Promoting Hearing Health in Older Adults

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Conflicts of Interest and Acknowledgements

Conflicts of Interest:
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Hearing loss tends to be a clarity issue not a volume issue.
Prevalence of Hearing Loss

Two-thirds of adults over the age of 70 years have hearing loss.

38 million adults in the United States have hearing loss.

48 million have hearing loss if we include unilateral hearing losses.

Hearing loss defined as a better-ear PTA of 0.5-4kHz tones > 25 dB.


Hearing Aid Use Among those with Hearing Loss

Less than 20% of persons with hearing loss own and use hearing aids.

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Age-Related Hearing Loss

Basic Questions

• What are the consequences of ARHL for older adults?
• What is the impact of treating ARHL on older adults?
• How can ARHL be effectively addressed in the community?
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Healthy Aging & Hearing Loss

Hearing Loss → Cognitive & Physical Functioning

Common pathological process

Healthy Aging & Hearing Loss: Mechanistic Pathways

Cognitive Load
Hearing Loss → Brain Structure → Social Isolation → Cognitive & Physical Functioning
Hearing Loss & Cognition

Adjusted 3MS & DSS scores by years of follow-up and hearing loss status in 1,966 adults > 70 years followed for 6 years

41% faster rate of cognitive decline in 3MS scores in HL vs. NH

Lin et al. JAMA Int Med, 2013

Hearing Loss & Dementia

Dementia incidence in 639 adults followed for >10 years in the Baltimore Longitudinal Study of Aging

Risk of incident all-cause dementia (compared to normal hearing)\(^a\)

<table>
<thead>
<tr>
<th></th>
<th>HR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>1.89</td>
<td>1.00 – 3.58</td>
<td>0.05</td>
</tr>
<tr>
<td>Moderate</td>
<td>3.00</td>
<td>1.43 – 6.30</td>
<td>.004</td>
</tr>
<tr>
<td>Severe</td>
<td>4.94</td>
<td>1.09 – 22.4</td>
<td>.04</td>
</tr>
</tbody>
</table>

\(^a\) Adjusted for age, sex, race, education, DM, smoking, & hypertension

Lin et al. Arch Neuro., 2011
Hearing Loss & Dementia

Livingston et al., Lancet 2017

Hearing and Health Care

Exposure | Mediators | Immediate outcomes | Long-term Outcomes
---|---|---|---
Hearing Loss | Poor Treatment Understanding | Agitation/Frustration | Satisfaction | Health Care Utilization (hospitalizations, 30-day readmission)
Communication Breakdown | Confusion | Length of Stay
Sensory Deprivation | Isolation | Delirium
Hearing and Health Care Cost

Retrospective, propensity-matched cohort study of persons with and without untreated hearing loss from a large health insurance claims database.

Population at follow-up points:
- 154,414 at 2-year
- 44,852 at 5-year
- 4728 at 10-year

Hearing and Health Care Utilization

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Hearing Loss and Satisfaction with Care

Data Source: Atherosclerosis Risk in Communities Study Visit 5 (2013)
Hearing Loss pilot (Washington County), 256 participants aged 67-89 years

Exposure: Pure-tone audiometry

Outcome: Self-report satisfaction with quality of care over last year

75-year-old participant: every 10 dB increase in hearing loss, the odds of being less satisfied increased 0.94 (95% CI:0.74-1.20).

85-year-old: for every 10 dB increase in hearing loss, the odds of being less satisfied increased 1.33 (95% CI:0.96-1.83).
Patient-Provider Communication

- IOM 2001: Patient-provider care is cornerstone of patient-centered care
  - “...care that is respectful of and responsive to individual patient preferences, needs, and value”

- Only 23.9% (16/67) of patient-provider communication papers involving older adults included any mention of hearing loss
  - Of those 16, only 4 included hearing loss in analyses

- Systematic review of inpatient patient-provider communication
  - 13/13 studies that included hearing loss found it associated with poorer patient-provider communication

Healthy Aging & Hearing Loss: Mechanistic Pathways

Hearing Loss → Brain Structure → Social Isolation → Cognitive & Physical Functioning → Cognitive Load

Hearing Care?

Hearing loss intervention could:
- Reduce the cognitive load of processing degraded sound
- Provide increased brain stimulation
- Improve social engagement
Hearing Aid Use Among those with Hearing Loss

Current secondary data is limited as factors associated with hearing aid use are likewise protective mechanisms (e.g., education, economic status)

Lack of randomized trials!

Age (in years)

Hearing loss defined as a better-ear PTA of 0.5-4kHz tones > 25 dB

**Translating Epidemiologic Evidence into Policy**

- **Over the Counter Hearing Aid Act 2017***
  - *FDA Reauthorization Act*


**Over-the-Counter Hearing Aid Act of 2017**

- Entry of consumer electronics manufacturers (e.g., Bose) will lead to reduction in cost of devices to consumers
- Devices are created for end-user in mind with integration with consumer electronics & adoption of wireless standards for far-field sound transmission

Hearing aids are regulated by the FDA, and until the recently passed OTC hearing aid legislation becomes effective in 2020, hearing aids can still only be sold by licensed professionals.

*Hearing loss, the third most common chronic condition among older adults,*³ has suddenly been thrust into the legislative spotlight following the emergence of research that found an association between hearing loss and important health care outcomes, including cognitive decline and dementia.⁴ Hearing loss and hearing care access have received attention from the White House,² US Congress,³ and major scientific institutions.⁴ Following recent legislation, hearing aids to address mild to moderate hearing losses are set to become available over-the-counter (OTC) by 2020, disentangling the purchase of hearing aids from the hearing rehabilitative services. The mean price to consumers for a pair of hearing aids is $4,700 but can range from $1,000 to more than $8,000.¹
OTC Hearing Care?

Hearing Aids:
- Regulated by the FDA
- $800 to $3000 per device
- Minimal insurance benefit (no Medicare benefit)
- Accepted gold standard of care
- Advertise to treat hearing loss

Personal Sound Amplification Products:
- Unregulated by the FDA
- Cost $30-300 per device
- E-commerce
- Tremendous recent advances
- Cannot advertise to treat hearing loss

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Hearing Aid v. PSAPs

Single-blind crossover; within-subject

Screening
- Consent & Otoscopy
- Audiologic evaluation
- MMSE (≥24)
- Questionnaire

Speech-in-Noise Testing
- Completed in 7 conditions: unaided, 5 PSAPs, & HA
- Order of devices and sentences randomized
- Participants blinded

Device Fitting
- Best-practice, prescriptive fitting

Analysis

Reed et al., JAMA 2017
**Hearing Aid v. PSAPs**

<table>
<thead>
<tr>
<th></th>
<th>Cost, US $</th>
<th>Mean Accuracy, % (95% CI)</th>
<th>Change From Unaided Hearing, Percentage Points (95% CI)</th>
<th>Difference Between PSAP and Hearing Aid Change, Percentage Points (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unaided</td>
<td>1910.00</td>
<td>76.5 (72.7 to 80.3)</td>
<td>11.9 (9.8 to 14.0)</td>
<td>NA</td>
</tr>
<tr>
<td>Oticon Nera 2 hearing aid&lt;sup&gt;1&lt;/sup&gt;</td>
<td>349.99</td>
<td>87.4 (83.5 to 91.4)</td>
<td>11.0 (8.8 to 13.1)</td>
<td>-1.0 (-2.7 to 0.8)</td>
</tr>
<tr>
<td>PSAP</td>
<td>349.99</td>
<td>86.7 (82.7 to 90.6)</td>
<td>10.2 (8.0 to 12.3)</td>
<td>-1.8 (-3.5 to 0)</td>
</tr>
<tr>
<td>Soundhawk</td>
<td>299.99</td>
<td>84.1 (80.2 to 88.1)</td>
<td>7.7 (5.5 to 9.8)</td>
<td>-4.3 (-6.1 to -2.5)</td>
</tr>
<tr>
<td>Etymotic BEAN&lt;sup&gt;2&lt;/sup&gt;</td>
<td>269.99</td>
<td>81.4 (77.4 to 85.3)</td>
<td>4.9 (2.8 to 7.0)</td>
<td>-7.0 (-8.8 to -5.3)</td>
</tr>
<tr>
<td>MSA 30X Sound Amplifier</td>
<td>29.99</td>
<td>65.3 (60.1 to 70.4)</td>
<td>-11.2 (-15.2 to -7.3)</td>
<td>-23.1 (-26.9 to -19.4)</td>
</tr>
</tbody>
</table>

Abbreviations: NA, not applicable; PSAP, personal sound amplification products; SSI, Sound Solutions International; SSQ, Sound Solutions Quest; PSAM, Personal Sound Amplifier Monitoring System. All devices were purchased between January 2016 and April 2016.

<sup>1</sup> The pure-tone average was 500-4000 Hz; the mean dB HL was 34.7 in the right ear and 36.1 in the left ear.

<sup>2</sup> The cost of the hearing aid was the wholesale price paid by the Johns Hopkins University Audiology Clinic. PSAPs were purchased online (Sound World Solutions CS500, Soundhawk, Etymotic BEAN, Tweak Focus) and storefront (SSSI, SSQ, PSAM, PSAM System). All devices were purchased between January 2016 and April 2016.

Reed et al., JAMA 2017

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**Community Based Hearing Care**

<table>
<thead>
<tr>
<th>PCP $15 / 30 min</th>
<th>Otolaryngologist $15 / 30 min</th>
<th>Audiologist $200-500 / 1 hr</th>
</tr>
</thead>
</table>

Total Cost = $3050-5050
Community Based Hearing Care

Baltimore HEARS Approach

1. Set a goal
2. Demonstrate
3. Practice
4. Teach

Nieman et al., Gerontologist 2017

Hospital Based Hearing Care

- No universal program to identify and intervene on hearing loss in adults in the hospital system
- Many calls for adult hearing screening but most have ignored basic principles of implementation science

Shukla et al. 2018 AJHQ; IOM 2001; Cohen et al. (2017) AGS
Hospital Based Hearing Care (ENHANCE)

<table>
<thead>
<tr>
<th>TABLE</th>
<th>ADDRESSING HEARING LOSS IN THE HEALTH CARE SYSTEM CHECKLIST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>Strategies</td>
</tr>
<tr>
<td>Technological/Considerations</td>
<td></td>
</tr>
<tr>
<td>Handheld amplification</td>
<td>Simple handheld devices, such as the Cochlear tool or Supertool, to use standard headphones and easily amplify sound to the device with the volume control to improve communication.</td>
</tr>
<tr>
<td>Amplified and caption telephones</td>
<td>These telephones are specially designated for individuals with hearing loss (HL) and provide increased amplification and captioned conversations.</td>
</tr>
<tr>
<td>Environmental/Adaptation</td>
<td></td>
</tr>
<tr>
<td>Remove background noise</td>
<td>Reduce background noise by turning down the television or radio and closing the door to noisy areas to improve communication. If the noise cannot be removed, try going somewhere away from the noise for communication.</td>
</tr>
<tr>
<td>Improve room lighting</td>
<td>This is a balancing act. Proper lighting helps individuals with HL visualize the speaker to aid in lip reading. If the lighting is too low, a window reflection can be distracting.</td>
</tr>
<tr>
<td>Use sound absorbent materials</td>
<td>Carpet, drapes, and even acoustic foam placed on the walls can improve the reverberance (or, echo) quality of a room.</td>
</tr>
<tr>
<td>Communication Considerations</td>
<td></td>
</tr>
<tr>
<td>Ensure attention</td>
<td>Start conversation and center your view when both parties are attentive.</td>
</tr>
<tr>
<td>Face-to-face communication</td>
<td>Ensuring that the listener can see your face is leverage. Spreading skills is important. This also ensures sound is being directed at the listener rather than in another direction.</td>
</tr>
<tr>
<td>Do not cover mouth</td>
<td>Many individuals consciously and subconsciously cover their mouth to help their conversation.</td>
</tr>
<tr>
<td>Speak slowly and clearly</td>
<td>HL is a sensory issue rather than a language issue. Slowing down and using a slightly lower tone can help listeners with HL follow the conversation.</td>
</tr>
<tr>
<td>Do not shout</td>
<td>Shouting does not help and often further disrupts information.</td>
</tr>
<tr>
<td>Give context to conversation</td>
<td>Place the conversation in some kind of context to help the listener decipher difficult to hear words.</td>
</tr>
<tr>
<td>Rephrase rather than repeat</td>
<td>Rephrase remarks to help the listener gain new content about the conversation and use words that are easier to hear. Rephrasing concrete information will frustrate negative feedback loop.</td>
</tr>
</tbody>
</table>

Changing Hearing Care Ecosystem

- PSAP or OTC Hearing Aid
  - $ $1-2 hours

- Community Health Worker
  - Community Hearing Aid Dispenser
  - $ $1/2 day
  - Hearing Aid Dispenser
  - $ $$$
  - 1-2 months
  - Gold Standard Audiology Care
  - $$$$$
  - 3-6 months
Take-Home Messages

1. Hearing loss has an independent association with markers of healthy aging
   - Cognitive decline, dementia

2. Persons with hearing loss interact with the health care system differently
   - Satisfaction, health resource utilization

3. Poor uptake of hearing care
   - Access and affordability

4. Pending policy effects
   - Over-the-counter hearing aids

5. Novel delivery models
   - Over-the-counter, community-based, hospital-based

6. RESEARCH NEEDED!
   - Randomized control trials

Thanks!

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