Auditory Insight®

Barriers to **Adult Cochlear Implantation**

RESEARCH NOTE | Q1 2022

Introduction from Nancy M. Williams, Auditory Insight President

A gap exists in the industry's dialog on how uncertain outcomes for cochlear implants impact patient demand. This novel finding is at the heart of our Q1 2022 Research Note.

Recent research highlights the critical role of patient demand in increasing adoption of cochlear implants (CIs) in the U.S. adult population.[1,2] Currently, the CI penetration in the indicated US adult population is about 5%.[3]

To explore the impact of patient demand on the low adoption of CIs, I partnered with Guest Contributor Erin Schafer, Ph.D., Professor and Audiologist. We examined patient barriers across three categories: CI candidate and patient beliefs, the general public's perceptions, and the patient experience within the hearing healthcare delivery system. We curated, analyzed, and synthesized six recent publications in the peer-reviewed hearing health literature.

Dr. Schafer and I reached three important conclusions:

- Three of the top five expressed patient concerns center around whether a CI would improve communication ability and music appreciation better than hearing aids
- Uncertainty surrounding the outcome of cochlear implantation drives these top patient concerns
- Variability in patient experience with the CI healthcare system and public perceptions about surgical risks exacerbate patient concerns about uncertain outcomes.

For gene and drug therapy companies in hearing healthcare, as well as CI manufacturers and CI centers, we see a host of implications.

We look forward to discussing this Auditory Insight research note with our valued clients.

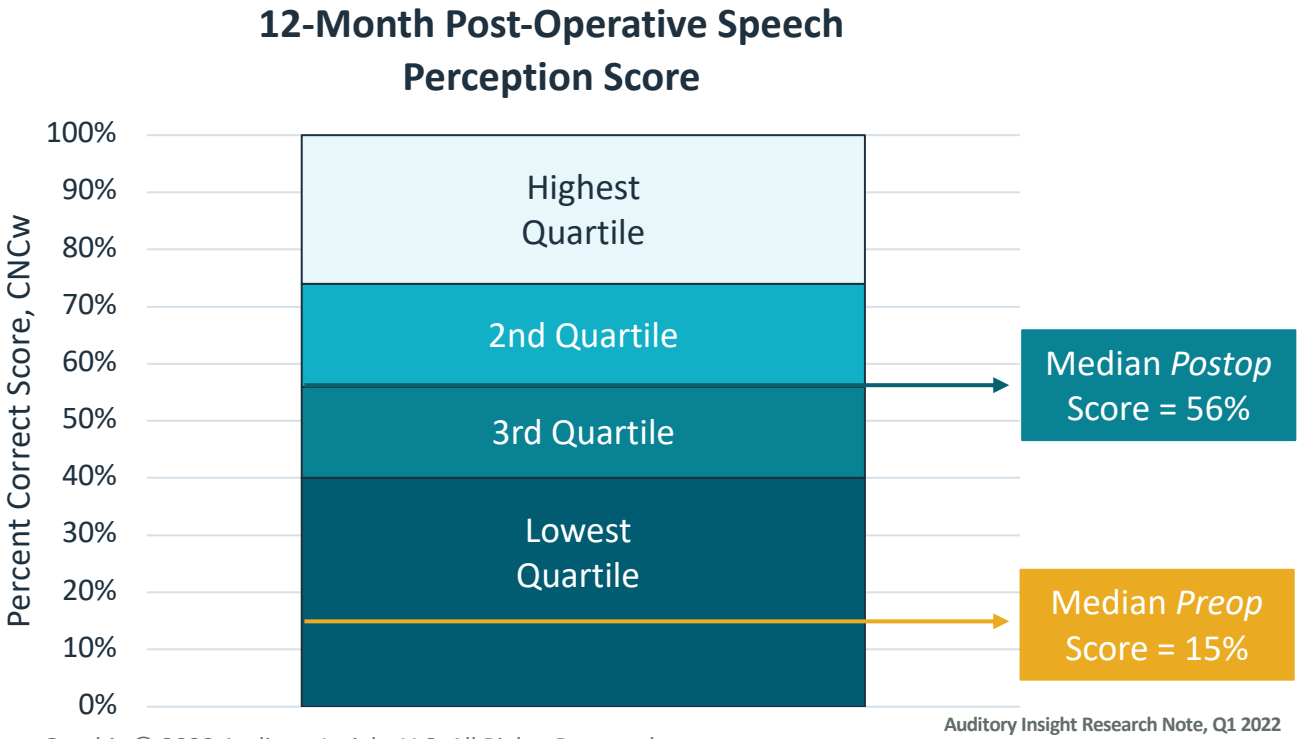
In our Q4 2021 Research Note, we indicated this note would profile companies likely to lead in developing the OTC market. Instead, we will cover that topic later in 2022.

Patients Experience Considerable Uncertainty Around Cochlear Implant Outcomes

An important foundation to understanding adult patient barriers to CI adoption is the wide range in outcomes. Patients' 12-month post-operative speech perception ranges from 0% to 100%, according to a recent study that mined a multi-institutional outcomes database.[4] Guest Contributor Dr. Erin Schafer is a co-author of this study.

The median patient experiences a measurable increase in word recognition, from 15% pre-implant (aided) to 56% 12 months after implantation, as shown below. The highest quartile of patients, who register post-operative word recognition of close to 75% or greater, will likely enjoy an increase in hearing that dramatically improves quality of life. In contrast, the lowest quartile of patients score 40% or less in speech recognition.

Auditory Insight believes this wide range of speech perception outcomes translates into considerable uncertainty for patients. Although clinicians may counsel that patients with higher pre-operative speech recognition generally realize the best outcomes, patients may still struggle to make an informed decision. For example, how does their hearing loss history and willingness and ability to undergo rehabilitation affect their predicted outcome? Patients lack a mechanism for predicting their outcome.

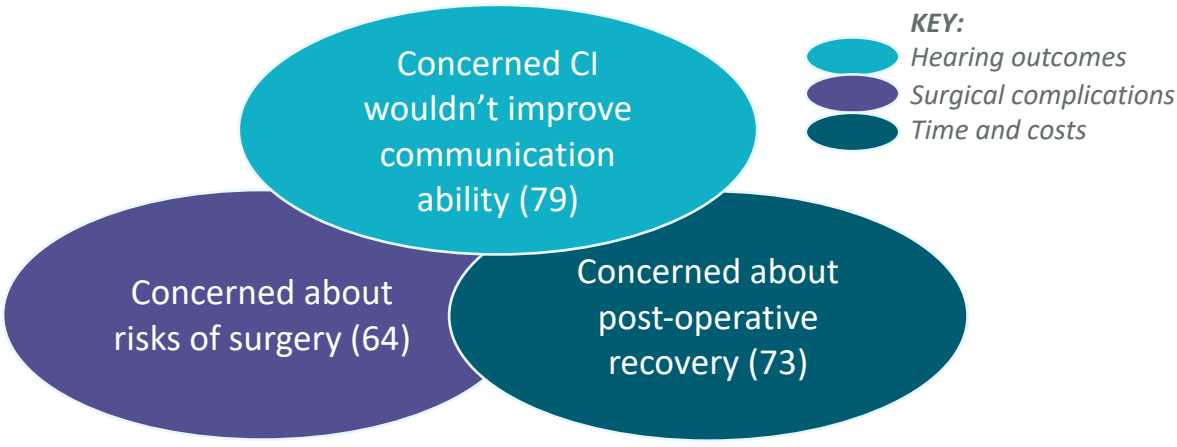


Auditory Insight Research Note, Q1 2022

Top Patient Concern Is That CI Would Not Improve Ability to Communicate

In a recent study, patients indicate their primary concern with implantation is that a CI would not improve their ability to communicate.[5] This study surveyed 52 patients from a single center and included roughly equal numbers of CI recipients and people who were candidates but did not opt to pursue a CI. Auditory Insight's perspective is that the uncertainty surrounding outcomes for cochlear implantation is the primary driver of this top patient concern. Our perspective is that patients question whether a CI would improve their ability to communicate at all given outcome uncertainty.

Top Three Patient Barriers Regarding Cochlear Implantation (Median Patient Rating)



Concerns about post-operative recovery is a second-tier barrier. The survey asks patients to rank the statement, *"I was concerned about the post-operative recovery process, including the adaptive period to adjust to the cochlear implant."* Patient concerns with recovery reflect not only the time for surgical healing, but also waiting for CI activation and participating in rehabilitation.

In the second tier, patients also express a concern about the specific risks of CI surgery. Auditory Insight analysis notes that this patient concern about surgical risks echoes public perceptions. In addition, our analysis of the questionnaire showed that the study does not probe on respondents' concerns with specific surgical complications, such as vertigo.

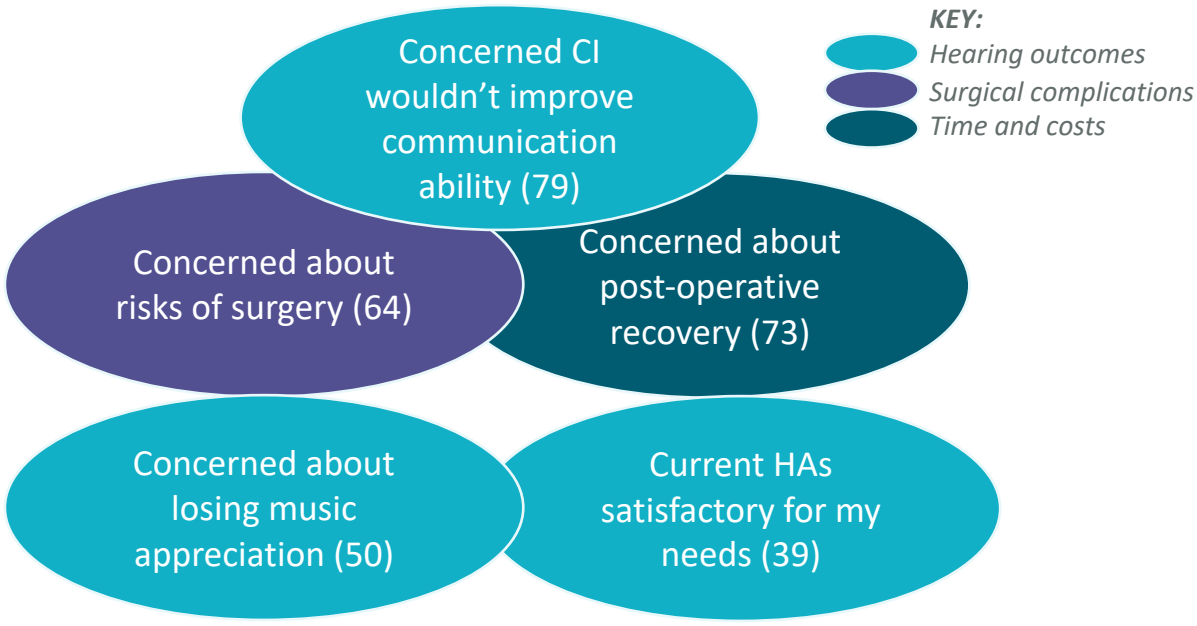
Three of Top Five CI Concerns Driven by Outcome Uncertainty

Expanding to the third tier in this same study[5] reveals two additional patient concerns, losing music appreciation and that a CI is unnecessary because hearing aids suffice. Auditory Insight analysis groups these with the top concern that a CI would not improve communication ability. We believe that these three concerns about hearing outcomes stem from patients' inability to predict the outcome of their surgery based on their unique profile.

Fears surrounding loss of music appreciation originate in mixed post-operative outcomes, with some CI recipients reporting adequate music appreciation while others report their ability to play or listen to music is destroyed. Clearly limitations in CI technology impact music perception post-surgery.

Given the uncertainty of CI surgical outcomes, many patients are no doubt motivated to limp along with their hearing aids for as long as possible. The literature supports this conclusion; the typical patient waits until their hearing loss reaches a profound level before proceeding with a CI.[4,6]

Hierarchy of Patient Barriers to Cochlear Implantation (Median Patient Rating)



Public Perceives Primary Benefit of Cochlear Implantation to be Hearing Strangers In Noise

When CI candidates evaluate implantation, they often solicit advice from family members, close friends and even coworkers. Taken together, the people in candidates' circles make up the general public.

In a survey of over 600 people in the U.S. general public, the perceived risks of cochlear implantation in most cases outweigh the benefits.[7]

To participate in this study, respondents did not need to have or even know someone with hearing loss.

The top benefits selected by survey participants, shown in the graphic at right, center around enhanced communication. Respondents assigned the highest priority to people's ability to converse with a stranger.

Auditory Insight believes that the public demonstrates a good understanding of a key challenge faced by people with hearing loss: the difficulty of recognizing and understanding an unfamiliar voice in a noisy environment.

Public Perceptions of Benefit-Risk Tradeoffs for Cochlear Implants

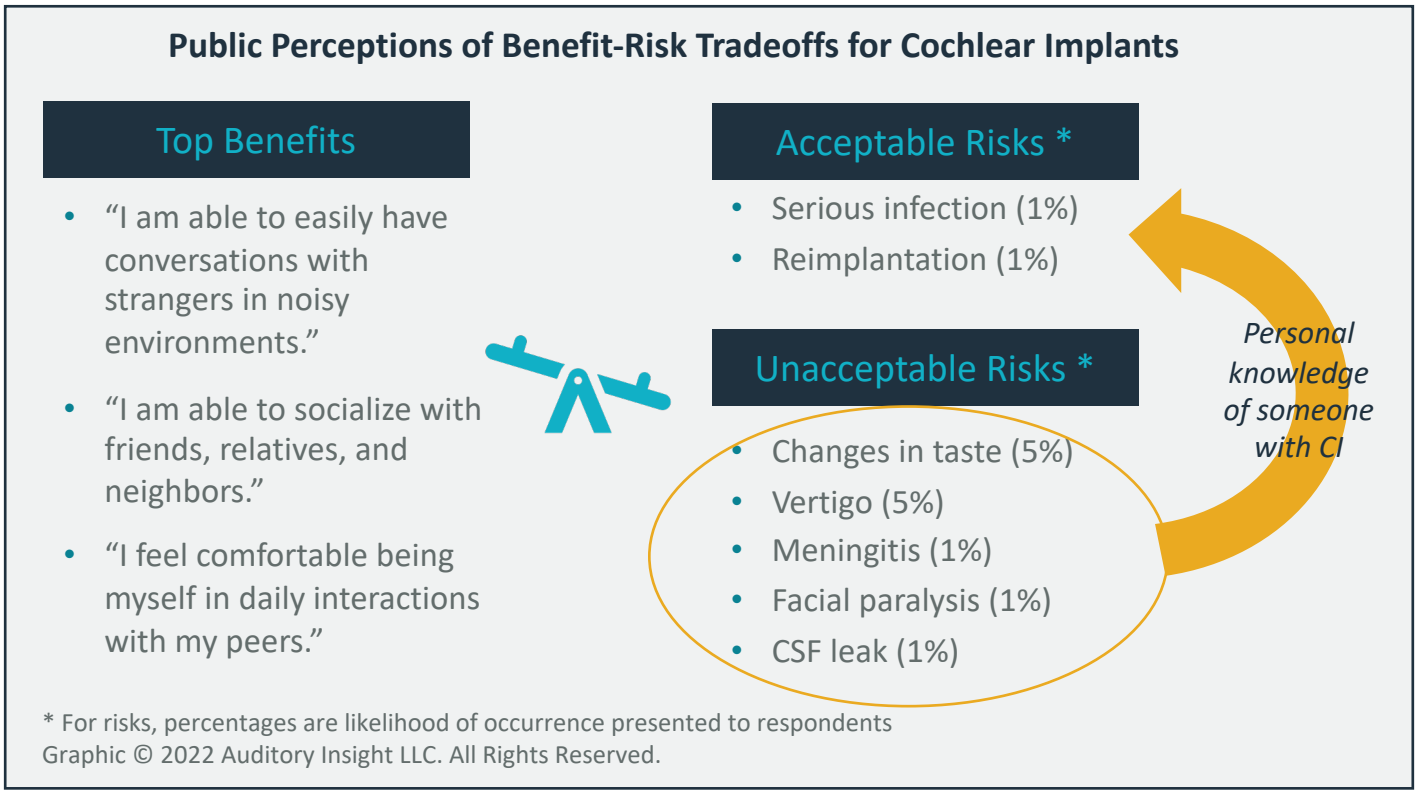
* Percentages denote share of respondents who ranked as most important priority

Risks of Surgical Complications Barrier in Public Perceptions

Despite recognizing the benefits of cochlear implantation, the public found the risks generally unacceptable. In this same study[7], respondents deemed only two risks—serious infection and reimplantation—as being acceptable. The public deemed that the remaining risks outweighed the benefits, as shown in the graphic below.

Auditory Insight notes one of the survey's limitations was not qualifying the duration and severity of each risk. Clarifying, for example, that "balance problems causing dizziness" would most likely be a short-term complication may have changed some responses. Nonetheless, Auditory Insight believes that the survey contains an urgent finding: the general public may be reinforcing patients' concerns with CIs.

Importantly, a subgroup of respondents who had "personal knowledge of someone with a CI" found *all* risks acceptable. Familiarity with a patient reversed the public's risk-benefit calculation to support for implantation. The implication is that peer meetings for CI candidates are crucial, even at the center level.



Patients Experience Process Variability Across the Lifecycle of Cochlear Implantation

Auditory Insight has examined a recent review containing a comprehensive list of CI barriers in the patient experience.[3] Our analysis identified variability in CI healthcare delivery throughout the patient experience.

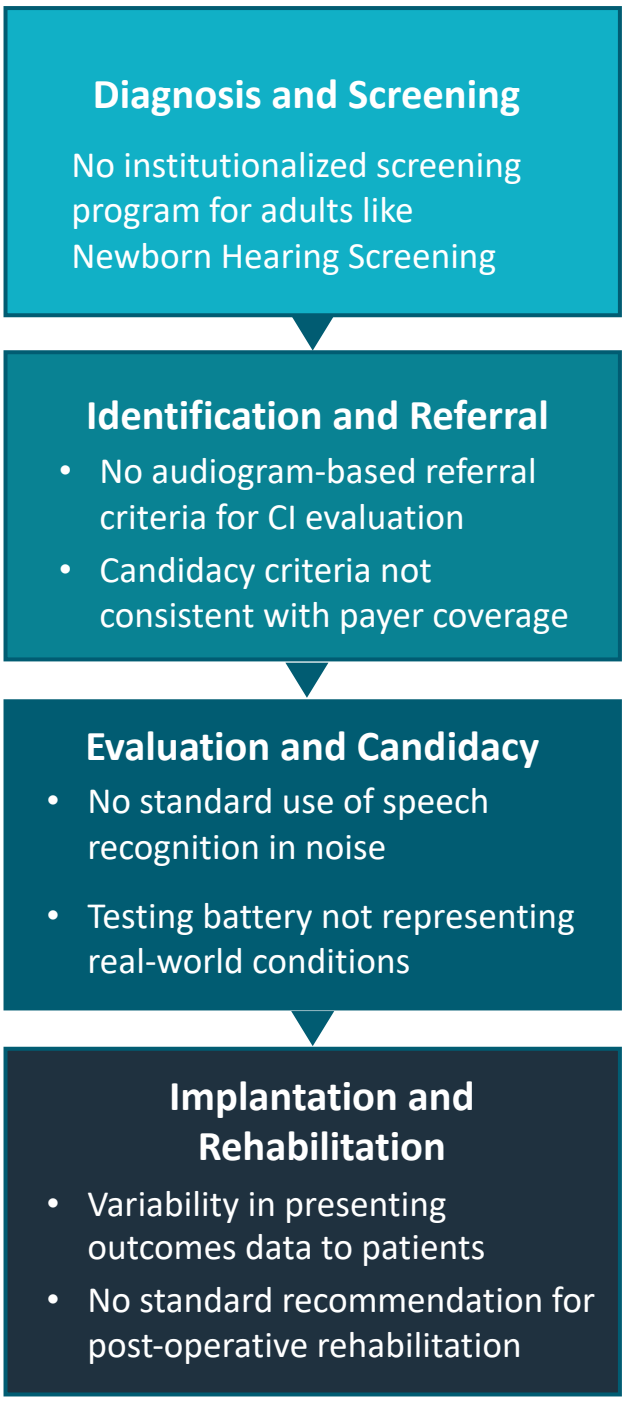
As shown at right, variability between providers surfaces at each stage of the patient experience, from *Diagnosis and Screening* through *Implantation and Rehabilitation*. At Auditory Insight, we call this *delivery process variability*.

Providers, including primary care physicians, audiologists, and CI surgeons, need discretion to deliver personalized care. However, in this case, many differences in patient experiences reflect a lack of CI standards and clinical guidelines.

For example, in the *Identification and Referral* stage, audiologists lack an audiogram-based referral criteria for CI evaluation, let alone criteria that is consistent with payer coverage. In the *Implantation and Rehabilitation* stage, CI surgeons and audiologists vary in how they present outcomes data to patients.

Process variability clearly suppresses the number of patients that move toward candidacy and surgery. Auditory Insight believes that this variability also impacts patient attitudes towards CIs, as we next elaborate.

Delivery Process Variability in Adult Patient Experience for Cochlear Implants



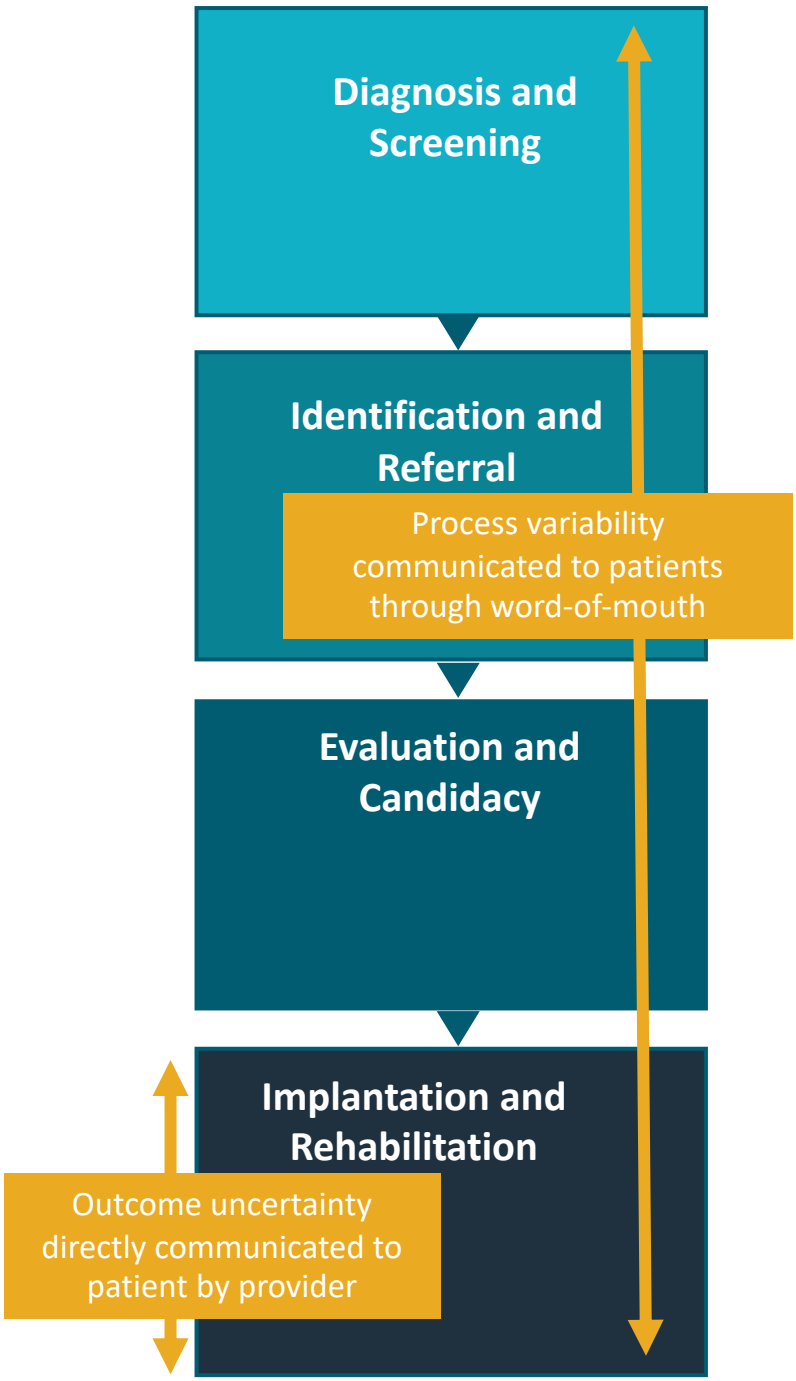
Process Variability May Compound Patient Concerns About Outcome Uncertainty

Auditory Insight hypothesizes that variability in CI delivery processes exacerbates patient concerns around CI outcomes. Process variability may further undermine patient confidence in CIs.

Opportunities for Patients to Recognize Variability. CI surgery is far less common than procedures like joint replacement. However, the general public believes that the benefits of CI surgery warrant the risks *when the respondent had personal knowledge of someone with a CI*. Other surveys support the finding that meeting someone who had a good outcome with a CI is an important motivator.[6] Moreover, CI manufacturers have created opportunities for candidates to meet with satisfied CI patients. Patients have plenty of opportunities to compare their experiences and discover differences in the level of care.

Significance Patients Attach to Variability. Management theories on service delivery explain that when part of a service is invisible to customers, they attach greater significance to visible markers to evaluate the quality of the entire service. In this case, the uncertainty regarding CI outcomes may cause some patients to question the quality of care. Significant variability in the hearing healthcare delivery system can only exacerbate their concerns.

Auditory Insight Analysis of Variability in Adult Patient Experience for Cochlear Implants



Implications for Lowering CI Barriers for U.S. Adults

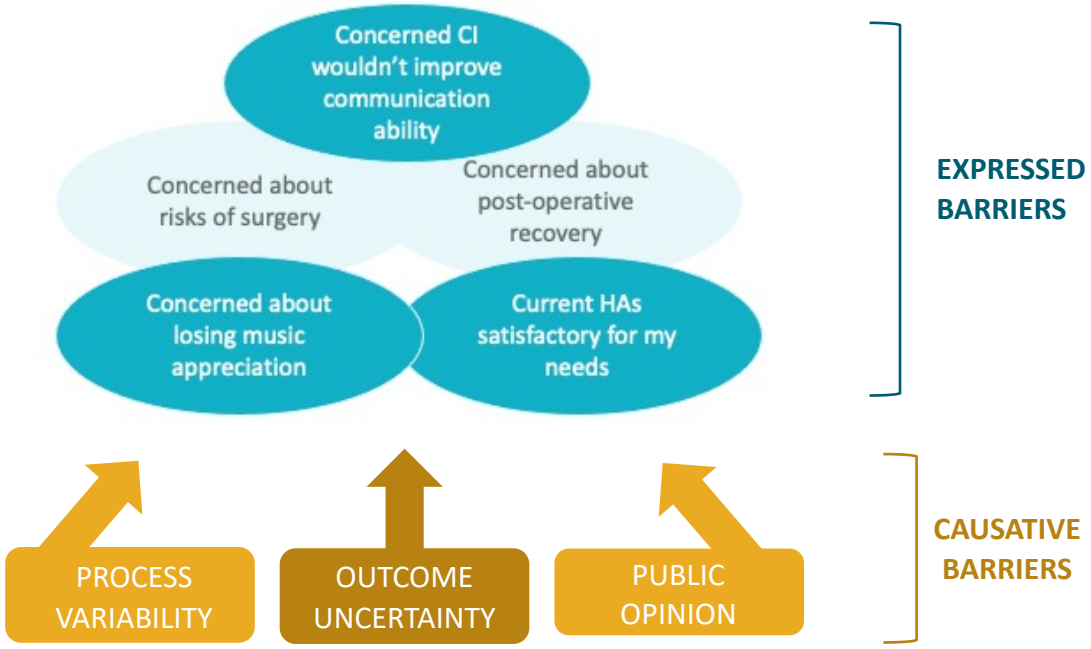
Auditory Insight's analysis of patient attitudes reveals that patients' concerns with hearing outcomes predominates, as shown below. Three of the top five *expressed barriers* center around whether a CI would improve communication ability and music appreciation better than hearing aids. In addition, we sought to go beyond these expressed barriers to analyze *causative barriers*. Our perspective is that the primary causative barrier is outcome uncertainty, exacerbated by process variability and reinforced by public opinion.

While the industry moves toward developing standards and clinical guidelines for adult CIs, we see three important opportunities for CI centers:

- Develop center-level data to summarize patient outcomes and time requirements
- Help patient chart a personalized risk/benefit analysis
- Create a center-level advocacy team of parents and patients.

For cochlear implant manufacturers, as well as gene and drug therapy companies in hearing healthcare, we see a host of implications and recommended actions that we are happy to discuss in a follow-up call to this research note.

Auditory Insight Analysis of Patient Barriers to U.S. Adult Cochlear Implantation



About the Authors

A strategic advisor and thought-leader on transforming hearing healthcare, **Nancy M. Williams** is Founder and President of Auditory Insight.

Guest Contributor **Dr. Erin Schafer** is a Professor and Director of Graduate Studies in Audiology at the University of North Texas. Her research programs focus on the assessment and (re)habilitation of adults and children with hearing loss and auditory disorders. She is also the editor of Audiology Today.

Advising Leaders on Transforming Hearing Healthcare

Auditory Insight partners with senior leaders of device and pharma companies to develop successful commercialization strategies. The firm also advises growth equity and private equity firms to create portfolio value in hearing healthcare. Auditory Insight has deep insight into consumer needs and experience, a practical understanding of clinical behaviors of audiologists and ENTs, and unique viewpoints on how hearing healthcare is evolving.

Endnotes

[1] Ebrahimi-Madiseh A, Eikelboom RH, Bennett RJ, et al. What Influences Decision-Making for Cochlear Implantation in Adults? Exploring Barriers and Drivers From a Multistakeholder Perspective. *Ear Hear*. 2020;41(6):1752-1763. doi:10.1097/AUD.0000000000000895

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