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Cognition and Hearing Health: Research and Clinic Application (Part 1)

Laurel Christensen, PhD
Chief Audiology Officer
GN Hearing

Hannah Fehlberg, AuD
Field Training Audiologist
GN ReSound

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Cognition and Hearing Health: Research and Clinic Application (Part 1)

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Field Training Audiologist
GN ReSound



Learning Outcomes

- After this course, participants will be able to identify risk factors for developing dementia.
- After this course, participants will be able to explain in patient-appropriate terms the connection between hearing loss and cognitive decline.
- After this course, participants will be able to discuss how to make an appropriate hearing aid recommendation based on their patient's hearing and cognitive abilities.



Agenda

- Research Overview
 - Hearing loss impacts on health
 - Relationship between hearing loss and cognition
 - Relationship between hearing aid usage and cognition
- Role of the HCP throughout the patient journey
 - Baseline/diagnostic testing
 - Rehabilitation process

How comfortable are you discussing the relationship between cognition and hearing health with patients?



Great! I'm an expert on the topic!



Comfortable enough to answer patient questions.



I avoid the topic.

Hearing Loss and Hearing Aid Use

ReSound GN



28.8 million
U.S. adults could benefit
from using hearing aids.



Only 1 in 4 U.S. adults ages 20 and over who could benefit from hearing aids has used them.



About **1 in 6** adults (16%)
ages 20 to 69

About **1 in 3** adults (30%)
ages 70+



Hearing Loss & Hearing Aid Use

Source: NIH NIDCD (2015)

Irritability, negativism and anger

Fatigue, tension, stress, and depression

Avoidance or withdrawal from social situations

Social rejection and loneliness

Reduced alertness and increased risk to personal safety

Reduced job performance and earning power

Diminished psychological and overall health



Social and Emotional Impact of Hearing Loss

References:

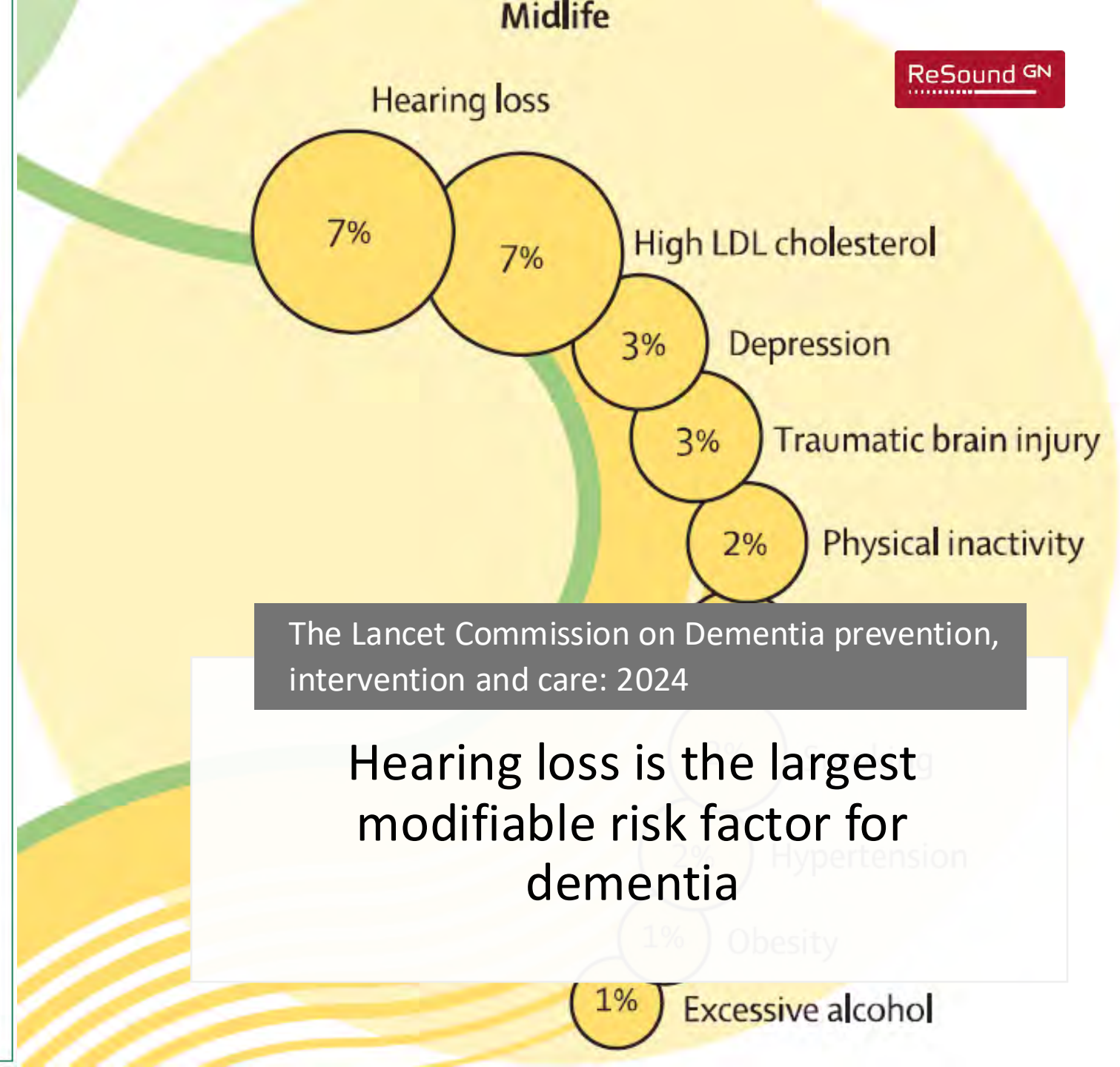
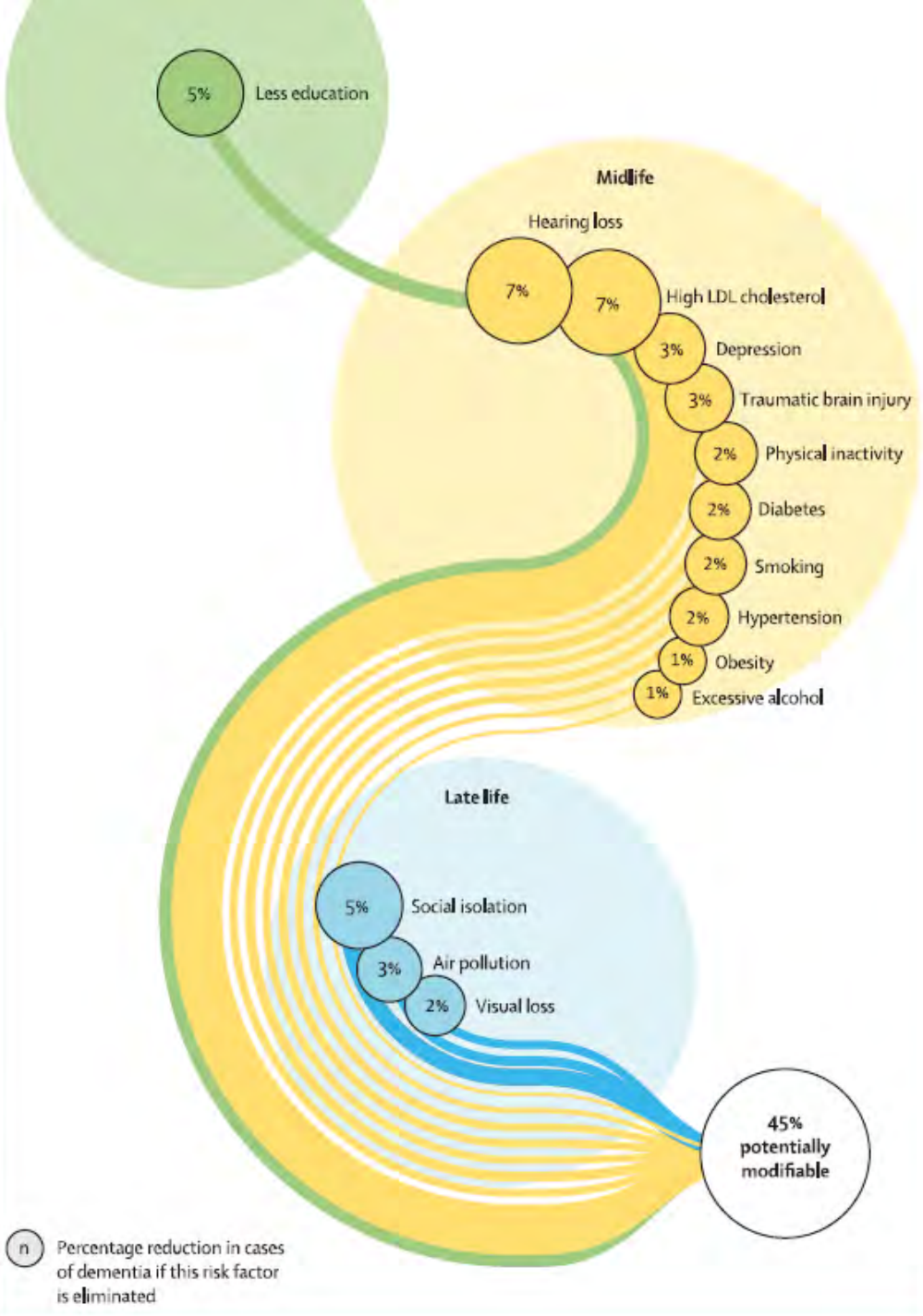
Kochkin, S. MarkeTrak VII: The Impact of Untreated Hearing loss on Household Income. Better Hearing Institute, Alexandria VA. (May 2007)

Kochkin, S. MarkeTrak VIII: Patients report improved quality of life with hearing aid usage, Hearing Journal, Vol. 64 (6), June 2011, pp. 25-32

Dementia Epidemiology – Worldwide*

- 35.6 million estimated 2010 (24.2M 2001; 4.6M new cases/yr)
 - 46% Asia
 - 30% Europe
 - 12% North America
- Doubling ~ every 20 years
 - 65.7M 2030; 115.4M 2050
- Majority (57.7%) live in low- and middle-income countries
 - 40% increase Europe over next 20 yrs
 - 63% ↑ North America
 - 77% ↑ southern Latin America; 134-146% rest of Latin America
 - 89% ↑ Asia Pacific; 117% East Asia; 107% South Asia
 - 125% ↑ North Africa and Middle East
- \$315 B (2005 US \$) costs for dementia care/yr worldwide

* Alzheimer's Disease International World Report, 2009 www.alz.co.uk/worldreport ; Ferri et al., 2005; Wimo et al., 2003



The Lancet Commission on Dementia prevention, intervention and care: 2024

Hearing loss is the largest modifiable risk factor for dementia

What about Mild Cognitive Impairment?

- Approximately 12% to 18% of people age 60 or older are living with MCI
- An estimated 10% to 15% of individuals living with MCI develop dementia each year
- About one-third of people living with MCI due to Alzheimer's disease develop dementia within five years
- Forty-two percent of Americans say they worry about developing MCI due to Alzheimer's disease
- More than 80% of Americans know little or are not familiar with MCI, which can be an early stage of Alzheimer's

Research on Cognition and Hearing:

Relationship of Hearing Impairment to Dementia and Cognitive Dysfunction in Older Adults

- Case-control study in 100 individuals who had Alzheimer's-type dementia and 100 age-, sex-, and education-matched controls.
- The prevalence of a hearing loss of 30 dB or greater was significantly higher in individuals with Alzheimer's than in controls even when adjusted for potentially confounding variables.
- Greater hearing loss was associated with a higher adjusted relative odds of having dementia.

NOTE: This study was published over 30 years ago and reported hearing impairment in older adults was strongly and independently associated with the likelihood of having dementia—raising the hypothesis that age-related hearing impairment may contribute to dementia risk. Little research was conducted on the topic until 2011 when Frank Lin and colleagues at Johns Hopkins published their landmark study (next slide).

Reference: Uhlmann, R.F., Larson, E.B., and Rees, T.S. Relationship of Hearing Impairment to Dementia and Cognitive Dysfunction in Older Adults. J. Am. Med. Assoc., 1989; 261(13): 1916-1919

Research on Cognition and Hearing:

Hearing Loss and Incident Dementia

- Followed 639 people ages 36 to 90 for nearly 12 years.
- For each 10-dB loss in hearing, the risk of dementia rose about 20 percent compared with those who could hear normally.
- The **risk of dementia** doubled among those with mild hearing loss, tripled among those with moderate hearing loss and increased fivefold among those with severe hearing loss.
- The relationship between hearing loss and dementia persisted even when other factors linked to cognitive disease, such as hypertension, diabetes and smoking, were considered.

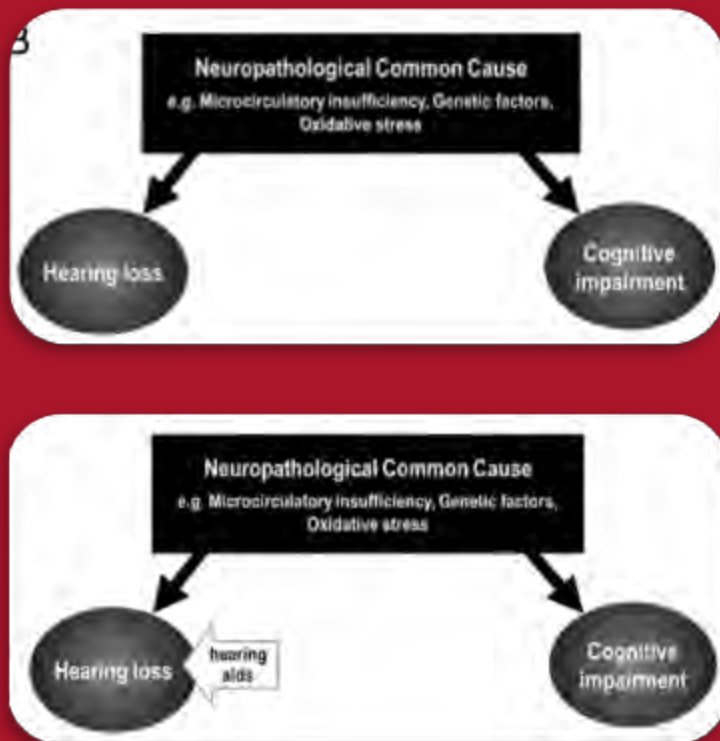


Reference: Lin FR, Metter EJ, O'Brien RJ, Resnick SM, Zonderman A, Ferrucci L. Hearing loss and incident dementia. Arch Neurol. 2011 Feb;68(2):214-20

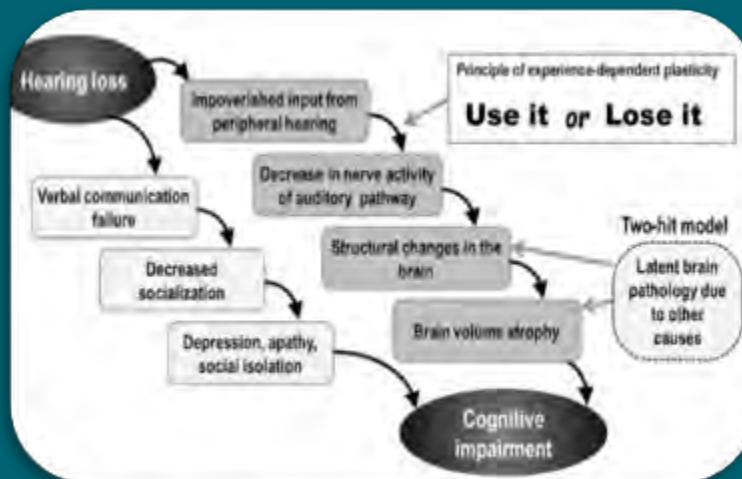
Hearing Loss and Cognitive Decline:

Does treating hearing loss prevent or slow the progress of dementia? Hearing is not all in the ears, but who's listening?

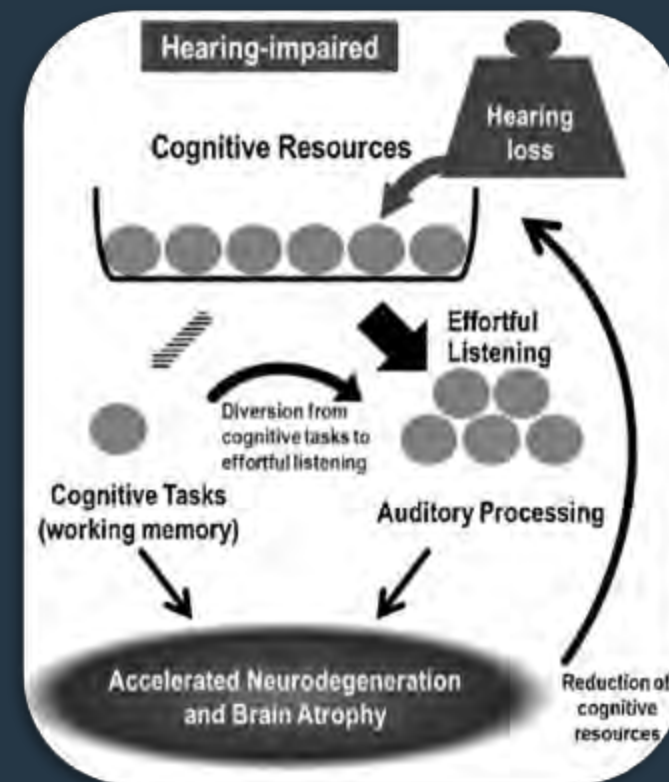
Common Cause Hypothesis



Cascade Hypothesis



Cognitive Load Hypothesis



Research on Cognition and Hearing:

US National Health and Nutrition Examination Survey

- Data from the 1999 to 2002 cycles of the National Health and Nutritional Examination Survey during which participants aged 60–69 years ($n = 605$) underwent both audiometric and cognitive testing.
- In this nationally representative study of 60- to 69-year-old adults, greater hearing loss was independently associated with poorer cognitive functioning using a nonverbal test of executive function and psychomotor speed.
- **Hearing aid use was associated with higher cognitive scores, but these results were based on a small number of individuals using hearing aids.**

Note: This was the earliest study to give an idea that treating hearing loss with amplification could make a difference in cognition.

US National Health and Nutrition Examination Survey

National Center for Health Statistics, Centers for Disease Control and Prevention, 2001-2004 National Health and Nutrition Examination Survey operations manuals, brochures, and consent documents. http://www.cdc.gov/nchs/about/major/nhanes/current_nhanes_01_02.htm#Interviewer.

Research on Cognition and Hearing:

Death, Depression, Disability, and Dementia Associated With Self-reported Hearing Problems: A 25-Year Study

- Assessed patients over a period of 25 years in order to provide more robust evidence. Specifically, 3,777 participants aged over 65 were included; of these, 1,289 reported hearing problems and 2,290 reported no trouble.
- Results found an increased risk of disability and dementia in those with hearing loss.
- An increased risk of depression in men who reported hearing problems.
- **In additional analyses, these negative associations were not found in the participants using hearing aids.**
- The study also showed that people with hearing loss who use hearing aids have the same chance of staying independent as people with normal hearing.

Research on Cognition and Hearing:

Hearing intervention versus health education control to reduce cognitive decline in older adults with hearing loss in the USA (Achieve)

- 977 participants with untreated hearing loss
- 24% from a previous study (ARIC)
- Overall, no significant effect of hearing intervention on 3 year cognitive change
- However, there was a significant effect of hearing intervention within the ARIC subgroup



In older adults at increased risk for cognitive decline, hearing intervention slowed down loss of thinking and memory abilities by 48% over 3 years.

Reference: Lin FR, Pike JR, Albert MS, Arnold M, Burgard S, Chisolm, T et al. Zonderman A, Ferrucci L. Hearing intervention versus health education control to reduce cognitive decline in older adults with hearing loss in the USA (Achieve): a multicentre, randomized controlled trial . The Lancet. 2023 Sept; 402(10404):786-797

Research on Cognition and Hearing:

Summary

- Increased hearing loss puts patients at a higher risk of dementia
- There is more research to be done to explore the effects of hearing aid usage on cognition, but early results suggest a positive effect on slowing cognitive decline for patients already at a high risk for dementia

How will this information impact how you treat and counsel patients?



I'll start telling all of my patients that hearing aids will stop the progression of cognitive decline



I'll feel more comfortable answering patient questions and counseling on the relationship between cognition and hearing health.



I'm not sure. I need to learn more.



Role of the Hearing Care Provider Throughout the Patient Journey

Baseline/Diagnostic Testing:

Why hearing healthcare providers?

Appointment Duration

- Average PCP appointment is only 20 minutes
- Average time spent with an HCP is 1.2 hours over first 2 months of hearing aid use

Relevant Case History Questions

- Communication abilities are strongly influenced by both hearing and cognition
- In order to provide quality hearing aid services, information about any cognitive difficulty is important to know

Higher Prevalence of MCI in Patient Population

- Higher incidence of cognitive impairment in audiologic caseloads
- Good opportunity to catch patients in the early stages of cognitive impairment

Baseline/Diagnostic Testing:

Considerations for screening

What are going to do with this information?

- How and when are you going to present the screener to your patient?
- Are you ready to counsel and answer your patient's questions?
- Are you prepared to make the appropriate referrals?

Is the screener more sensitive to MCI vs. dementia?

- It's important to pick a screener designed to pick up on MCI
- A ceiling effect could be noted if selecting a screener designed for detecting dementia

Is the screener sensitive to hearing loss (or other impairments)?

- Is it administered verbally?
- Provide optimum testing conditions for those with hearing loss:
 - Face to face
 - Well lit room
 - Low level of background noise
 - Amplification

Baseline/Diagnostic Testing:

Impact of Hearing Loss and Amplification on a Cognitive Screening Test

- 61 participants
 - 42 hearing impaired (22 hearing aid users, and 20 who used a pocket talker during testing)
 - 19 normal hearing
- CNC, QuickSIN, and MoCA completed twice for all subjects



Consider patient's familiarity with amplification before performing a cognitive screener that has an auditory component

Results:

- Patients with hearing loss did not perform as well on MOCA as normal hearing individuals
- Hearing aid users performed better on MOCA in their aided condition
- Pocket talker user performance was WORSE on MOCA than in their unaided condition

Baseline/Diagnostic Testing: Reducing the Impact of Hearing loss

Table 2. Information about several most commonly used cognitive screening tests (for more details, see Cordell et al., 2013, for a review).

Test name	Testing time (min)	Number of test items	Abilities tested	Advantages	Availability of the test
General Practitioner Assessment of Cognition (GPCOG)	Patient: 2–5 Informant: 1–3	9	• Orientation • Visuospatial abilities • Executive functions • Retrieval of recent information • Delayed verbal recall	• Developed for and validated in primary care • Little or no educational bias • Informant component is useful	• Freely available from Alzheimer's Association website
Mini-Cog	2–4	2	• Recall • Visuospatial abilities	• Developed for and validated in primary care • Little or no educational bias • Multiple languages available • Short administration time	• Freely available from Alzheimer's Association website
Mini-Mental State Examination (MMSE)	7–10	11	• Orientation • Registration • Attention/calculation • Recall • Naming • Repetition • Comprehension (verbal and written) • Writing	• Most widely used and studied worldwide • Often used as reference for comparative evaluations of other assessments	• The clinical version is developed by PAR Inc. and can be purchased from the company's website
Montreal Cognitive Assessment (MoCA)	About 10	13	• Attention/concentration • Executive functions • Memory • Language • Visuospatial abilities • Abstraction • Calculation • Orientation	• Designed for detecting mild cognitive impairment (MCI; higher sensitivity than MMSE) • Tests a wide range of abilities • Multiple languages available	• Freely available from the MoCA website
Saint Louis University Mental Status Examination (SLUMS)	About 7	11	• Attention • Numeric calculation • Immediate and delayed recall • Animal naming • Digit span • Visuospatial abilities • Figure recognition/size differentiation • Immediate recall of facts from a paragraph	• Higher sensitivity than MMSE for detecting MCI • No educational bias • Tests a wide range of abilities	• Freely available from the Saint Louis University website



Baseline/Diagnostic Testing: Counseling and Referrals

- Have a family member present
- Focus on good communication strategies
- Discuss realistic expectations
- Help patient understand their hearing loss and health effects
- Provide positive messaging focusing on the known benefits of addressing hearing loss (improved communication, quality of life, and aging)
- Provide resources
- Make appropriate referrals



Rehabilitation Process:

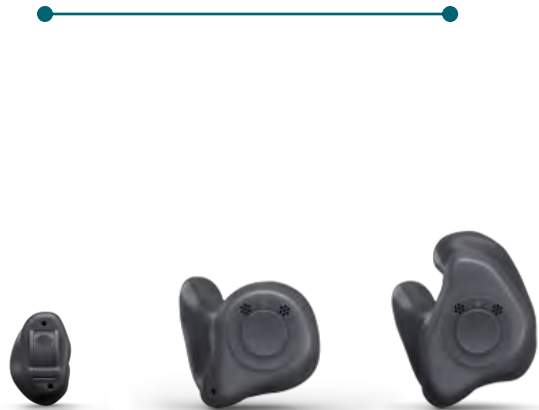
Style considerations

- Dexterity
- Visual considerations
- Durability
- Power/amount of hearing loss
- Ease of use
 - Rechargeability
 - Push Button/Configuration
 - Telecoil
 - Phone use



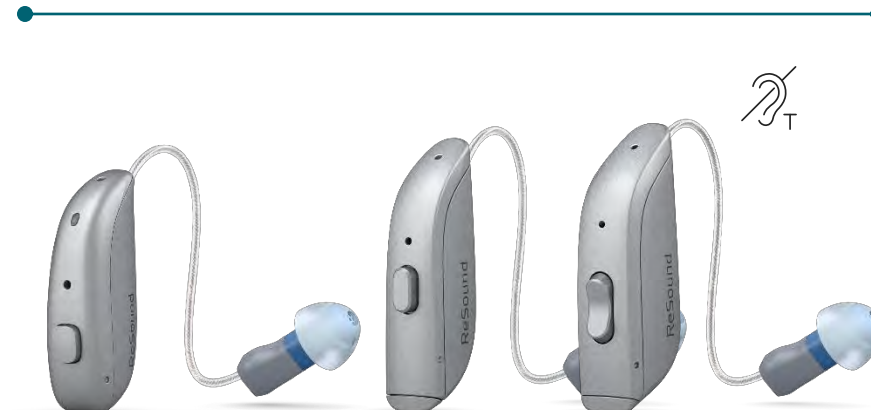
ReSound Nexia: Available in all styles

Custom



NXIC NXITC-DWC NXITE-DWC

RIE



NX60S-DRWC NX61-DRW NX62-DRW

BTE



NX77-DWC NX88-DWC

CIC

10A battery

ITC

Rechargeable

ITE

Rechargeable

Micro RIE

Rechargeable

Standard RIE

312, 13 battery

BTE

Rechargeable

PBTE

In technology levels 9,7,5

All-day power without compromises



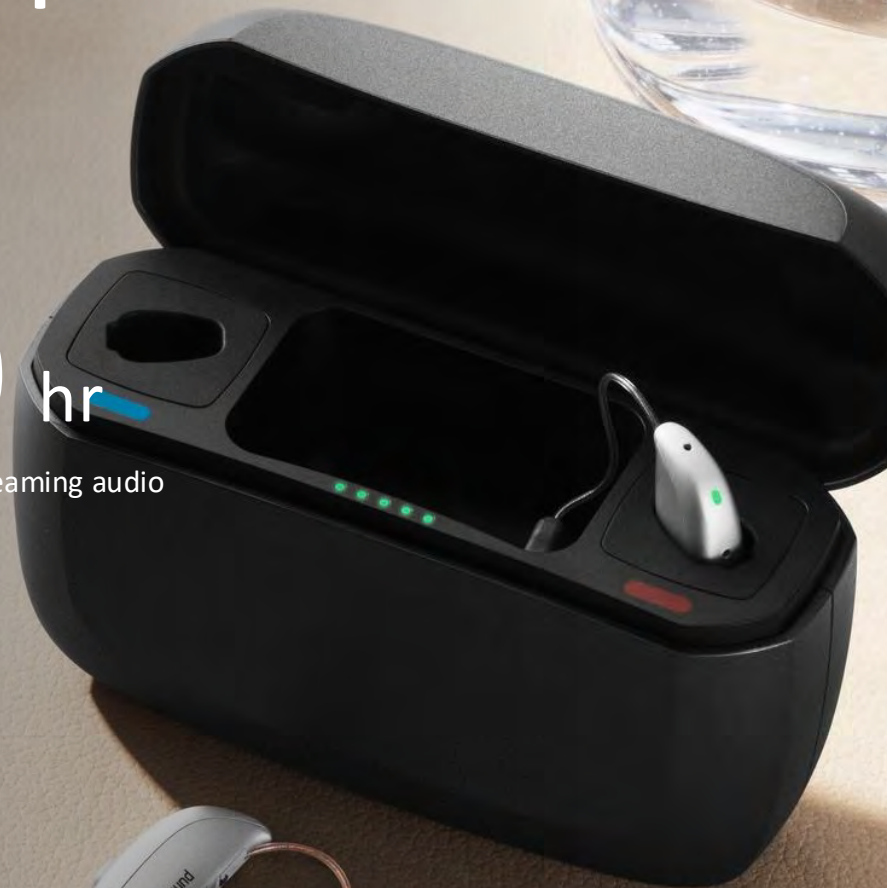
24 hr

All-day battery on one charge, with three more charges available with the premium charger*



20 hr

Typical use when streaming audio 50% of the time*



Battery Life

Chargers

IP Rating

*All-day battery provides a maximum of 30 hours of use with typical use time of 24 hours on one charge or 20 hours when streaming 50% of the time. Battery life can vary by use.

ReSound Nexia™

Charger overview



RIE



NX60S-DRWC



Premium



Standard



Desktop

BTE



NX77-DWC



NX88-DWC



Desktop

Customs



ITE/ITC



Custom Charger

Battery Life

Chargers

IP Rating

Battery Life

Chargers

IP Rating



All-weather proof:
IP68 protection rating in & out,
including receivers

Rehabilitation Process:

Technology recommendations

- Speech in noise performance
- Automation:
 - Environmental Classification
 - Directionality
 - Noise Reduction
 - Telecoil/streaming activation
- Programming capabilities:
 - Adjustable attack/release times
 - Adjustability and customization within the software
- Accessibility Options

Let's find the best solution for you

Everyone spends their time differently. Understanding your daily challenges in the listening environments you are in is critical to choosing a solution that will support you every day in your favorite activities.

Technology level 5 Select

Identifies important sounds allowing you to participate and engage in conversations.



Best for environments with less background noise including:

- Religious Services
- Talking on the Phone
- Watching TV
- Home (Quiet Environments)

Technology level 7 Advanced

Adjusts to different listening situations to enhance audibility and speech understanding.



Best for environments with moderate levels of background noise including:

- Listening to Music
- Restaurant
- Shopping
- Driving in the Car
- Religious Services
- Talking on the Phone
- Watching TV
- Home (Quiet Environments)

Technology level 9 Premium

Excellent audibility and speech understanding in the widest range of environments.



Best for environments with all levels of background noise including:

- Outdoor Activities
- Entertainment Venues (Casinos, Exhibit Halls, etc.)
- Travel and Airports
- Theater/Performances
- Listening to Music
- Restaurant
- Shopping
- Driving in the Car
- Religious Services
- Talking on the Phone
- Watching TV
- Home (Quiet Environments)

Features may vary based on product and technology level





Made for Bluetooth[®] Low Energy
Audio and Auracast[™]

Benefits of Bluetooth LE Audio



Improved Codec

Richer sound quality

Lower latency

Lower power consumption



Multi-stream

Connect to multiple devices
simultaneously

Two-way communication:
makes possible hands-free
calls* in Android phones



 **AURACAST**
A BROADCASTING TECHNOLOGY

Broadcasting and audio
sharing

In personal electronic
devices and public places

Auracast will make the world more hearing friendly and accessible for everyone



Share your audio

Shared listening and watching
from your personal device



Hear your best

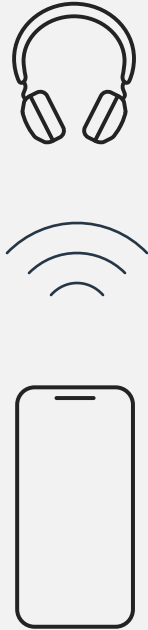
Public address and
assistive listening



Unmute your world

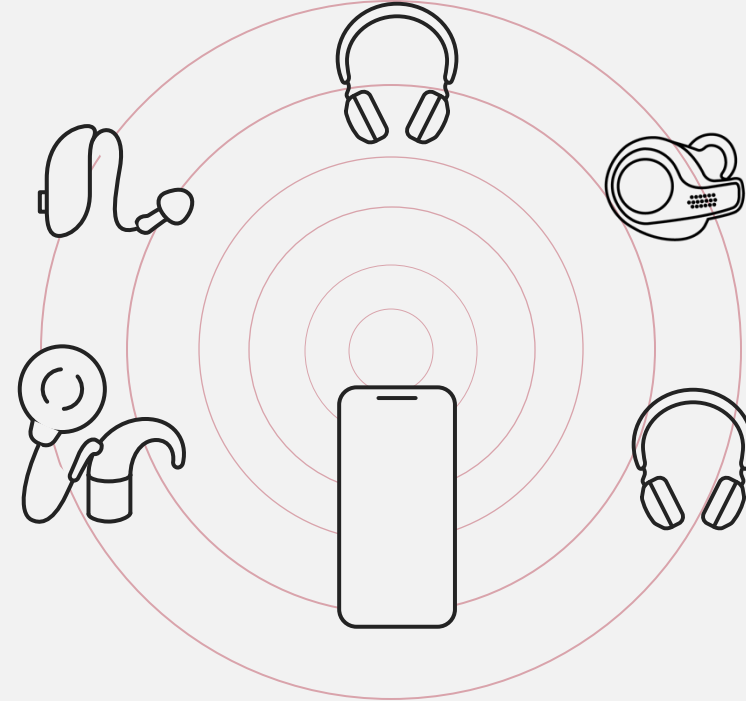
Public TV watching

What is Auracast broadcast audio?



Classic Bluetooth

Only allows for one-to-one communication
between devices



Auracast broadcast audio

Auracast will allow electronic devices to
broadcast audio simultaneously to an
unlimited number of nearby audio
devices with Bluetooth LE Audio

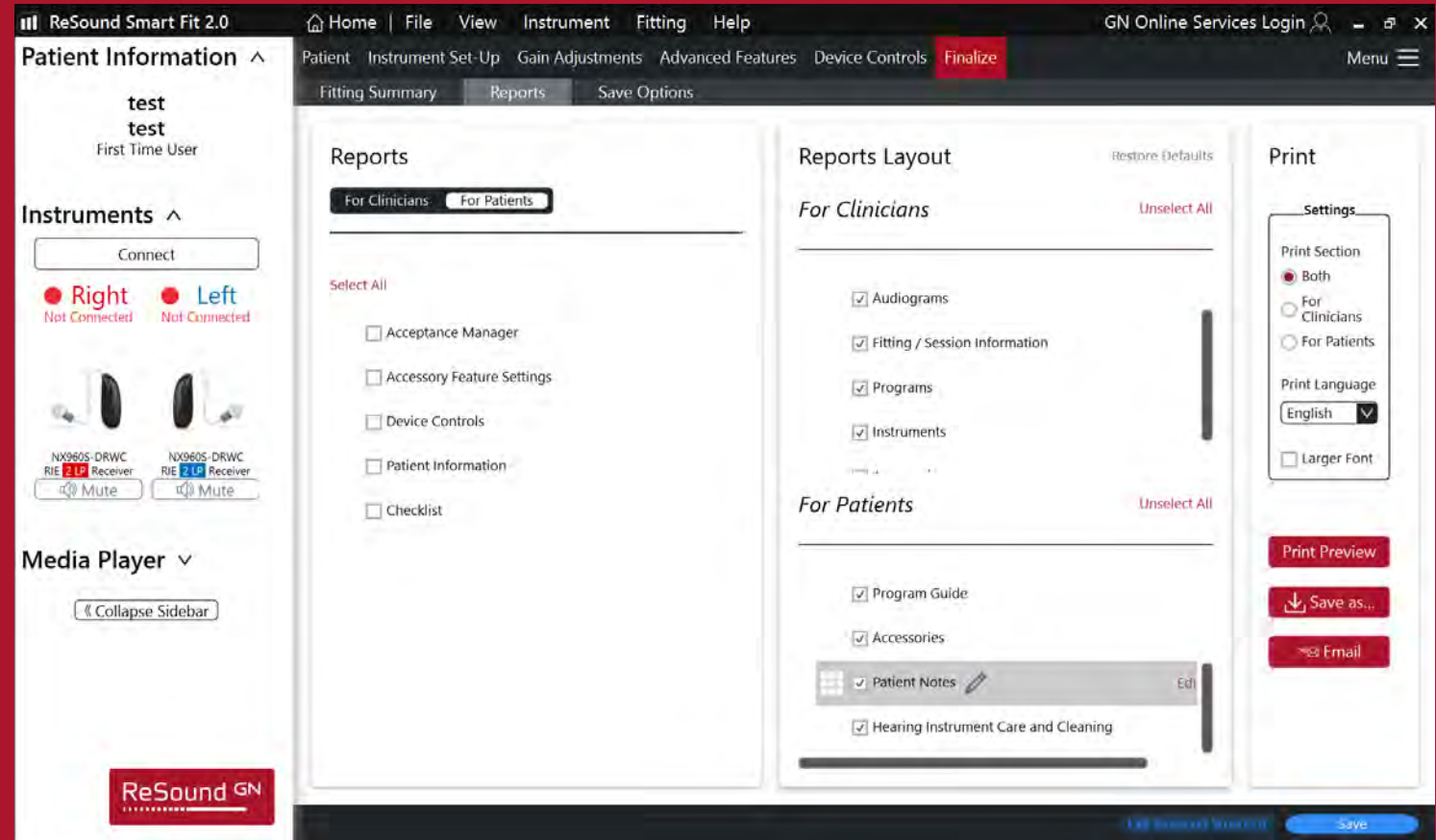
ReSound GN

-

ReSound Smartfit 2.0 Features



- **Catalog**
 - Easy to filter hearing aids by features
- **AutoREM capability**
 - Great to improve efficiency of verification for new and follow up fittings
- **Customizable Patient Reports**
 - Edit information based on patient need
 - Enter specific patient notes
 - Available in a variety of languages





Case Studies

Peter

Restaurant consultant

- Reports problems hearing for the last 5 years but has never worn hearing aids
- Severe high frequency hearing loss
- Recently saw a report about hearing loss and cognition. He wants to know if wearing hearing aids will keep him from developing dementia



How might you address Peter's concerns?



Provide resources on modifiable risk factors for dementia.
Consider completing a cognitive screening test



Discuss the connection between cognition and hearing health, and make sure to emphasize the known benefits of addressing hearing loss (improved communication, quality of life, and aging)



Tell him he has nothing to worry about if he buys hearing aids

Greta

Social worker

- Severe flat hearing loss and 18 years of hearing aid experience
- Complains of issues hearing in noise with her current hearing aids. She has a secondary program that helps, but due to dexterity issues is struggling to manually change programs. She finds herself pulling away from social situations due to her problems.
- She uses a smartphone, but isn't always able to have it on her at work

How might you address Greta's concerns?



Choose a hearing aid with automatic directionality and noise reduction features so that she doesn't need to change into a secondary program



Consider a spouse mic that Greta can use in social situations and can control via her phone, hearing aid, or remote control



Choose a hearing aid that can accommodate for Greta's poor dexterity: large push button, rechargeable, wireless connectivity

A middle-aged Black man with a beard, wearing a brown coat over a red shirt and blue jeans, is walking through an airport terminal. He is holding a black suitcase in his right hand and a smartphone in his left. In the background, there are airport signs for gates A2-A17 and BCDEF, and large windows showing an airplane on the tarmac.

Sam

Retired pilot

- Severe high frequency hearing loss and no previous hearing aid experience
- Very physically and socially active
- Loves traveling, but has a hard time understanding tour guides and navigating public transportation
- Reports a family history of dementia on his intake questionnaire

How might you address Sam's concerns?



Reassure him that wearing hearing aids and staying socially active will keep him from developing dementia



Complete a cognitive screener, and make appropriate referrals if needed.



Choose a hearing aid with BTLEA technology so that he can utilize Auracast and reduce listening fatigue when traveling

THANK YOU