric testing: 15 of 49 (30.6%) of the nurse responses correctly identified the presence of hearing loss, 30 of 49 (61.2%) failed to identify existing hearing loss, and 4 of 49 (8.2%) were unsure regarding the presence of hearing loss. With regard to the degree of hearing loss present, 14 (53.8%) responses matched the measured degree of hearing loss and 2 (7.7%) gave incorrect assessments of degree. Ten (38.5%) were unsure of the degree of hearing loss. The authors of the study concluded that medical and nursing staff need further resources and training to address the assessment of patients' hearing abilities. VanCott explored communication patterns between older patients (age 65 to 95 years) and nurses during admission assessment on general medical-surgical units in two acute care hospitals.<sup>24</sup> This author categorized miscommunica-

tions into six areas including: acoustics, phonology and syntax, lexicon, conceptions, intent, and credence. A breakdown in communication due to acoustics (message not reaching the hearer) occurred in 50% of admission interviews and was mainly due to noise in the environment. VanCott further reported that nurses failed to recognize when patients were experiencing hearing difficulties during the interview and that acoustical problems occasionally resulted in patients providing misleading information during the admission assessment.<sup>24</sup>

There is currently no standard protocol guiding hearing screening or evaluation procedures in the inpatient hospital setting. Screening audiometry is not a routine component of hospital admissions or nursing assessment procedures. Therefore, the most likely scenario for identification of hearing loss on admission involves direct questioning or informal observation by nursing staff. When asked directly about hearing status, older individuals will typically underestimate their own degree of hearing impairment when compared to the gold standard of audiometry.<sup>43-48</sup> In the absence of direct questioning regarding hearing loss, nursing staff may use informal observation to assess an older hospital patient's hearing and communication ability. Heron and Wharrad collected survey responses to describe the methods most often used by nurses to assess a patient's communication ability.<sup>22</sup> The most frequently used method involved having a conversation with the patient, followed by observing if the patient wears a hearing aid. The next most common method was to ask the patient directly if they had a hearing problem. Another aim of that study was to examine the extent to which nurses were aware of patients' communication ability. Results suggested that nurses were largely unaware of patients' hearing ability, though they had demonstrated theoretical knowledge of hearing loss. Similarly, Hines investigated communication problems of patients with hearing loss in the hospital.<sup>29</sup> He administered surveys to patients with hearing loss who had been in the hospital in the prior 3 years. Respondents reported that their communication needs had not been adequately addressed by hospital staff. The author

concluded that shortcomings seemed to result from inadequate training of nurses and doctors and from patients' reluctance to reveal their communication difficulties to the staff.

### **QUALITY IMPROVEMENT EFFORTS TARGETING OLDER INPATIENTS WITH HEARING LOSS**

As noted earlier, several studies have quantified the prevalence of hearing loss in community-dwelling older adults, but not in hospitalized patients. Similarly, it is unclear what the most feasible and effective method of identifying hearing loss might be in the hospital setting where immediate health needs are top priority. Given these challenges, the authors of this article have undertaken a quality improvement project to investigate related questions at a large urban hospital in Pittsburgh, Pennsylvania. This project grew out of an interprofessional collaboration between clinicians, students, and investigators from audiology, nursing, and geriatrics. Within the hospital, our group has become known as the Communication, Hearing, and Audiometry Team (CHAT), and we have reached out to patients, nurses, physicians, and other care providers throughout the hospital units. An overarching goal of this project had been to assess the visibility of hearing loss under standard hospital conditions. Preliminary results of this project support the challenging nature of recognizing existing hearing loss in older hospital patients. The results from this study will be disseminated in a future publication.

### **CONCLUSIONS AND DISCUSSION**

Given the known prevalence of hearing loss in community-dwelling older adults, it is likely that at least two thirds of older hospitalized patients have some degree of hearing loss. For some of these patients, the hearing loss will not significantly impede the flow of health-related communication. For others, the ability to receive important health information may be seriously compromised. The latter group includes those inpatients we can describe as functioning with a high communication risk level. It appears that the invisibility of hearing

loss remains a challenge in recognizing and addressing the associated communication risk. Furthermore, hearing may be a low priority for patients when they are worried about pressing health issues, potentially impacting the accuracy of self-report responses. Unfortunately, a hospital stay is precisely the time when critical health information is exchanged, often under adverse listening conditions.

### **FUTURE CONSIDERATIONS**

In keeping with Taylor's call for a model of interventional audiology, it seems that the inpatient hospital setting is a relevant environment for action.<sup>43</sup> Future data regarding the impact of hearing loss on hospital outcomes will further clarify the extent of this problem. One approach to improve identification of hearing loss could involve restructuring the questions or procedures included in the admission process. Given the high prevalence of hearing loss in the older hospitalized population, another approach might be to include a quick, objective measure of hearing thresholds on admission, for all older patients. This measure could lead to an assessment of communication risk and could trigger preventative interventions (e.g., personal amplifier, risk notice in the electronic medical record, wrist band notification). Any of these methods would necessitate buy-in from the entire health care team and hospital administrators. In all, it seems that the invisibility of hearing loss might best be remedied by audiologists reaching across health disciplines with an interventional approach.

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### **REFERENCES**

1. Schiller JS, Lucas JW, Ward BW, Peregoy JA. Summary health statistics for U.S. Adults: National health interview survey. National Center for Health Statistics. Vital Health Stat; 2012. Available at: [https://www.cdc.gov/hchs/data/series/sr\\_10/sr10\\_252.pdf](https://www.cdc.gov/hchs/data/series/sr_10/sr10_252.pdf). Accessed on January 16, 2017
2. Lin FR, Thorpe R, Gordon-Salant S, Ferrucci L. Hearing loss prevalence and risk factors among

- older adults in the United States. *J Gerontol A Biol Sci Med Sci* 2011;66(5):582–590
3. Cruickshanks KJ, Wiley TL, Tweed TS, et al; The Epidemiology of Hearing Loss Study. Prevalence of hearing loss in older adults in Beaver Dam, Wisconsin. *Am J Epidemiol* 1998;148(9):879–886
  4. Hardin SR. Hearing loss in older critical care patients: participation in decision making. *Crit Care Nurse* 2012;32(6):43–50
  5. Iezzoni LI, O'Day BL, Killeen M, Harker H. Communicating about health care: observations from persons who are deaf or hard of hearing. *Ann Intern Med* 2004;140(5):356–362
  6. Bagai A, Thavendiranathan P, Detsky AS. Does this patient have hearing impairment? *JAMA* 2006;295(4):416–428
  7. Brink P, Stones M. Examination of the relationship among hearing impairment, linguistic communication, mood, and social engagement of residents in complex continuing-care facilities. *Gerontologist* 2007;47(5):633–641
  8. Kramer SE, Kapteyn TS, Kuik DJ, Deeg DJ. The association of hearing impairment and chronic diseases with psychosocial health status in older age. *J Aging Health* 2002;14(1):122–137
  9. Lin FR, Metter EJ, O'Brien RJ, Resnick SM, Zonderman AB, Ferrucci L. Hearing loss and incident dementia. *Arch Neurol* 2011;68(2):214–220
  10. Dalton DS, Cruickshanks KJ, Klein BE, Klein R, Wiley TL, Nondahl DM. The impact of hearing loss on quality of life in older adults. *Gerontologist* 2003;43(5):661–668
  11. Green CA, Pope CR. Effects of hearing impairment on use of health services among the elderly. *J Aging Health* 2001;13(3):315–328
  12. Zazove P, Niemann LC, Gorenflo DW, et al. The health status and health care utilization of deaf and hard-of-hearing persons. *Arch Fam Med* 1993;2(7):745–752
  13. Kurz RS, Haddock C, Van Winkle DL, Wang G. The effects of hearing impairment on health services utilization. *Med Care* 1991;29(9):878–889
  14. Genter DJ, Frick KD, Chen D, Betz J, Lin FR. Association of hearing loss with hospitalization and burden of disease in older adults. *JAMA* 2013;309(22):2322–2324
  15. Genter DJ, Betz J, Pratt S, et al; Health, Aging and Body Composition Study. Association between hearing impairment and risk of hospitalization in older adults. *J Am Geriatr Soc* 2015;63(6):1146–1152
  16. Pandhi N, Schumacher JR, Barnett S, Smith MA. Hearing loss and older adults' perceptions of access to care. *J Community Health* 2011;36(5):748–755
  17. Jorgensen LE, Palmer CV, Pratt S, Erickson KI, Moncrieff D. The effect of decreased audibility on MMSE performance: a measure commonly used for diagnosing dementia. *J Am Acad Audiol* 2016;27(4):311–323
  18. Crews JE, Campbell VA. Vision impairment and hearing loss among community-dwelling older Americans: implications for health and functioning. *Am J Public Health* 2004;94(5):823–829
  19. Grue EV, Ranhoff AH, Noro A, et al. Vision and hearing impairments and their associations with falling and loss of instrumental activities in daily living in acute hospitalized older persons in five Nordic hospitals. *Scand J Caring Sci* 2009;23(4):635–643
  20. Lin FR, Ferrucci L. Hearing loss and falls among older adults in the United States. *Arch Intern Med* 2012;172(4):369–371
  21. Barnartt SN, Seelman KD, Gracer B. Policy issues in communications accessibility. *J Disabil.* 1990;1(2):47–63
  22. Heron R, Wharrad HJ. Prevalence and nursing staff awareness of hearing impairment in older hospital patients. *J Clin Nurs* 2000;9(6):834–841
  23. Choiniere DB. The effects of hospital noise. *Nurs Adm Q* 2010;34(4):327–333
  24. VanCott ML. Communicative competence during nursing admission interviews of elderly patients in acute care settings. *Qual Health Res* 1993;3(2):184–208
  25. Pope DS, Gallun FJ, Kappel S. Effect of hospital noise on patients' ability to hear, understand, and recall speech. *Res Nurs Health* 2013;36(3):228–241
  26. Amalraj S, Starkweather C, Nguyen C, Naeim A. Health literacy, communication, and treatment decision-making in older cancer patients. *Oncology (Williston Park)* 2009;23(4):369–375
  27. U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. National Action Plan to Improve Health Literacy. Washington, DC: U.S. Department of Health and Human Services; 2010
  28. Fook L, Morgan R, Sharma P, Adekoke A, Turnbull CJ. The impact of hearing on communication. *Postgrad Med J* 2000;76(892):92–95
  29. Hines J. Communication problems of hearing-impaired patients. *Nurs Stand* 2000;14(19):33–37
  30. Weinstein BE. Tool kit for screening otologic function of older adults1. *Am J Audiol* 2013;22(1):179–182
  31. Mulley GP, Ng KY. Problems encountered by hearing-impaired people in hospitals. *Lancet* 1995;345(8965):1640
  32. Inouye SK, Viscoli CM, Horwitz RI, Hurst LD, Tinetti ME. A predictive model for delirium in hospitalized elderly medical patients based on admission characteristics. *Ann Intern Med* 1993;119(6):474–481
  33. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 5th ed.

- Arlington, VA: American Psychiatric Publishing; 2013
34. Gillick MR, Serrell NA, Gillick LS. Adverse consequences of hospitalization in the elderly. *Soc Sci Med* 1982;16(10):1033–1038
  35. Young J, Inouye SK. Delirium in older people. *BMJ* 2007;334(7598):842–846
  36. Siddiqi N, House AO, Holmes JD. Occurrence and outcome of delirium in medical in-patients: a systematic literature review. *Age Ageing* 2006; 35(4):350–364
  37. Inouye SK, Rushing JT, Foreman MD, Palmer RM, Pompei P. Does delirium contribute to poor hospital outcomes? A three-site epidemiologic study. *J Gen Intern Med* 1998;13(4):234–242
  38. McCusker J, Cole M, Dendukuri N, Han L, Belzile E. The course of delirium in older medical inpatients: a prospective study. *J Gen Intern Med* 2003; 18(9):696–704
  39. George J, Bleasdale S, Singleton SJ. Causes and prognosis of delirium in elderly patients admitted to a district general hospital. *Age Ageing* 1997; 26(6):423–427
  40. Kamil RJ, Betz J, Powers BB, et al; Health ABC study. Association of hearing impairment with incident frailty and falls in older adults. *J Aging Health* 2016;28(4):644–660
  41. Lopez D, McCaul KA, Hankey GJ, et al. Falls, injuries from falls, health related quality of life and mortality in older adults with vision and hearing impairment—is there a gender difference? *Maturitas* 2011;69(4):359–364
  42. Viljanen A, Kaprio J, Pyykkö I, et al. Hearing as a predictor of falls and postural balance in older female twins. *J Gerontol A Biol Sci Med Sci* 2009;64(2):312–317
  43. Taylor B. Interventional audiology: broadening the scope of practice to meet the changing demands of the new consumer. *Semin Hear* 2016;37(2): 120–136
  44. Pacala JT, Yueh B. Hearing deficits in the older patient: “I didn’t notice anything.”. *JAMA* 2012; 307(11):1185–1194
  45. Alcock CIt’s not denial. It’s observation. *The Hearing Review*. 2015. Available at: <http://www.hearingreview.com/2015/11/not-denial-observation/>. Accessed October 13, 2016
  46. Choi JS, Betz J, Deal J, et al. A comparison of self-report and audiometric measures of hearing and their associations with functional outcomes in older adults. *J Aging Health* 2016;28(5):890–910
  47. Wallhagen MI, Pettengill E, Whiteside M. Sensory impairment in older adults: part 1: hearing loss. *Am J Nurs* 2006;106(10):40–48, quiz 48–49
  48. World Health Organization. *Guidelines for Hearing Aids and Services for Developing Countries*. Geneva, Switzerland: World Health Organization; 2004