Huh? What?
How Hearing Loss Impacts Geriatric Patient Care

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Disclosure

Dr. Powers has no financial interests to disclose.

All products and prices mentioned in this presentation are for informational and educational purposes only and do not serve as an endorsement.
Learning Objectives

• Recognize the association between common geriatric syndromes and hearing loss
• Perform two common hearing screening tests
• Appreciate the role of clear communication, hearing aids, and amplifying/alarming devices in the hearing impaired geriatric population
“BLINDNESS SEPARATES PEOPLE FROM THINGS; DEAFNESS SEPARATES PEOPLE FROM PEOPLE.”

-Helen Keller
Presby + Cusis = Old Age Hearing

• Most common hearing loss over age 50
• High frequency sensorineural hearing loss
• Lifetime of insults to the auditory system
  – Noise damage
  – Exposure to ototoxic agents
  – Systemic disease
  – Genetic susceptibility
  – Otological disorders
Epidemiology

Prevalence of Bilateral Hearing Loss by Age Decile
NHANES Data 2005-2006

Symptoms

- Reduced hearing sensitivity
- Reduced speech understanding in noise
- Impaired sound detection and localization
- Slowed central processing of auditory input
Effects

• Word Confusion
  – Mash/Math, Mat/Map, Someday/Sunday
• Missing high frequency warning sounds
  – Alarms, sirens, beepers, turn signals
• Psychosocial
• Emotional
• Cognitive
• Physical
Speech Banana

Human Speech
- 500-4kHz
- Avg 50dB

Normal Audiogram

O = right ear
X = left ear
Presbycusis Audiogram

- Pure Tone Average
  - Average Intensity (dB) on pure tone audiogram
  - 500, 1000, 2000, (4000) Hz

Right = 37.5
Left = 36.25
Young Men

Average Hearing in Men, by age

Hearing gets worse

High-pitched hearing is the worst

70-79 years

80-89 years

(Moscicki, el al, 1985)
Unrecognized

• Nursing Home\(^1\)
  – 77-94% of nursing home residents had loss
  – 48% moderate to severe loss was undocumented

• Primary Care Study at an academic medical center and VA hospital\(^2\)
  – 18% of charts had documentation about hearing

\(^2\)Shafer S, Day H. *JAGS.* 2010.
Impact

• Associated with:
  – Functional decline
  – Frailty and falls
  – Poor quality of life
  – Depressive symptoms
  – Social isolation
  – Cognitive deficits

Presbycusis and Functional Decline

Decline in (A) SPPB Score and (B) Gait Speed by Hearing Status

SPPB= Short Physical Performance Battery

Health ABC Study

Presbycusis and Frailty/Falls

Adults age 70-79 with moderate or greater hearing loss have compared to those with normal hearing have:

• 63% increased risk of developing frailty
• Greater annual increase in odds of falling (9.7 vs. 4.4)

Presbycusis and Depression

• Hearing aid use is independently associated with reduced odds of MDD and depressive symptoms in older adults

Mener et al. JAGS. 2013.
Presbycusis and Loneliness

- Hearing loss is significantly associated with loneliness
  - Measured by the De Jong-Gierveld Scale
- Hearing aid use can decrease loneliness in 4-6 weeks

Presbycusis and Patient Satisfaction

• Using the Consumer Assessment of Healthcare Providers and Systems (CAHPS)

• 10% lower odds of favorable ratings of patient-physician communication

• 6% lower odds of favorable overall healthcare experience

Mick et al. JAGS. 2014.
Presbycusis and Institutionalization

- Longitudinal predictors of institutionalization of older adults include:
  - Severe Hearing Loss (but NOT visual impairment)
  - Widowhood
  - Depression (GDS ≥10)
  - Mobility Impairments
  - Walking Impairments
  - Dementia

Hajek et al. Plos One. 2015.
Presbycusis and Hospitalization

- Health ABC Study
- Annual Rate of Hospitalization is Higher in Hearing Impaired Older Adults
  - 17% higher for mild hearing loss
  - 21% higher for moderate or greater hearing loss

Genther et al. JAGS 2015.
Hearing Loss & Incident Dementia

Baltimore Longitudinal Study of Aging

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

Adjusted for age, sex, race, education, DM, smoking & hypertension

Lin et al., Arch Neuro. 2011.
Presbycusis and Brain Atrophy

Estimated Annual Rates of Change in Brain Volume (cm³/year)

<table>
<thead>
<tr>
<th></th>
<th>Normal Hearing mean (SE)</th>
<th>Hearing Loss, mean (SE)</th>
<th>Difference mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global measures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole brain</td>
<td>-7.21 (0.27)**</td>
<td>-8.33 (0.36)**</td>
<td>-1.13 (0.45) *</td>
</tr>
<tr>
<td>vCSF</td>
<td>1.30 (0.10)**</td>
<td>1.28 (0.14)**</td>
<td>-0.020 (0.18)</td>
</tr>
<tr>
<td>White matter</td>
<td>-4.14 (0.31)**</td>
<td>-4.99 (0.39)**</td>
<td>-0.85 (0.39) *</td>
</tr>
<tr>
<td>Gray matter</td>
<td>-2.63 (0.22)**</td>
<td>-3.38 (0.28)**</td>
<td>-0.76 (0.36) *</td>
</tr>
<tr>
<td><strong>Lobar measures</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rotational 1</td>
<td>1.30 (0.10)**</td>
<td>1.28 (0.14)**</td>
<td>-0.020 (0.18)</td>
</tr>
<tr>
<td>Frontal</td>
<td>-0.96 (0.11)**</td>
<td>-1.11 (0.14)**</td>
<td>-0.16 (0.14)</td>
</tr>
<tr>
<td>Temporal</td>
<td>-0.46 (0.096)**</td>
<td>-0.71 (0.12)**</td>
<td>-0.25 (0.12) *</td>
</tr>
<tr>
<td>Parietal</td>
<td>-0.71 (0.051)**</td>
<td>-0.74 (0.066)**</td>
<td>-0.044 (0.081)</td>
</tr>
<tr>
<td>Occipital</td>
<td>-0.54 (0.057)**</td>
<td>-0.50 (0.073)**</td>
<td>0.047 (0.071)</td>
</tr>
<tr>
<td><strong>Regional Volumes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superior temporal gyrus</td>
<td>-0.20 (0.023)**</td>
<td>-0.31 (0.030)**</td>
<td>-0.11 (0.038) *</td>
</tr>
<tr>
<td>Middle temporal gyrus</td>
<td>-0.15 (0.033)**</td>
<td>-0.30 (0.042)**</td>
<td>-0.15 (0.054) *</td>
</tr>
<tr>
<td>Inferior temporal gyrus</td>
<td>-0.048 (0.015)**</td>
<td>-0.12 (0.020)**</td>
<td>-0.067 (0.025) *</td>
</tr>
<tr>
<td>Hippocampus</td>
<td>-0.019 (0.0051)**</td>
<td>-0.031 (0.0065)</td>
<td>-0.012 (0.0082)</td>
</tr>
</tbody>
</table>


+ <0.05 * <0.01 ** <0.001
Presbycusis & Geriatric Syndromes
Common Cause or Modifiable Risk Factor?

- Hearing Loss
- Cognitive Load
- Brain Structure and Function
- Social Isolation
- Common Pathological Process
- Cognitive & Physical Functioning

Flowchart showing the relationships between hearing loss, cognitive load, brain structure and function, social isolation, and common pathological processes leading to cognitive and physical functioning.
Screening

• Weber Test—conductive or sensorineural
• Rinne Test—air and bone conduction
• Audioscopes
• Whisper Test
• Ling Six Sound Test
• Hearing Handicap Inventory for the Elderly
Ling 6 Sound Test

• Have patient close eyes and repeat after you:
  – Ah
  – Ee
  – Oo
  – S
  – Sh
  – M

• If ≥1 missed consider a pocket talker in the visit and a referral to audiology
Refer for Additional Hearing Evaluation if Score is \( \geq 10 \) Points

**Interpretation of score:**
- 0-8 suggests no hearing handicap
- 10-24 suggests mild-moderate hearing handicap
- 26-40 suggests significant hearing handicap

Refer for additional hearing evaluation if score is > 10 points
One Simple Question

- On a scale of 1 to 10, 1 being the worst and 10 being the best, how would you rate your hearing ability?
  - 1-5 likely purchase amplification (75-100%)
  - 8-10 will not purchase amplification (80-100%)
  - 6-7 need more information

Overall 79% of older adults with hearing loss have never have worn hearing aids.
Expense

• Prices range from $1,200 to $3,700 per aid
  – 80% of wearers need two
• Batteries costs $50 to $100 per year
• Consumer Reports survey found 40% of those who bargained got a price break

• Not covered by Medicare or most state Medicaid
• Covered by few private insurers

http://www.aarp.org/health/conditions-treatments/info-05-2011/paying-for-hearing-aids.html
The Challenge

• My mother put her hearing aids in her juice and now the staff won’t let her wear them.

• My mother was hiding her hearing aids in the laundry – we’ve lost them now.

• My problem isn’t with my hearing – it’s my memory that’s failing.

From Baltimore Hears Patients/Caregivers
San Antonio HEARS Comments

Please explain if you have worn a hearing aid before but do not anymore:

• I’m not used to them
• I have trouble putting them in
• I lost them
• He “does not know how to control anymore. He messes with them and they are out of sync”
• He “pulled his hearing aid apart and couldn’t put it back together.”
Types of Hearing Aids
Batteries
Telecoils

- Work with electromagnetic radiation
- When in use the patient only hears electromagnetic sounds
  - i.e. telephone, overhead announcer
  - Can’t hear regular voices or sounds

http://youtu.be/Ahbaz0VvlZF0
Neck Loops

• Work with telecoil in hearing aid
• Can also work with FM technology
  – TVs
  – Telephones
  – MP3 players
  – Microphones
  – Hearing aid programming

$40
(VA available)
Blue Tooth Accessories

- Many aids in last 2-4 years
- Remote control
- Hearing aids “like headsets”
- Eliminates background noise
- Can connect to up to 8 blue tooth devices
  - Telephone, iPod, TV, computer, GPS, car stereos
Other Hearing Aid Accessories

• Many compatible devices but all signals are proprietary
  – Button microphones
  – Pen microphones
  – Remote microphones
  – TV systems
  – Compatible phones
  – Rechargeable batteries
Benefits of Use

• Use leads to improved
  – Speech perception and understanding
  – Hearing related QoL (not overall QoL)

• Very few studies on hearing aid use and
  – Cognitive Decline
  – Falls and Immobility
  – Health Outcomes
But almost 80% of people don’t wear hearing aids?

- NEED FOR LOW:
  - Stress
  - Cost
  - Burden
- EASY access
- SIMPLE tools
4 Universal Listening Needs

- Hearing aids do not always provide real world improvement in face-to-face communication.
- Hearing aids alone do not provide good reception for:
  - Media
  - Telephone
  - Warning/cues signals

The Goal

“My mother listens to music more often and when she’s watching television she seems to understand what she is watching and laughs or smiles at appropriate times. She also speaks louder, asks more questions, and seems to follow the conversation better. She is reading more often.”

Actual Feedback from a Caregiver of a Patient with Dementia in the Baltimore HEARS Program
Tips for Communicating

• Face person
• Ensure adequate lighting
• Do not cover your mouth when talking
• Speak at a normal to slightly slower rate
• Do not shout—lower your pitch
• If asked to repeat—rephrase
• Make sure patient is relaxed as possible
Aural Rehabilitation

The Complete HEARS Guide

5.4 Tips

1. Attention First

2. Get Face to Face

3. Speak Slowly

4. Big Ideas and Key Words

5. Repeat then Reword

6. Summarize

Version 1.2 © 2014 Johns Hopkins University
Hearing Loss and Room Acoustics

- **REVERBERATION**
- **AUDIBILITY***
- **NOISE**

* Determined by intensity of target signal, vocal effort of talker, distance, hearing loss
Hearing Assistive Devices

- Two main categories
  - Amplification/Communication
  - Safety Alerts
Amplifiers

- **PockeTalker** up to 130dB output $140

- **Comfort Duett** $150

- **Loud ‘N Clear Amplifier** $10

- **RCA Symphonix Personal Amplifier** $200
Telephones

• Difficult even with hearing aid use
  – No visual cues
  – Unfamiliar voices
  – Using only one ear

• Phone options with hearing aids
  – Acoustic, telecoil, wireless routing
Landlines

• Amplifiers from 25-45dB ($15-50)
• Amplified answering machines with slow playback ($60-100)
• Amplified speakerphones ($80) (VA Available)
• Mono or binaural headsets ($100-200)
• Captioned phones ($200) (VA Available)
Cell Phones

• Acoustic coupling
  – M1-M4 ratings from FCC
• Inductive coupling (telecoil)
  – T3 rating from FCC
• Apps:
  – Clear Captions
  – Skype/Google Chat
  – Google Voice
  – Sound Boost

Teletypewriter (TTY)

• New technologies making obsolete
• Typewriter with LED screen and spool of paper to print text
• Text transmitted via telephone line to similar device
TV Systems

Induction Loop Systems $150-300

TV Ears $125

Bluetooth Audio Adapter $60
At the Movies

- Streaming wireless closed captioning
- Amplifier systems
Safety Alert System

Made up of Receivers and Transmitters

- Receiver types:
  - Bed shaker
  - Strobe light
  - Lamp
  - Vibrating pager

- Transmitter Types:
  - Alarm Clock
  - Doorbell
  - Phone Ring
  - Baby Cry
  - Appliance Alert
  - Weather Alert
  - Movement
  - Smoke/Carbon Monoxide
  - Security

Systems generally work up to 2000 feet
Example Receivers

Watch Receiver Kit
$284-$306

LED/Vibrating Receiver
$127

Tabletop Receiver
$254
Example Transmitters

Door Window Access $72
Doorbell Alert $522
Movement Signaling Mat $138
Sound Detector $81
Fire Safety and Hearing Loss

- Seniors age 65+ have fire death rate 2X the national average
- Most smoke detectors peak at 3100Hz where the elderly have hearing loss
- There is ~ 40dB difference between detecting a signal when awake v. asleep
- Individuals with hearing loss incorrectly assume they can hear the smoke detector with their hearing aids off
Smoke Detectors

90dB Smoke Detector and Strobe $103

Strobe connects to regular smoke detector $69 (VA available)

Smoke detector, strobe, bed shaker, silent call $287-$342
Alarm Clocks

- Portable Sonic Shaker $35
- Sonic Boom Shaker and Light $90
- Flashing Shaking Alarm $50
- Bed Shaker $40 (VA Available)
Summary

• Recognize the association between common geriatric syndromes and hearing loss
• Perform two common hearing screening tests
• Appreciate the role of clear communication, hearing aids, and amplifying/alarming devices in the hearing impaired geriatric population
Resources

• Eek M, Wressle E. Everyday technology and 86-year-old individuals in Sweden. Disability and Rehabilitation: Assistive Technology. 20
• http://www.drtbalu.com/images/audiogram.jpg
• http://youtu.be/TvK41KVn4eQ
Thank You

Any Questions?

Escope amplified stethoscope/hearing aid compatible $370
Financial Assistance

- VA benefits
- Medical flexible spending accounts
- Sertoma.org
- Vocational Rehab
- Hearing aid recycling programs
VA Hearing Aid Benefits

• Veterans with a hearing impairment severe enough that it interferes with their ability to participate actively in their own medical treatment
  – Severe = restricts access to, involvement in, or active participation in health care services.
  – Severe ≠ severe hearing loss must be present to be eligible for hearing aids

• Must be evaluated by an audiologist and enrolled at a VA facility for healthcare

Where to Get Assistance

• Center for Deaf and Hearing Services
  – 1945 5th Avenue, Pittsburgh, PA 15219
  – (412) 281-1375

• Try before you buy for assistive devices
Where to Get Assistance

• UPMC Center for Assistive Technology
  – 3600 Forbes Avenue Suite 3010
  – Pittsburgh, PA 15213
  – 412-647-1310 (p) 412-647-1325 (TTD)

• Audiology services

• Aural rehabilitation

• Assistive listening and alerting devices

• Hearing aid and adaptive equipment dispensing
Simulated Hearing Loss

https://youtu.be/KZXOGGZq3AM