Hearing Loss or Dementia
How hearing impacts patient outcomes

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Financial Disclosures

The author of this continuing education activity has no relevant financial relationships with commercial interests.
OUTCOME/OBJECTIVES

• Define hearing loss as a modifiable risk factor for dementia
  – Literature review

• Describe why/when/how to refer to audiology vs. ENT
  – Medical vs. non-medical
  – Hearing loss vs. understanding

• Identify one change you can make to mitigate the negative impact of hearing loss in your practice
  – Look
    • Do an otoscopic
    • Look for hearing aids
  – Ask
    • Do you have any trouble hearing
    • Do you have hearing aids? Where are they?
  – Refer to audiology
Common abbreviations

- ARHL – Age Related Hearing Loss
- HA – Hearing Aids
- HL – Hearing Loss
- PTA – Pure Tone Average
- SNHL – Sensorineural Hearing Loss
Case 1 ‘Mr. B’ 88y.o. HBPC patient

- Lives at home with his wife
  - Can’t hear phone ring
  - Can’t hear doorbell
  - Can’t hear the TV
  - Can’t understand people
- Got hearing aids “a while ago”
  - “They never worked!”

Word recognition score:
Right ear 40%
Left ear 32%
Case 2 ‘Mrs. S’ 86 y.o. Assisted Living Ctr.

- State Vet’s Home
  - 3 kids, 2 local, 1 in IL
    - Local kids visit frequently
    - Weekly calls from kid in IL
  - Hears “pretty well, I think”
- Wearing hearing aids for years
- “I’d be lost without them!”

Word recognition score:
Right ear 92%
Left ear 96%
HL risk factor for dementia

Define hearing loss as a modifiable risk factor for dementia
Seems like everything causes/contributes to dementia
AARP Bulletin June 2019
Literature review – keeping it objective

- Untreated HL associated w/ 46% higher total health care costs over 10 years compared w/ costs for those w/o HL
  - JAMA OTLARYNG bit.ly/hcare-costs

- ARHL significantly associated w/ decline in all main cognitive domains and with increased risk for cognitive impairment and incident dementia

- Meta analysis of 36 studies, 20,264 unique participants
Literature review – keeping it objective

- Literature search of 488 articles selected 17 for inclusion
- All studies indicate HL is associated with dementia or cognitive decline
- Most only consider HL by PTA
- 2 included central testing
  - Dichotic signals – different info going to each ear
  - SSI-ICM (synthetic sentence identification with ipsilateral competing message)
  - SSW (Staggered spondaic word tests)

- HL is associated w/ incident dementia
- Prospective study of 639 patients

- Hearing loss is associated with accelerated cognitive decline and incident dementia
- N = 1,984 older adults
Literature review – keeping it objective

- Elderly individuals w/ HL have increased rate of developing dementia
- HL may be a marker for cognitive decline in adults 65 and older
- 4,463 patients > 65 y.o.
  - Gurgel, R et al. Otol Neurotol 35(5) June 2014 775-781
- In 1989 JAMA article Hearing Loss – Who’s Listening reported “HL strongly and independently associated w/ likelihood of having dementia”
- Since 2011 “…growing epidemiological and clinical research studies...have demonstrated that hearing impairment is associated w/ accelerated cognitive decline.”
- The greater the HL the greater the risk
  - Lin, F and Albert M. Aging Ment Health 18(6) 2014 Aug. 671-673
Literature review – keeping it objective

- ARHL is a possible biomarker and modifiable risk factor for cognitive decline, cognitive impairment and dementia
- Systematic review and meta-analysis
- 36 studies
- 12 countries
- 20,264 patients

- HOH show increased risk of disability, dementia, and depression
- Associations were NOT found in those with HA
- Prospective study N=3,777
- 1,289 reported hearing problems
Literature review – keeping it objective

• Depressive symptoms and HL are associated w/ increased risk of disability regardless of severity of HL
• 2196 patients in Health Aging and Body Composition Study
  – Armstrong N et al. J of Geron Biol Sci Med Sci 2018 20(20) 1-6. Associations of HL and Depressive Symptoms w/ Incident Disability in Older Adults: Health, Aging, and Body Composition Study

• Men with hearing loss are more likely to develop dementia
• International Study
• 37,898 men mean age 72.5
• Followed for 11 years
Literature review – keeping it objective

- Greater HL is associated with poorer physical function

- HL increases the risk of difficulty performing instrumental activities of daily living

- Interventions for cognitive training require adequate hearing and speech processing

- Restoring hearing and optimizing communication can increase social engagement and decrease the probability of HL cascading into cognitive decline
  - Weinstein, B. The Hearing J. 2017 Sept 18-20. Preventive Care for Dementia and HL

- ARHL adds to cognitive load of already vulnerable aging brain. May result in social disengagement accelerating cognitive decline

- There is no robust evidence that HA protect against cognitive decline but HA can reduce isolation, loneliness and depression improving mood, social interaction and participation in cognitively stimulating activity
  - Weinstein, B. The Hng J 2017 Nov 26-30. Dementia and ARHL – Part II
Potentially Modifiable risk factors for dementia:

- Low level of education
- Hearing Loss
- Hypertension
- Obesity
- Smoking
- Depression
- Physical inactivity
- Social isolation
- Diabetes

Livingston, G. et.al.
Lancet 2017 Dec. 16; 360
Dementia prevention, intervention and care
Literature review – keeping it really objective

- Prevention of 9 population attributable risk factors *may be over optimistic*
- No evidence of increased dementia in the deaf community
- Unlikely that treating HL will reduce dementia rates

Literature review – Summary

- We do NOT know that HL causes dementia
- We DO know that it is correlated
- We DO know that is modifiable
- We DO know that is treatable
- We DO know that undiagnosed and untreated HL can make you look cognitively impaired
- *We DO know that we are all going to be aware of HL and address it in older adults*
- *We DO know that it is a good idea to refer older adults for evaluation*
- *We DO know how important it is to look in ears when we can*
Hearing Loss

Describe why/when/how to refer to audiology vs. ENT
Hearing loss causes, contributes to, or exacerbates:
Communication handicap, social isolation, anger, frustration, fatigue, cognitive decline…
How big a deal is hearing loss really?

- Encountered in all medical setting
- Frequently influences medical encounters
- 50% of those 60-69
- 80% of those over 85!!
- Primary effect – impaired communication
- Contributes to social isolation
- Reduced quality of life
- Compared to age matched normal hearing peers hearing impaired show higher rates of hospitalization, death, falls, frailty, higher rates of dementia, and depression

Cunningham and Tucci, NEJM Dec. 21, 2017
Why refer?

- Cognitive Load “bandwidth”
- HA may mitigate the effect of cognitive decline later in life.
  - Hearing J
- HA early in course of HL may stem the worldwide rise of dementia.
  - J Am Geri Soc 2018
- HA use positively associated with memory scores. Scores decline slower after HA use.
  - Health and Retirement Study, N=2040, measured cognitive performance every 2 years over 18 years (1996-2014)
- HA use appears to be a buffer against the experience of loneliness.
  - Am J Audio 2016
Causes of hearing loss

- Aging
  - Presbycusis
- Noise
  - Head trauma
- Cerumen
  - Ear wax
- Family history
  - Ototoxic medications
    - Aminoglycoside antibiotics
      - Gentamycin, Neomycin
    - Antineoplastics
      - Cisplatin
    - Aspirin
      - In large doses
      - Usually temporary
      - Tinnitus
- Syndromes
  - Usher’s
- Autoimmune
  - Meniere’s
Types of hearing loss

- **Peripheral**
  - Conductive
    - Wax
    - Ear infections
    - TM perforations
    - Cholesteatoma
    - Otosclerosis
  - **Treatable (mostly)**
    - Sensorineural
      - Cochlear
  - **Permanent (mostly)**
    - “Easy” to diagnose and treat
- **Central**
  - Medial to the cochlea
    - Lesions
      - Acoustic schwannoma
    - Brainstem injury
    - Brain injury
    - Auditory processing disorders
      - Auditory synaptopathy
  - **Permanent (mostly)**
    - Difficult to diagnose and treat
    - Audiogram can be normal
Hearing Loss – can you fix it?

“Curable“
- Cerumen
- Ear wax
- Plugged up ears
- PLEASE DO OTOSCOPIE EXAM IF YOU CAN
  - Incidence of cerumen at SVH ~30%
- Other conductive hearing loss
  - Rare in older adults
    - TM perforation
      - Traumatic – Q-tip
      - Chronic
    - Otitis
      - Externa/Media
    - Otosclerosis

“Incurable“
- Sensorineural hearing loss
- Most common – usually cochlear in origin
  - Permanent
  - Painless
  - Invisible
  - Insidious
- NOT curable but it IS TREATABLE
- Central hearing loss
  - Somewhere after the cochlea
    - Auditory nerve
    - Brainstem
    - Cortex

VETERANS HEALTH ADMINISTRATION
COMORBIDITIES Linked to Hearing Loss

- Social Isolation
- Depression
- Falls
- Cardiovascular disease
- Diabetes
- Cognitive decline
- Mortality

- American Academy of Audiology

Untreated hearing loss increases health care costs and hospitalization rates

- AARP Bulletin Jan/Feb 2019 in collaboration with Johns Hopkins
Hearing vs. Understanding – a BIG difference

2 basic truths:

1. You can’t understand it if you don’t hear it. Take care of the basics first. Ears clear? Hearing aids on?

2. Just because you hear it does not mean you understand it. Maximize the signal. Minimize the cognitive load.
The audiogram
• Pure tone thresholds measure sensitivity by frequency
• How loud each pitch has to be to be audible, the “prescription”
• Measured by air conduction and bone conduction
• Results are used to prescribe the amplification characteristics when prescribing hearing aids: gain by frequency

Mr. B and Mrs. S audiometric results

WRS:
Right ear 40%
Left ear 32%

WRS:
Right ear 92%
Left ear 96%
A lot (most?) HL occurs in the cochlea as a result of hair cell damage.
In the aging auditory system there is potential for damage at any point.

**The Auditory Pathway**

1. Cochlea
2. Cochlear nerve
3. Cochlear nucleus
4. Superior olivary complex
5. Lateral lemniscus
6. Inferior colliculus
7. Medial geniculate body
8. Cortex
What can you expect from hearing aids?

BIG oversimplification but hope it helps....
“My hearing aids are great!”

Ishihara Color Blindness Test Plate 1
“My hearing aids stink!”
When/where to refer
- depends on practice setting and resources available

**Audiology**
- All geriatric patients
- Non-specific hearing loss
- Presbycusis
- Sudden hearing loss
- Tinnitus

**ENT (will probably want an audiogram)**
- Is it a ‘medical’ issue?
- Has past medical Rx failed?
- Can PCP treat?
- HL chronic or sudden?
  - Chronic rarely needs ENT unless there is relative comorbidity

**PCP**
- Cerumen
- Otalgia
- Otorrhea
- Vertigo/dizzy/balance

- 21 CFR 801.420(c)(2), (Hearing Aids)
  - (i) Visible congenital or traumatic deformity of the ear.
  - (ii) History of active drainage from the ear within the previous 90 days.
  - (iii) History of sudden or rapidly progressive hearing loss within the previous 90 days. EMERGENCY
  - (iv) Acute or chronic dizziness.
  - (v) Unilateral hearing loss of sudden or recent onset within the previous 90 days.
  - (vi) Audiometric air-bone gap equal to or greater than 15 decibels at 500 hertz (Hz), 1,000 Hz, and 2,000 Hz.
  - (vii) Visible evidence of significant cerumen accumulation or a foreign body in the ear canal.
  - (viii) Pain or discomfort in the ear.
What can you do?

Hearing loss takeaways

• Expect your patient has some degree of hearing loss
• If possible, do an otoscopic exam – please!
• Ask about hearing
• Ask if they have hearing aids and if they use them
• Refer to audiology when in doubt
• Remember:
  • Most hearing loss in older adults is not curable
  • Most hearing loss in older adults IS TREATABLE
Hearing Loss

Identify one change you can make to mitigate the negative impact of hearing loss in your practice
Identifying your patient with hearing loss
It’s not brain surgery

• Age
  – Remember 80% over 85 y.o.
• Chart review
  – Use it but don’t count on it
• Ask!
  – Beware of denial
• “What?”
  – Asking for repetition
• “Yes”
• Inappropriate answers
  – Maybe it’s NOT dementia
• Looking to others to answer
• Puzzled look, Fatigue, Anger, Frustration
• Withdrawal
“Best hearing aid?”

Depends!

Hearing loss
Lifestyle
Manual dexterity
Visual acuity
Cognitive ability
Connectivity

A = completely in canal, B = in the canal, C = in the ear, D = behind the ear, E = receiver in canal (RIC), F = slim tube
What’s in a hearing aid?

- **Microphone**: Sound enters through the directional microphone system. The directional microphones focus on conversations and improve speech understanding in the presence of noise.
- **Rocker Switch**: The rocker switch controls a hearing aid’s settings. It can be used to adjust volume, change programs or change the span of the directional focus. The hearing aid can work completely automatically, without the need for any controls or the programmable switch can be utilized.
- **Battery Compartment**: A hearing aid is powered by a zinc-air battery or NiMH rechargeable for less handling of batteries. The battery door acts as an on/off switch for the hearing aid. Most hearing aids are available in rechargeable models.
- **Digital Chip**: The digital chip, also known as “the brain” of a hearing aid, analyzes and converts sound to deliver the optimal high-definition digital sound quality. This part reduces unwanted background noise and cancels feedback.
- **Amplifier**: The built-in amplifier analyzes and boosts the sound from the digital signal processor. This where the sounds of music, or speech, get an extra boost in order to give a more natural listening experience.
- **Receiver (or speaker)**: The receiver (or speaker) sends sound through the receiver wire to the ear. The adjustable ear piece is fully customizable to fit comfortably in the ear canal. Our most popular RIC model is versatile, discreet and can be personalized for your specific needs.

**Optional**

Disposabel vs. Rechargeable
How do HAs work?

HOW HEARING AIDS WORK (THE BASICS)

Someone Says Hello
“ello ooreh oohh ee you en!”

A microphone picks up the sound & converts it into an electrical/digital signal.

An amplifier increases the strength of the signal. In more sophisticated devices, the signal is manipulated by advanced processing.

A receiver/speaker converts it back into sound & sends it to the inner ear.

The brain “hears” & understands the sound as speech.

We Hear Them Say Hello
“Hello! It sure is good to see you again!”

Please distribute freely

advancedhearing.com
Domes, Wax traps, and Batteries

If you care for Vets who use hearing aids this is for you!
“streamer” may/may not be required
Other HAs/amplification options

- CROS
- BiCROS
- CI
- Baha®
What can you do?

- Do an otoscopic exam
- Look at the ear for hearing aids
- Ask if they have hearing aids
- Ask how they work
- Ask when the last time they were seen by audiology
- Do a quick check of battery and for wax
- Refer to audiology
Case 1 ‘Mr. B’ 88y.o. HBPC patient

- HBPC
  - Can’t hear phone ring
  - Can’t understand on the phone
  - Can’t hear doorbell
  - Can’t hear the TV
  - Can’t understand people

- Got hearing aids “a while ago”
- “They never worked!”
Tools for Mr. B

Amplified/captioned phone

Hearing aids

Flashing doorbell

Hearing aid accessories: TV streamer
Case 2 ‘Mrs. S’ 86 y.o. Assisted Living Ctr.

- State Vet’s Home
  - 3 kids, 2 local, 1 in IL
    - Local kids visit frequently
    - Weekly calls from kid in IL
  - Hears “pretty well, I think”
- Wearing hearing aids for years
- “I’d be lost without them!”

What is this caregiver doing right? Everything!
Engaged, look at body language. Down at Vet’s level. Eye contact.
Probably asked her if her hearing aids were working OK.
Probably speaking slowly, articulating clearly, and raising voice just enough to be heard over hallway noise.
Tools for Mrs. B

Hearing aids

Hearing aid accessory: remote mic
For your office/travel kit

Comfort Duett
What can you do beside refer to audiology?
Remember this slide!
Communicating effectively with someone with hearing loss

• Remember what your mom taught you!
  – **Look at me when you’re talking to me**
  – Don’t mumble
  – Slow down
  – Don’t shout
  – Don’t talk with your mouth full
• Avoid distractions
  – Noise, Glaring light
• Provide printed material
Further reading

• The Common Sense of Considering the Senses in Patient Communication
  – Frank R. Lin, MD, PhD and Heather E. Whitson, MD, MHS

• Age-Related Hearing Loss and Communication Breakdown in the Clinical Setting
  – Vikki Cudmore, MB, BCh, BAO; et al

• Hearing Loss in Adults
  – Lisa L. Cunningham, Ph.D., and Debara L. Tucci, M.D., M.B.A.
  – NEJM 2017; 377;2465-2473

• Association of Age-Related Hearing Loss With Cognitive Function, Cognitive Impairment, and Dementia A Systematic Review and Meta-analysis
  – David G Loughrey, BA(Hons), et al.
  – JAMA Otolaryngology Head Neck Surg
Thanks!

Please email with any feedback or questions.
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