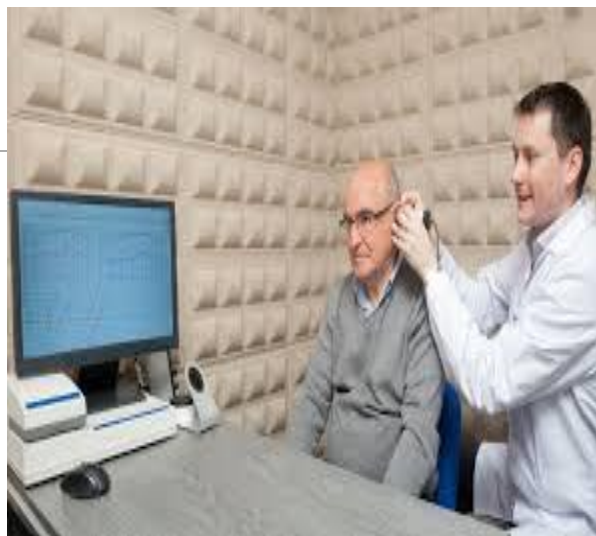


# Hearing loss in Geriatrics



بهیبه کهن سال  
عضو هیات علمی گروه شنوایی شناسی  
دانشگاه علوم پزشکی اراک

سنة  
الهدى

# What is the most important activity for maintaining quality of life?

**Spending time with family and friends (96%)**

**Religious or spiritual activities (82%)**

**Exercise and physical activity (80%)**



AARP 2003



# The Impact of Hearing Loss



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**“When someone in the family has a hearing loss, the entire family has a hearing problem”**

**◦ Mark Ross**

# I Propose--A New Perspective

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“Hearing loss is a significant, costly PUBLIC HEALTH ISSUE”

## Left unaddressed/untreated

- Continued growth in number of, not just hearing-, but psychosocially and cognitively-impaired older adults with diminished quality of life, requiring costly care

# Hearing Loss in the Geriatric Population

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**Presbycusis – age-related hearing loss**

- **Primarily affects adults age 50+**

**Manifests as a high-frequency, sensory loss**

- **Permanent, damages to the cochlear structures**
- **Sometimes neural involvement (“sensorineural”)**

**Results from:**

- **Noise exposure**
- **Age-related changes in the auditory system**
  - **Vascular**
- **Genetic predisposition**

# What Auditory Functions are Impaired in Aging?

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- **sensory presbycusis :**  
**Loss of hair cells at base of cochlea**
- **Neural presbycusis**  
**Low SDS**
- **Strial presbycusis**  
**Flat audiometry**
- **Cochlear conductive**  
**Stiffness of basilar membrane**



# World Health Organization: Hearing Loss Is...

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- **Is the second most prevalent cause of living with a disability after depression [Mathers et al (2003) and Weinstein (2011)]**
- **Is recognized by the World Health Organization as being in the top 3 of their Global Burden of Disease along with depression and arthritis (<http://www.who.int/mediacentre/factsheets>)**
- **Can accelerate some disabilities such as cognitive dysfunction and depression**
- **Can be mistaken for cognitive concerns**

# Statistics

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Aging is the leading cause of hearing loss (Cruickshanks et al. 2003), with measured hearing loss rising sharply after age 40, to reach **44%** at ages 60-69, **65%** at ages 70 to 79 and **90%** over the age of 80 (Cruickshanks et al. 1998) .

The population aged 65 + is projected to double from 5 million in 2011 to 10.4 million by 2036.

Hearing loss is highly prevalent in the **US**

Adults: **16%+** (Agrawal, Platz, & Niparko, 2008)

Adults 70 years and older: **65%** (Lin, Thorpe, Gordon-Salant, & Ferrucci, 2011)

# Prevalence of ARHL in Europe?

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- ❑ **30% of men & 20% of women by the age of 70 ,have at least 30dB SNHL**
- ❑ **55% of men & 45% of women by the age of 80**

# Impact

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## Hearing loss can lead to:

- ❑ An increased risk of poverty (Jung et al. 2012)
- ❑ Social isolation (Arlinger, 2003)
- ❑ Restricted quality of life
- ❑ Increased need for support services and hospital care (Schneider, 2010)
- ❑ Depression, withdrawal, stress, anger and fatigue causing damage to families and relationships (Chia, 2007); (Sindhusake, 2001)

# What Does Untreated Hearing Loss Look Like?

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- Common coping strategies used by individuals with untreated hearing impairment include:
  - Substitution: “*mall or Paul?*”
  - *Smile and nod...*
  - Talking and not listening
  - “*What? Huh?*”
  - Withdrawal: social and environmental
  - Speaking loudly

**Such coping strategies often lead to miscommunication, indifference, exhaustion, social isolation and frustration.**

**They can also easily be mistaken for cognitive impairment.**

# Hearing Loss and Other Co-Morbid Conditions

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Hearing loss has now been linked to a **broad range of disease processes** including:

- An association between high frequency hearing loss and increased risk of falls. *Lin and Ferrucci (2012)*
- An association with Type II diabetes: *hearing impaired adults are more than twice as likely to have Type II diabetes compared to those who do not have hearing loss. Bainbridge et al (2008)*
- A link with cardiovascular disease. *Gates et al (1993) and Fisher et al (2014)*
- *Dementia (Lin, 2011; Lin et al., 2013)*

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# **Demantia and hearing loss**

# Dementia around the world

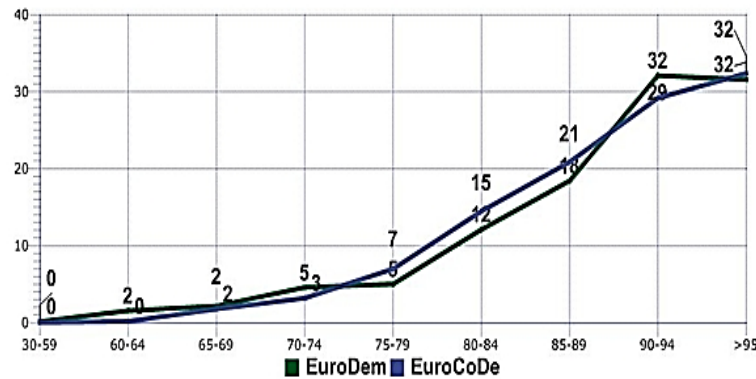
People living with dementia around the world



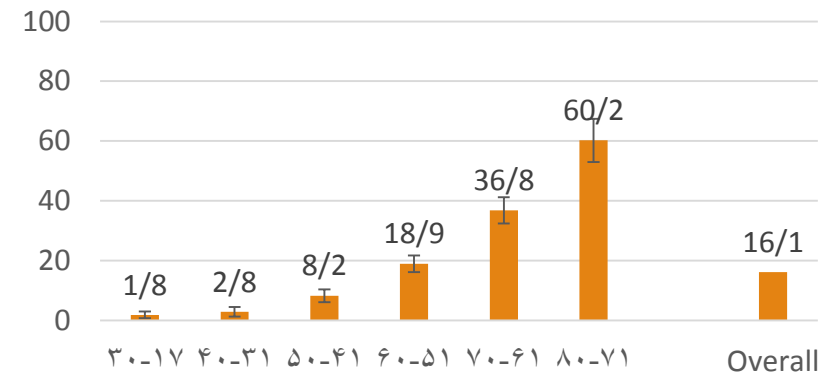


# The problem

## Dementia

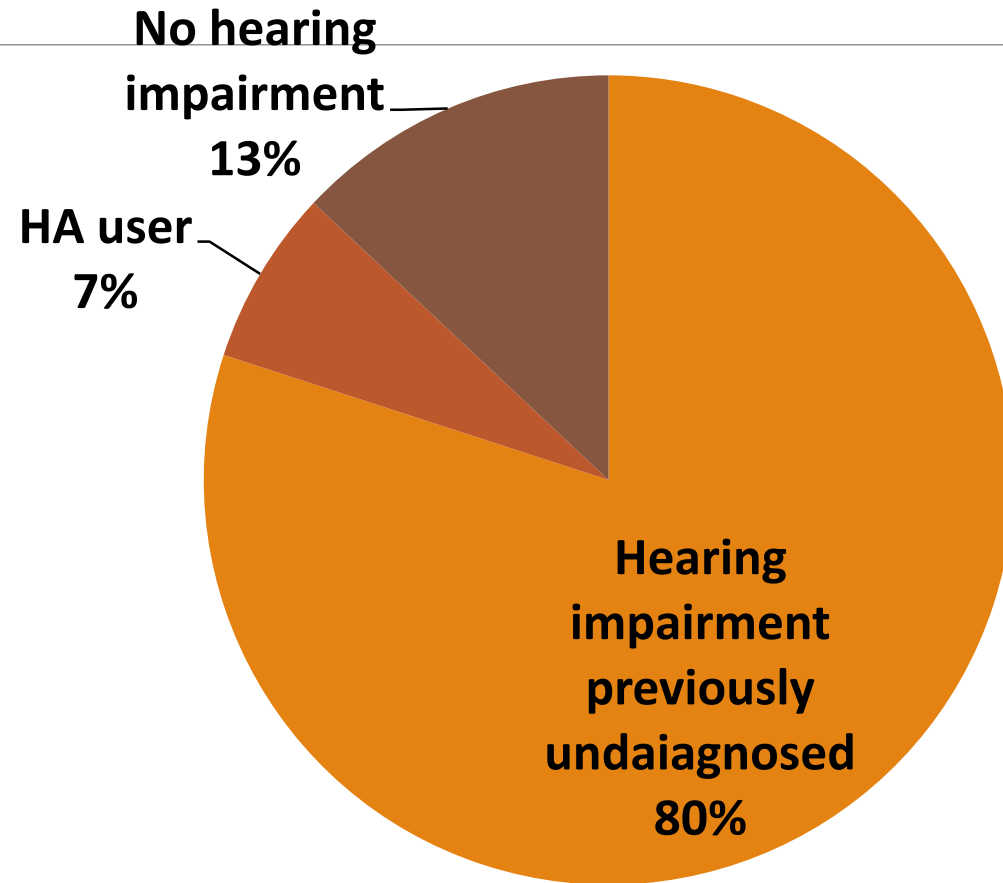


## Hearing impairment



- 1/3 at age 90 have dementia
- 60% adults aged 70-80 years
- Cognitive & hearing problems are under-treated

## Dementia and hearing loss



Allen et al (2003)

# Demantia and hearing loss

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- ❑ Dementia and **hearing** loss are both common conditions in the ageing population and they often coexist
- ❑ Currently, no effective therapies are **available to cure** dementia or slow its progression.
- ❑ Mild cognitive impairment (MCI) is an intermediate state between normal cognition and dementia, with a published prevalence between 5.0 and 36.7% worldwide
- ❑ Hearing impairment, or hearing loss often occurs with aging and is common among older adults
- ❑ hearing loss as a risk factor for the development of dementia,
- ❑ hearing impairment is more common in patients with dementia than in healthy older adults

## Hearing Loss and Dementia – WHY??

- Research to date indicates connection is associative, not causal.
- 3 hearing loss impacts
  - Isolation
  - Cognitive Load
  - Potential underlying pathology

## Isolation

- Risk factor regardless of whether normal hearing or hearing impaired
- Hearing loss can trigger downward spiral
  - Can't hear
    - Don't pay attention
      - Shut yourself off
        - Lack of stimulation
          - Dulls memory and thinking

## Cognitive Overload

- Trying so hard to hear that it makes it hard to actually absorb what is being said.
- Constant expending of mental energy decoding what is heard.
- “The brain is so preoccupied with translating the sounds into words that it seems to have no processing power left to search through the storerooms of memory for a response.” Dr. Lin

## Pathological Factors?

- Underlying pathological mechanism that influences both hearing loss and dementia
- Could be environmental or genetic
  - Researchers don't know

# Does Hearing Loss Cause Dementia? Perhaps...

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- JAMA, 2008 Uhlmann, et al.
- Relationship of hearing impairment to dementia and cognitive dysfunction in older adults.
  - 100 cases with Alzheimer's-type dementia (AD) and 100 age-, sex-, and education-matched, nondemented controls.
- Greater hearing loss is associated with a higher odds of having dementia.
- Hearing loss is significantly correlated with the severity of cognitive dysfunction.



# Dementia and Hearing Loss

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30% to 40% of people with hearing loss are at greater risk of experiencing cognitive decline as compared to those who have normal hearing.

(Lin et al. 2013)

Why?

- A reduction in neural stimulation (neuron firing)
- Loss of environmental stimulation
- Poor social interactions, loneliness (isolation?)
- Exhaustion due to increased effort to hear

**It is important for hearing-impaired adults both with and without cognitive decline and or functional deficits to receive the appropriate audiologic treatment to improve their quality of life.**

## Demographic and Clinical Characteristics of Baseline Study Cohort by Hearing Loss Status

	Hearing Loss Status <sup>a</sup>				P Value
	Normal (n=455)	Mild (n=125)	Moderate (n=53)	Severe (n=6)	
Male sex	225 (49.5)	94 (75.2)	36 (67.9)	5 (83.3)	<.001
Age, mean (SD), y	59.9 (12.2)	71.1 (8.6)	77.0 (8.4)	77.7 (4.8)	<.001
Race					
White	404 (88.8)	121 (96.8)	49 (92.5)	6 (100.0)	.17
Black	44 (9.7)	4 (3.2)	4 (7.5)	0	
Other	7 (1.5)	0	0	0	
Education, mean (SD), y	16.6 (2.8)	16.2 (3.0)	16.7 (3.6)	16.2 (4.0)	.74
Diabetes mellitus	62 (13.6)	20 (16.0)	12 (22.6)	1 (16.7)	.27
Smoking					
Current	19 (4.2)	1 (0.8)	1 (1.9)	0	.05
Former	244 (53.6)	85 (68.0)	35 (66.0)	3 (50.0)	
Never	192 (42.2)	39 (31.2)	17 (32.1)	3 (50.0)	
Hypertension	204 (44.8)	79 (63.2)	38 (71.7)	6 (100.0)	<.001
Hearing aid use <sup>b</sup>	6 (1.5)	14 (11.9)	39 (78.0)	4 (66.7)	<.001
Blessed Information Memory Concentration Test score					
0	265 (58.2)	65 (52.0)	31 (58.5)	0	.08
1	112 (24.6)	32 (25.6)	13 (24.5)	2 (33.3)	
2	49 (10.8)	19 (15.2)	6 (11.3)	3 (50.0)	
3	29 (6.4)	3 (2.2)	3 (5.7)	1 (16.7)	
Development of all-cause dementia during follow-up	20 (4.4)	21 (16.8)	15 (28.3)	2 (33.3)	<.001

<sup>a</sup>Hearing loss is defined by the pure-tone average (PTA) of 0.5, 1, 2, and 4 kHz, with tones presented by air conduction in the better-hearing ear. A PTA of less than 25 dB indicates normal hearing; 25 to 40 dB, mild loss; 41 to 70 dB, moderate loss; and greater than 70 dB, severe loss. Unless otherwise indicated, data are expressed as number (percentage) of participants. Percentages have been rounded and might not total 100.

<sup>b</sup>Data on hearing aid use were missing for 72 individuals. Participants with hearing aid use data per hearing loss category included 393 with normal hearing, 118 with mild loss, 50 with moderate loss, and 6 with severe loss.

# Dementia & Hearing Loss



Mild hearing loss: **2 times**  
more likely to develop dementia

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Moderate hearing loss: **3 times**  
more likely to develop dementia

[http://www.hearingloss.org/sites/default/files/docs/Reynolds\\_saturday.pdf](http://www.hearingloss.org/sites/default/files/docs/Reynolds_saturday.pdf)

Severe hearing loss: **5 times**  
more likely to develop dementia

# Hearing loss and dementia evaluation

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Which dementia test most commonly used?

Do physicians ask about hearing?

Do physicians refer for hearing testing?

Jorgensen, L., Palmer, C. V., & Fischer, G. (2014). Evaluation of hearing status at the time of dementia diagnosis. *Audiology Today, Jan/Feb*, 28-45.

# Hearing loss and dementia evaluation

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Which test most commonly used?

Diagnosis based on family/self report of cognitive changes plus **MMSE**

# Hearing loss may affect diagnosis of dementia

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Hearing problems look like cognitive problems

Impact of hearing loss on dementia tests

Impact of hearing loss on tasks – more difficulty, so increased likelihood of being diagnosed with dementia

→ assess and rule out/treat hearing problems in people complaining of 'memory problems'

UK national dementia guidelines recommend to 'take into account sensory impairment' during cognitive evaluation

# Hearing problems look like cognitive problems

<b>Dementia</b>	<b>Untreated Hearing Loss</b>
Social isolation (Holmen et al, 2000)	Social isolation (Weinstein and Ventry, 1982)
Decreased comprehension (Pogacar and Williams, 1984)	Decreased understanding/discrimination (Dubno et al, 1984)
Repeating questions (Nyatsanza et al, 2003)	Repeating questions (Katz, 2002)
Short-term memory problem (Miller, 1973)	Working memory problem (Salthouse, 1996)
Stereotyped/inappropriate word use (Nyatsanza et al, 2003)	Stereotyped/inappropriate word use (Tesch-Romer, 1997)
Difficulty following conversation (Bozeat et al, 2000)	Difficulty following conversation (Dalton et al, 2003)

# Cognitive Reactions

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Can't think straight – confused

Hard to focus

Distracting thoughts

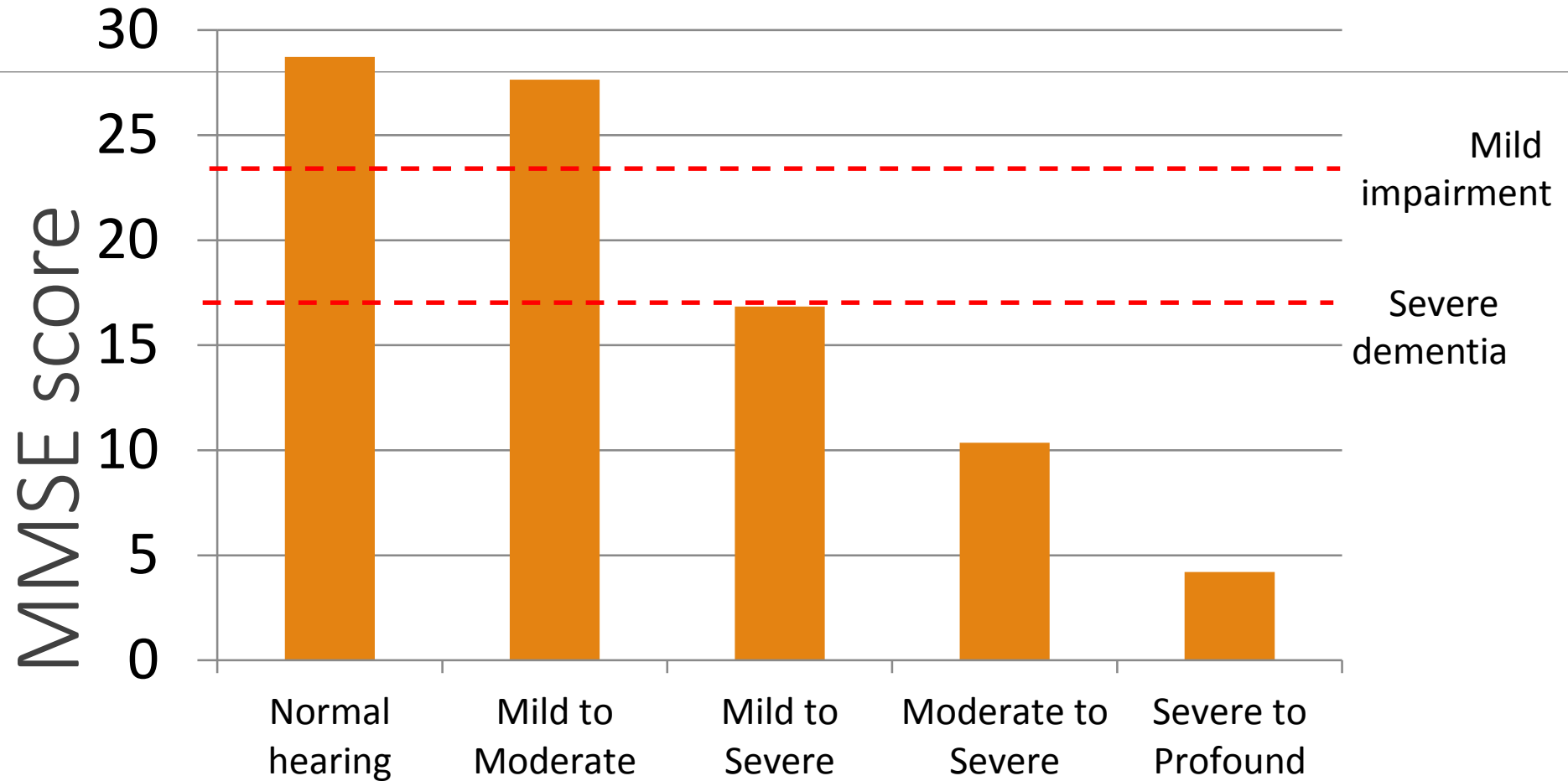
Distrustful of others

Decreased self esteem

Can't remember what you cannot hear clearly in the first place



# Impact of audibility on MMSE



Hearing level

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# Intervention and treatment



# Ensure Patients are Using Their Hearing Devices

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For patients who report they have hearing loss, ask if they wear hearing aids or cochlear implant(s)

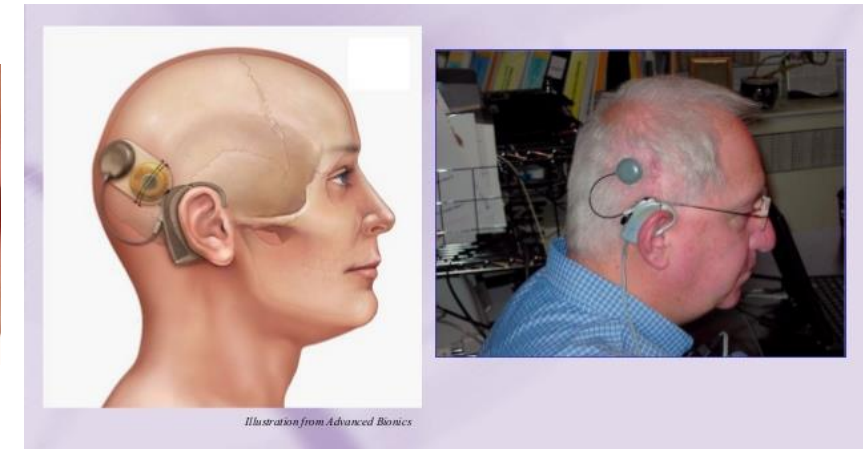
- If “yes”, be sure they are wearing them (correctly) before you continue to speak to them!
- If they do not have their devices, have an amplifier on hand for conversation
- If they have their devices, ensure the battery is new
- If battery is dead, replace from patient supply – or contact audiology for replacement battery

# Ensure Patients are Using Their Hearing Devices

## Hearing Aids



## Cochlear Implant



# New Marketing Approach

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- (Not small/invisible/discreet/hidden)
- But--
- Hearing aids are the devices that will
  - Improve memory
  - Enable continued active social life
  - Prevent mental slowing
  - Make it possible to continue living an independent, active, mentally-healthy life
- Wearing hearing aids is a “Brain training” exercise that has immediate positive impact

# Not Just Hearing Aids!

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Cochlear implants shown to improve QOL in older adults (Wanscher, 2006)

Significant improvement in social functioning

- Increased socialization known to be related to decreased depression

# Use Assistive Devices

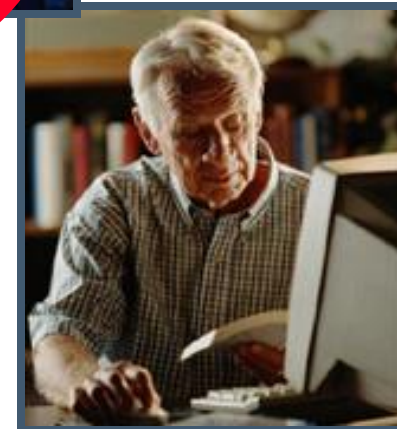
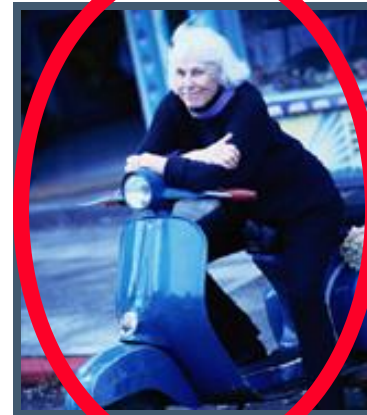
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If you are working in a geriatric unit, ask the nurses for a pocket amplifier



# Despite the Positive Benefits - Only 1 in 5 Use Amplification

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# Smart Study

[www.hopkinsmedicine.org/otolaryngology/research/clinical\\_trial/index.html](http://www.hopkinsmedicine.org/otolaryngology/research/clinical_trial/index.html)

## Studying Multiple Outcome After Aural Rehabilitation Treatment

- Current Study
- Investigating whether hearing aid or cochlear implant use can improve
  - Memory and learning abilities
  - Relationships with family and friends
  - Overall quality of life. ←
- Focus – aid use, aid fitting, continued contact with audiologist, use of ALDs ←
- Results from this study will impact
  - Strategies for hearing aid and cochlear implant delivery
  - Future clinical trials of hearing loss interventions. ←

[http://www.hopkinsmedicine.org/otolaryngology/research/clinical\\_trial/index.html](http://www.hopkinsmedicine.org/otolaryngology/research/clinical_trial/index.html)

Ref: Hearing fitness, HLAA 2013, Portland, Keri Reynolds

# Summary

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**Hearing impairment is a hidden disability not often perceived by patients or those within their support system.**

**Hearing loss is often linked to other chronic medical conditions.**

**Encourage your patients to have their hearing tested as part of their annual check-up, especially if they are over the age of 60.**

## How Are We Doing?

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Attempts to reach more

- Screening
- Education
  - Physician
  - clients

# Hearing Screening

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Objective vs. subjective

Subjective

- “Do you think you have a hearing problem?”
  - Yes or no
  - Single item screener found to be accurate in most older adults (Kamil, Genther, & Lin, 2015; Torre, Moyer, & Haro, 2006)
- Hearing handicap screening for the elderly (HHIE-S) (Ventry & Weinstein, 1983)
  - Brief, 10-item screening tool that assess self-perceived hearing handicap
  - Score of 10 or greater warrants referral for full audiologic exam

# What We ARE Doing

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- Diagnosing hearing loss
  - For the primary purpose of fitting hearing aids
- Encouraging people to have their hearing screened
- Promoting the profession of Audiology
- Advocating for public policies that favorably impact our profession and the patients we serve

# Audiological Assessment

Audiological Test	Clinical Application
Otoscopy	<ul style="list-style-type: none"><li>• Confirms (un)occlusion of ear canal</li></ul>
Tympanometry	<ul style="list-style-type: none"><li>• Confirms presence of middle ear fluid</li><li>• Checks overall mobility of middle ear system</li></ul>
Acoustic Reflexes	<ul style="list-style-type: none"><li>• Confirms integrity of auditory and facial nerve pathways</li><li>• Can detect presence of a retrocochlear lesion</li></ul>
Otoacoustic Emissions	<ul style="list-style-type: none"><li>• Checks outer hair cell integrity</li><li>• Confirms sensorineural hearing loss</li></ul>
Pure Tone Testing	<ul style="list-style-type: none"><li>• Checks entire behavioral auditory system</li><li>• Confirms presence or absence hearing loss</li><li>• Confirms type and degree of hearing loss</li></ul>
Speech Reception Threshold	<ul style="list-style-type: none"><li>• Determines lowest level of perceptible speech</li><li>• Confirms presence of hearing loss</li></ul>
Word Recognition	<ul style="list-style-type: none"><li>• Measures accuracy level of perceived speech</li><li>• Determines potential candidacy for hearing aids</li></ul>
Speech in Noise Testing	<ul style="list-style-type: none"><li>• Indicates difficulty understanding speech in noise</li><li>• Predictive of hearing aid benefit</li></ul>
Specialized Evoked Potentials	<ul style="list-style-type: none"><li>• Measures cortical response to auditory stimuli</li></ul>

## What Do We Do?

- Does it mean you **WILL** develop dementia if hearing is impaired?

**ABSOLUTELY NOT!!!!**

- But, is your risk increased?

**YES, IT IS!**

- Can we do anything about it?

**At this point, more research is needed..**

# Conclusions

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Incorporate hearing evaluation as part of cognitive evaluation for dementia

Audiologists to work with physicians who diagnose dementia

Change dementia diagnostic guidelines to include hearing evaluation

Educate physicians on need for hearing evaluation