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Comorbidities, Part 2

Victor Bray

1



Part 1 Learning Outcomes

2

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Learning Outcomes

- Describe the criteria for a chronic disease and the most significant comorbid diseases in the population.
- Describe odds ratio and apply odds ratio data in evaluating the significance of chronic diseases with respect to hearing loss.
- Utilize case history information on patient's chronic, comorbid conditions in the management of hearing and balance disorders associated with metabolic syndrome.

3

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Part 2 Learning Outcomes

4

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Learning Outcomes

- Describe symptoms of cognitive impairment and utilize information on cognitive status in auditory rehabilitation.
- Describe symptoms of depressive disorders in the audiology patient, screen for depressive disorders, and as appropriate, refer for depressive disorders.
- Analyze the patients health records (case history) for the presence of comorbid chronic diseases that are of importance in the treatment of the audiology patient.

5

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Key Words for the Webinars ...

Chronic
Comorbid
Co-management
Communications



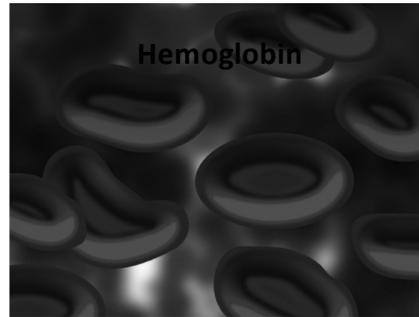
6

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Anemia

- Anemia develops from reduction of robust, healthy red blood cells to carry oxygen throughout the body.
- The blood cells may lack enough hemoglobin, the protein that gives blood its red color.
- Anemia affects about 7% of the US population.



7

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Hearing Loss & Anemia

- Sudden sensorineural hearing loss associated with iron-deficiency anemia: a population-based study.
- *JAMA Otolaryngol Head Neck Surg.* 2014 May;140(5):417-22.
- *Chung, Chen, Lin, Hung*
- Sickle-cell anemia associated with SSNHL
- Is iron-deficient anemia (IDA) associated with SSNHL?
- There is an association between SSNHL and prior IDA, OR = 1.34
- Patients with IDA should be managed to reduce hearing loss

8

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Hearing Loss and Anemia

Why might IDA might be linked to hearing loss?

- Blood supply to the inner ear via the labyrinthine artery is highly sensitive to ischemic damage. Individuals with vascular disease are known to be more susceptible to sudden SNHL. Blood supply is, therefore, clearly an important factor in hearing loss.
- Another potential mechanism involves myelin, which is important for the efficient conduction of signals along nerve fibers. Reduced iron in the body causes the breakdown of lipid saturase and desaturase, and, consequently, the production of myelin. If the myelin coating the auditory nerve is damaged, hearing could be reduced.

<https://www.medicalnewstoday.com/articles/315017.php>

9

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Fibromyalgia

- Fibromyalgia syndrome affects the muscles and soft tissue.
- Symptoms include chronic muscle pain, fatigue, sleep problems, and painful tender points or trigger points.

What is Fibromyalgia?

- Pain
- Physical dysfunction
- Multiple chemical sensitivity
- Dyscognition
- Mood disturbances
- Stiffness
- Tenderness to touch
- Overlapping conditions
- Anxiety/Psychological distress
- Fatigue
- Sexual dysfunction
- Sleep disturbances

10 Million Americans (men, women, & children)
2 - 4% of the population
Source: www.togetherwalks.org

10

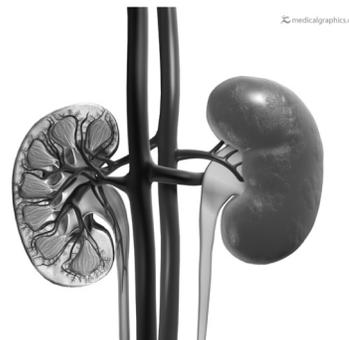
Hearing Loss & Fibromyalgia

- Are persons with fibromyalgia or other musculoskeletal pain more likely to report hearing loss? A HUNT study
- *BMC Musculoskeletal Disorders BMC series – 2016, 17:477*
- *Stranden, Solvin, Fors, Getz and Helvik*
- Results: Individuals with fibromyalgia had increased likelihood to report subjective hearing loss
- Female OR = 4.6
- Male OR = 4.5

11

Healthy Kidneys

- Keep a balance of water and minerals in your blood
- Remove waste from your blood
- Make renin and erythropoietin
- Make an active form of vitamin D



12




Kidney Disease

- Kidney disease affects the body's ability to clean blood, filter water, and control blood pressure.
- When kidneys are damaged, waste products and fluid can build up in the body.
- Without treatment, the kidneys may eventually stop working which can be life-threatening.

Stages of Kidney Disease	
Stage 1	90% or more
Stage 2	60 - 89%
Stage 3	30 - 59%
Stage 4	15 - 29%
Stage 5	<15% "kidney failure"

Source: www.choosingdialysis.org

13




Chronic Kidney Disease

- Chronic kidney disease from poor function for > than 3 mo.
- Most common culprits:
 - Diabetes (types 1 and 2)
 - High blood pressure
 - High blood sugar levels
- High blood pressure stresses the blood vessels of the kidneys.



14

Hearing Loss & Kidney Disease

- The Association Between Reduced GFR and Hearing Loss: A Cross-sectional Population-Based Study
- *American Journal of Kidney Diseases. Volume 56, Issue 4, October 2010, Pages 661-669*
- *Vilayur, Gopinath, Harris, Burlutsky, McMahon, Mitchell*
- Results: Moderate Chronic Kidney Disease (CKD) was independently associated with hearing loss.
- OR:1.43; $p = 0.006$
- Recommend: Earlier hearing assessment with CKD

15

National Kidney Foundation

- "Hearing loss is commonly linked to syndromal kidney disease, however, this study suggests a strong tie to CKD in general.
- The link can be explained by structural and functional similarities between tissues in the inner ear and in the kidney.
- Additionally, toxins that accumulate in kidney failure can damage nerves, including those in the inner ear.
- Another reason for this connection is that kidney disease and hearing loss share common risk factors, including diabetes, high blood pressure and advanced age."

16




Rheumatoid Arthritis

- Arthritis means inflammation in a joint
- Rheumatoid arthritis affects joints on both sides of the body, such as both hands, both wrists, or both knees
- RA can also affect the skin, eyes, lungs, heart, blood, or nerves
- What Causes RA? We don't know the exact cause.
- Something seems to trigger the immune system to attack the body
- Some experts think that a virus or bacteria may change the immune system

17




Hearing Loss & Rheumatoid Arthritis

- **Is Hearing Impairment Associated with Rheumatoid Arthritis? A Review**
- *Open Rheumatol J.* 2016; 10: 26 –32.
- *Emamifar, Bjoerndal, Hansen*
- **Conclusion:** Based on our review it can be postulated that patients with RA are at higher risk of hearing impairment compared to healthy subjects in their course of the disease.

18

American Arthritis Foundation

- Clinical trials have found higher rates of sensorineural hearing loss in patients with rheumatoid arthritis (RA).
- A 2006 study detected hearing impairment, which was overwhelmingly sensorineural, in 42.7 percent of patients with RA. By contrast, only 15.9 percent of the control group showed that type of hearing loss.
- The drugs used to treat the aches and pains of arthritis could also be to blame.

19

Thyroid Disease

- Hypothyroidism is when the thyroid gland does not produce enough thyroid hormone
- The underactive gland can cause slowed development in children, some types of hypothyroidism are present at birth.
- Hyperthyroidism results when the thyroid gland, produces too much thyroid hormone
- The thyroid controls metabolism and has negative effects when overactive

20

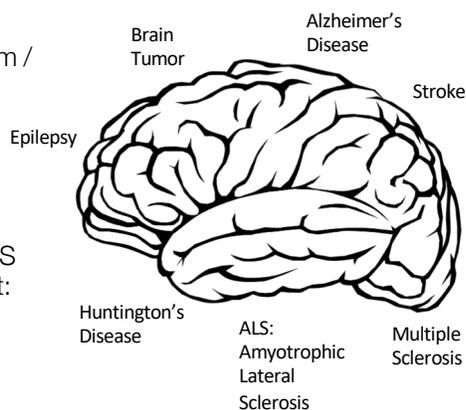
Hearing Loss & Graves' Disease (Thyroid)

- Evaluation of hearing loss in patients with Graves' disease.
- *Endocrine*. 2012 Feb;41(1):116-21.
- *Berker, Karabulut, Isik, Tutuncu, Ozuquz, Erden, Aydin, Dagli, Guler*
- Our results are highly suggestive of a decrease in hearing ability in patients with Graves' Disease, particularly at high frequencies.

21

Neurological Disorders

- Diseases of the central nervous system / peripheral nervous system.
- Brain disorders can result
 - from neurological injury;
 - from brain tumors;
 - as neurodegenerative diseases;
 - as mental disorders.
- Also epilepsy, migraine headaches, MS
- Of particular interest to the audiologist:
 - demyelination of nerve fibers (MS),
 - neurological disorders resulting from infectious organisms (bacterial / viral meningitis),
 - degenerative neurological disorders accompanied by loss of sensory function in vision, hearing and/or balance.

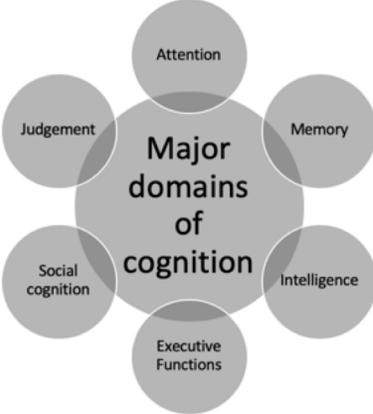


22

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Cognition

- “The mental action or process of acquiring knowledge and understanding through thought, experience, and the senses.
- Cognitive processes use existing knowledge and generate new knowledge.”



The diagram illustrates the major domains of cognition. A central circle labeled "Major domains of cognition" is surrounded by six smaller circles, each representing a domain: Attention (top), Memory (top-right), Intelligence (right), Executive Functions (bottom), Social cognition (bottom-left), and Judgement (left).

23

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Cognitive Decline & MCI



- Mild cognitive impairment (MCI) is the stage between the expected cognitive decline of normal aging and the more serious decline of dementia.
- It can involve problems with memory, language, thinking and judgment that are greater than normal age-related changes.

24

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Cognitive Decline & Dementia

Dementia is a syndrome of impairment in cognitive abilities, such as attention, memory, language skills, visual perception, reasoning, problem solving and self-management.



Hearing Loss & Cognitive Decline

<http://www.dsnonline.co.uk/wp-content>

25

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Hearing Loss & Cognitive Decline

- How does hearing loss affect the brain?
- *Aging Health. 2012 Apr; 8(2): 107-109.*
- *Wingfield and Peelle*
- *“There is ample evidence linking hearing loss to changes in cognitive ability, particularly when listeners are faced with the task of understanding speech that is acoustically or linguistically challenging.”*

26



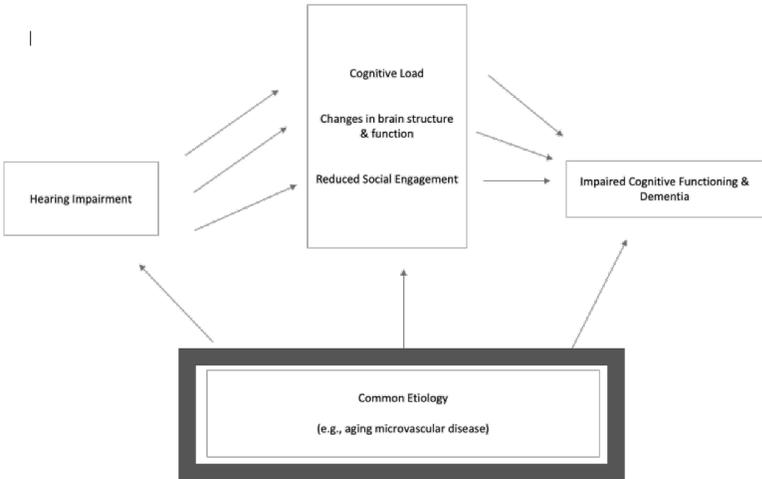

Hearing Loss & Cognitive Decline

- *Lin. Hearing loss and cognition among older adults in the United States. J. Gerontol. Med. Sci. 2011*
- *Lin, Metter, O'Brian, et al. Hearing loss and incident dementia. Arch. Neurol. 2011*
- *Lin, Yaffe, Xia, et al. Hearing Loss and Cognitive Decline in Older Adults. JAMA Intern. Med. 2013*
- *Lin, Ferrucci, An, et al. Association of hearing impairment with brain volume changes in older adults. NeuroImag. 2014*
- *Lin & Albert. Hearing Loss and Dementia – Who's Listening? Aging Ment Health. 2014*

27




Hearing Loss and Dementia – Who's Listening?



```

    graph TD
      Etiology[Common Etiology  
(e.g., aging microvascular disease)]
      HI[Hearing Impairment]
      CL[Cognitive Load]
      CSF[Changes in brain structure & function]
      RSE[Reduced Social Engagement]
      ICFD[Impaired Cognitive Functioning & Dementia]

      Etiology --> HI
      Etiology --> CL
      Etiology --> CSF
      Etiology --> RSE
      Etiology --> ICFD

      HI --> CL
      HI --> CSF
      HI --> RSE

      CL --> ICFD
      CSF --> ICFD
      RSE --> ICFD
    
```

Lin, F. R., & Albert, M. (2014). Hearing loss and dementia-who is listening?. *Aging & mental health*, 18(6), 671

28

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Multiple Causes of Dementia

- Alzheimer's disease (most common form of dementia)
- Brain fluid buildup (hydrocephalus)
- Brain infection, meningitis, syphilis
- Brain injury, tumors, stroke
- Drug toxicity
- HIV infection
- Multiple Sclerosis
- Parkinson's Disease
- Thiamine deficiency with alcoholism
- Vascular dementia
- Thyroid disease

29

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Alzheimer's Disease

- The disease isn't a normal part of aging.
- The symptoms seem to come from two main types of nerve damage:
 - tangles and plaques
- The initial neural damage occurs in the hippocampus
- In later stages of the disease, neural degeneration is widespread

30




**DEPRESSION
HAPPENS**

Bray, 2019
Audiology Practices
<http://www.audiologypractices.org/depression-happens>

Depression, Hearing Loss, and Treatment
 with Hearing Aids

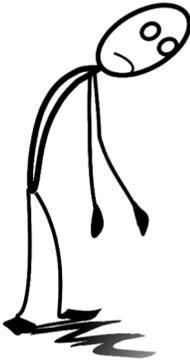
Bray, 2019 (in press)
The Hearing Review

31




Depression

- Feelings of intense sadness, including feeling *helpless, hopeless, and worthless*, lasting for many days to weeks that keep the patient from functioning normally may be indications of clinical depression.
- Depression commonly occurs with other illnesses such as anxiety, obsessive compulsive disorder, panic disorder, phobias, and eating disorders.



"Depression: Uncorrected hearing loss gives rise to poorer quality of life. Isolation and reduced social activity, leading to depression."

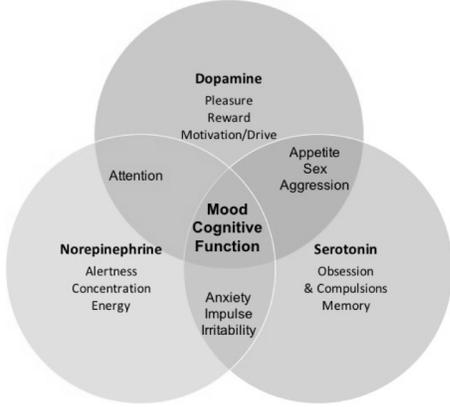
32




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Depression

- Because certain brain chemicals or neurotransmitters, specifically serotonin and norepinephrine, influence both mood and pain, it's not uncommon for depressed individuals to have physical symptoms.
- These symptoms may include joint pain back pain, gastrointestinal problems, sleep disturbances, and appetite changes.



33




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Clinical Depression: ≥ 5 Symptoms, ≥ 2 Weeks

- A depressed mood during most of the day, particularly in the morning
- Fatigue or loss of energy almost every day
- Feelings of worthlessness or guilt almost every day
- Impaired concentration, indecisiveness
- Insomnia (an inability to sleep) or hypersomnia (excessive sleeping) almost every day
- Markedly diminished interest or pleasure in almost all activities nearly every day
- Recurring thoughts of death or suicide (not just fearing death)
- A sense of restlessness or being slowed down
- Significant weight loss or weight gain

34





What are Risk Factors for Depression?

- Alcohol dependence
 - Anxiety
 - Chronic pain
 - **Comorbid chronic medical conditions**
 - Female sex
 - Hypomania or Mania
 - Nonresponsive to effective treatments for medical conditions
- Obstetric patients
 - Psychosis
 - Personal or family history of depression
 - Recent childbirth
 - **Recent stressful events**
 - Substance misuse
 - Unexplained somatic symptoms

35





What are Problems Associated with Untreated HL?

Sequence of Events	Adjusted Odds Ratio for Impact of Moderate or More Hearing Loss
Hearing Impairment	(n = 2,461 Alameda County)
Ability to Communicate	(self-report, 2-year longitudinal)
Affect Interpersonal Relationships	Fair or poor physical health OR: 1.39*
	ADL disability OR: 1.85***
	IADL disability OR: 1.32*
	Physical performance disability OR: 1.98***
Multiple Negative Outcomes	Fair or poor mental health OR: 1.90***
Depression	Depression OR: 2.05***
Loneliness	
Altered Self-Esteem	
Diminished Functional Status	

Negative Consequences of Hearing Impairment in Old Age: A Longitudinal Analysis
William J. Strawbridge, PhD¹, Margaret I. Wallhagen, PhD², Sarah J. Shema, MS³, and George A. Kaplan, PhD⁴

36




What are Problems Associated with Untreated HL?

- Uncorrected hearing loss auditory disability
- Affects both the HI person and significant others
- The HI person not aware of all consequences
- Uncorrected hearing loss poorer quality of life
- Correlation between uncorrected HL and cognition
- No proof that HL is the cause of reduced cognitive function



Negative consequences of uncorrected hearing loss – a review
- Stig Arlinger

<https://www.asthmaptkids.com/quality-of-life>

37




Hearing Loss & Depression

- **Hearing Impairment Associated With Depression in US Adults, National Health and Nutrition Examination Survey 2005-2010**
- *Li, Zhang, Hoffman, et al.*
- *JAMA Otolaryngol Head Neck Surg. 2014*
- Using excellent hearing as the reference, multivariate odds ratios for depression:
 - 1.4 for good hearing,
 - 1.7 for a little trouble,
 - 2.4 for moderate trouble,
 - 1.5 for a lot of trouble,
 - 0.6 for deaf.

38




Increased risk of depression in patients with acquired sensory hearing loss
A 12-year follow-up study

Wei-Ting Hsu, MD¹, Chih-Chao Hsu, MD², Ming-Hsuan Wan, MD³, Hong-Chang Lin, MD⁴, Hsuan-Tien Tsai, MD, PhD⁵, Pi-Jen Su, MD, PhD⁶, Chih-Te Sun, MS⁷, Cheng-Li Lin, MS⁸, Chung-Yi Hsu, MD, PhD⁹, Kuang-Hsi Chang, PhD¹⁰, Yi-Chao Hsu, PhD¹¹

Comorbidities and Untreated Hearing Loss?

- Comorbidities of **SNHL** included cirrhosis, hypertension, hyperlipidemia, diabetes mellitus, asthma, chronic kidney disease, ***chronic artery disease, alcohol-related illness, anxiety, COPD, stroke***, and steroids.
 - *[Are these in your case history? –VB]*
- **SNHL and comorbidities** in ***bold italics*** (above) also associated w/ **depression**.
- Comparing SHNL to NH, **depression** incidence (aHR:1.73) increased with age and with women more than men.

39




Hearing Aids & Depression

- **Hearing Loss and Depression in Older Adults**
- *J Am Geriatr Soc. 2013 Sep; 61(9): 1627–1629.*
- *Mener, Betz, Genther, Chen, Lin*
- MDD: Major Depressive Disorder
- At baseline, 58.5% participants had a >25 dB HL, 3.9% participants met criteria for MDD, and 7.4% participants met criteria for having any depressive symptoms.
- Greater HL (per 25 dB) was not significantly associated with an increased odds of MDD (OR=1.63), or any depressive symptoms (OR=1.58).
- Hearing aid use was associated with reduced odds of MDD (OR=0.35) and any depressive symptoms (OR=0.33,) in the fully adjusted model.

40





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What are Psychosocial Correlates of HRQoL?

Aspects of Discussion and Working Definitions

PSYCHOLOGICAL	SOCIAL
<ul style="list-style-type: none"> ➤ Anxiety ➤ Cognitive Disorder ➤ Dementia ➤ Depression ➤ Loss of Self Esteem ➤ Stress ➤ Worry 	<ul style="list-style-type: none"> ➤ Activity Limitation ➤ Participation Restriction ➤ Loneliness ➤ Social Isolation ➤ Social Withdrawal

Depression is characterized by chronic feelings of sadness or worthlessness, irritability, physical lethargy, insomnia and sometimes thoughts of suicide.

41





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Association of Hearing Impairment and Anxiety in Older Adults

Kevin J. Coenen, MPH, Josh Bartz, MS, Jennifer Dault, PhD, Janet S. Choi, MPH, Mike N. Apantaku, PhD, Tamara Martin, PhD, Elizabeth Helmer, PhD, Kathryn R. Martin, PhD MPH, Kara Helms, DSc, Sheila Pratt, PhD, Susan M. Rubin, MPH, Suzanne Satterfield, MD, MPH, Kristine Yaffe, MD, Eleanor R. Simonick, PhD, and Frank R. Lin, MD, PhD for the Health ABC Study

Anxiety and Untreated Hearing Loss?

<p>Procedures:</p> <ul style="list-style-type: none"> ▪ Adults, mean age 60 ▪ Moderate to profound HL <p>Findings:</p> <ul style="list-style-type: none"> ▪ Anxiety associated with the severity of the hearing loss. ▪ ↑ anxiety & depression associated with ↑ rumination & catastrophizing behaviors. ▪ Rumination is focused attention of symptoms over solutions. ▪ Catastrophizing is imagined worst-case scenarios as fact. 	<p>Procedures:</p> <ul style="list-style-type: none"> ▪ Adults, age 76 – 85 ▪ Normal, Mild, and ≥ Moderate HL <p>Findings:</p> <ul style="list-style-type: none"> ▪ ↑ anxiety with ↑ hearing loss ▪ Mild HL OR:1.32 ▪ Mod+ HLOR:1.59 <p>Comments:</p> <ul style="list-style-type: none"> ▪ Hearing impairment is associated with greater odds of anxiety. ▪ Cannot establish the temporal link between HL and anxiety.
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Cognitive coping and goal adjustment are associated with symptoms of depression and anxiety in people with acquired hearing loss

Nadia Gamefski & Vivian Kraaij

42




Loneliness and Untreated Hearing Loss?

Procedures:

- Adults w/ problems hearing.

Baseline Findings:

- Depression, social loneliness & emotional loneliness associated with poorer hearing (self report)

4 Year Findings:

- Social Loneliness in non-users of hearing aids (self report).
- Emotional Loneliness in men (self report and speech in noise screening).

Association of Hearing Loss and Loneliness in Older Adults
Yoon-kyu Sung, MHS¹, Lingheng Li, MHS¹, Caitlin Blake, MSPH¹, Josh Betz, MS¹, and Frank R. Lin, MD, PhD¹

Procedures:

- Adult HA and CI candidates
- SMART study

Findings:

- Loneliness significantly associated with Age and Hearing Loss.

Comments:

- Increased loneliness independently associated with greater hearing loss and younger age.
- Need to address hearing loss as a potentially modifiable factor for loneliness and healthy aging.

Prospective effects of hearing status on loneliness and depression in older persons: Identification of subgroups
 Marieke Pronk, Dorly J.H. Deeg, Cas Smits, Theo G. van Tilburg, Dirk J. Kuik, Joost M. Festen & Sophia E. Kramer

43




Loneliness and Treated Hearing Loss?

Procedures:

- 40 adults, ages 62 – 92
- Mild to moderately-severe HL

Findings:

- Significant change for overall loneliness and perceived emotional loneliness.
- Mod/Sev HL associated with more reduction in perceived loneliness.

Comments:

- Hearing aid use (4 – 6 weeks) a buffer against social and emotional loneliness, especially with significant HL.

44





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Screening for Depression?

- Clinicians should consider screening patients with identified risk factors or who present with unexplained somatic symptoms, chronic pain, anxiety, substance abuse, or nonresponsive to effective treatments for medical conditions.

- Patient Health Questionnaire (PHQ) self-administered screening tool for presence of depressive symptoms.
- PHQ-2 & PHQ-9
- Over the past 2 weeks have you
 - felt down, depressed, hopeless?"
 - felt little interest or pleasure in doing things?"
- Positive response or responses are a failure of the screening.

<https://www.aafp.org/afp/2012/0115/p139.html>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2906530/>

45





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Depression, Hearing Loss & The Big Picture

Overview of Hearing Loss

- Hearing loss can be mild or severe, present since birth or begin later in life, occur gradually or suddenly, result from a health condition or accompany aging, one or both ears can be affected. Most hearing loss in adults is permanent or slowly progressive.
- Hearing loss has been associated with serious health comorbidities such as depression, anxiety, low self-esteem and insecurity, social isolation, stress, mental fatigue, cognitive decline and dementia, reduced mobility, and falls. Both the severity of hearing loss and the impact hearing loss has on individuals' lives vary. More research is needed to better understand the impacts.
- It has been estimated that 30 million people (12.7 percent of Americans ages 12 years or older) in the U.S. have hearing loss.
- The unmet need for hearing health care is high. Estimates of hearing aid use are that 67 to 86 percent of adults (50 years and older) who might benefit from hearing aids do not use them.

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Why Focus on Hearing Health Care Now?

- *Changing Demographics: Intersection of Hearing Loss and Aging*
- *Recognizing Hearing Loss as a Public Health Priority and a Societal Responsibility*
- *Rapidly Changing Technologies*
- *Changes in Health Care Paradigms*

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46





Vital and Health Statistics (1990 – 1992) Collins (1997) HHS / CDC / NSHS

Chronic Conditions	Causes of Death
<ol style="list-style-type: none"> 1. Deformities or orthopedic impairments 2. Chronic sinusitis 3. Arthritis 4. High blood pressure 5. Hay fever or allergic rhinitis 6. Deafness / hearing impairment 7. Heart disease 8. Chronic bronchitis 9. Asthma 10. Other headache (non-tension) 	<ol style="list-style-type: none"> 1. Diseases of the heart 2. Malignant neoplasms 3. Cerebrovascular diseases 4. Chronic obstructive pulmonary disease 5. Accidents and adverse effects 6. Pneumonia and influenza 7. Diabetes mellitus 8. Human immunodeficiency viral infection 9. Suicide 10. Homicide and legal intervention

47





Vital and Health Statistics Collins (1997) HHS / CDC / NSHS

Series 10
No. 194



Vital and Health Statistics

From the CENTERS FOR DISEASE CONTROL AND PREVENTION / National Center for Health Statistics

Prevalence of Selected Chronic Conditions:
United States, 1990-92

This report presents an update of the prevalence of selected chronic conditions in the United States. Its purpose is to provide prevalence data by age, sex and age, race and age, family income, and geographic region for major chronic condition systems. It further assesses the percent of selected conditions that cause activity limitation, the percent for which a physician was consulted, and the percent that caused hospitalization. Conditions with the highest prevalence and those causing the most disability days are also analyzed. Trends in prevalence rates for the conditions with highest prevalence are examined as well.

48

Vital and Health Statistics (1990 – 1992) Prevalence of Chronic Conditions

Table D. Selected chronic conditions with highest prevalence in rank order, by family income and geographic region: United States, 1990–92

Chronic condition	All persons ¹	Family income				Geographic region			
		Less than \$10,000	\$10,000–\$19,999	\$20,000–\$34,999	\$35,000 and over	Northeast	Midwest	South	West
Rank									
Deformities or orthopedic impairments	1	1	2	1	2	1	2	3	1
Chronic sinusitis	2	4	3	2	1	4	1	1	6
Arthritis	3	2	1	3	4	2	3	2	3
High blood pressure	4	3	4	4	5	3	4	4	5
Hay fever or allergic rhinitis without asthma	5	7	7	6	3	5	7	5	2
Deafness and other hearing impairments	6	5	5	5	6	6	5	6	4
Heart disease	7	6	6	7	7	7	6	7	7
Chronic bronchitis	8	9	8	8	8	8	8	8	9
Asthma	9	8	10	10	9	9	9	9	8
Other headache (excludes tension headache)	10	10	9	9	(2)	(2)	10	10	10
Dermatitis	(2)	(2)	(2)	(2)	10	(2)	(2)	(2)	(2)
Migraine headache	(2)	(2)	(2)	(2)	(2)	10	(2)	(2)	(2)

Deafness & hearing impairment = 6th most prevalent chronic condition

¹Includes unknown family income.

²Indicated rank is not in top 10.

NOTE: This table shows rank by condition prevalence, not person prevalence. A person may have more than one condition in some group.

Vital and Health Statistics (1990 – 1992) Prevalence of Chronic Conditions

Table C. Selected chronic conditions with highest prevalence in rank order, by sex, race, and age: United States, 1990–92

Chronic condition	All persons ¹	Sex		Race		Age				
		Male	Female	White	Black	Under 18 years	18–44 years	45–64 years	65–74 years	75 years and over
Rank										
Deformities or orthopedic impairments	1	1	3	1	3	6	1	3	5	5
Chronic sinusitis	2	2	2	2	2	2	2	4	6	7
Arthritis	3	5	1	3	4	(2)	8	1	1	1
High blood pressure	4	4	4	4	1	(2)	6	2	2	3
Hay fever or allergic rhinitis without asthma	5	6	5	6	5	1	3	7	10	(2)
Deafness and other hearing impairments	6	3	7	5	8	10	7	5	3	2
Heart disease	7	7	6	7	6	9	(2)	6	4	4
Chronic bronchitis	8	9	8	8	9	4	9	9	(2)	(2)
Asthma	9	8	(2)	9	7	3	10	(2)	(2)	(2)
Other headache (excludes tension headache)	10	(2)	10	10	10	(2)	4	(2)	(2)	(2)
Blindness and other visual impairments	(2)	10	(2)	(2)	(2)	(2)	(2)	(2)	(2)	8
Migraine headache	(2)	(2)	9	(2)	(2)	(2)	5	(2)	(2)	(2)
Dermatitis	(2)	(2)	(2)	(2)	(2)	5	(2)	(2)	(2)	(2)
Acne	(2)	(2)	(2)	(2)	(2)	7	(2)	(2)	(2)	(2)
Chronic disease of tonsils and adenoids	(2)	(2)	(2)	(2)	(2)	8	(2)	(2)	(2)	(2)
Speech impairments	(2)	(2)	(2)	(2)	(2)	10	(2)	(2)	(2)	(2)
Hemorrhoids	(2)	(2)	(2)	(2)	(2)	(2)	(2)	8	(2)	(2)
Diabetes	(2)	(2)	(2)	(2)	(2)	(2)	(2)	10	8	9
Cataracts	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	7	6
Tinnitus	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	9	10

Deafness & hearing impairment 3rd most prevalent chronic condition in the elderly (65 years of age and older)




Our Call-to-Action to Others ...

- Age-Related Hearing Loss and Communication Breakdown in the Clinical Setting
- *JAMA Otolaryngol Head Neck Surg. 2017.*
- *Cudmore, Henn, Colm, O'Tuathaigh, et al.*
- Hearing Loss and Patient-Physician Communication
 - *The Role of an Otolaryngologist [Audiologist^{VB}]*
- *JAMA Otolaryngol Head Neck Surg. 2017.*
- *Weinreich*

51




Our Call-to-Action to Others ...

- Recent analyses have highlighted a significant increase in the rate of hearing loss in patients 60 years and older.¹
- The estimated prevalence of bilateral hearing loss greater than 25 dB is 27% among patients age 60 to 69 years; 55%, 70 to 79 years; and 79%, 80 years and older.¹
- The prevalence of medical errors is higher among older patients, and they are also among the most dependent users of the health care system.²

Age-Related Hearing Loss and Communication Breakdown in the Clinical Setting

52

Our Call-to-Action to Others ...

- Failures in clinical communication are considered to be the leading cause of medical errors.²
- Walsh and colleagues³ reported that improved communication between the medical teams and families could have prevented 36% of medical errors.
- However, the contribution of hearing loss to medical errors among older patients is nascent.

Age-Related Hearing Loss and Communication Breakdown in the Clinical Setting

53

Our Call-to-Action to Others ...

- While audiometry is an effective method of diagnosis of hearing impairment, not all impaired listeners will have the same speech comprehension, despite having similar pure-tone thresholds and configurations.⁴
- In the present study, qualitative analysis was applied to semi-structured interview data collected in 100 older adults 60 years and older.

Age-Related Hearing Loss and Communication Breakdown in the Clinical Setting

54

Our Call-to-Action to Others ...

- Baseline prevalence was calculated for communication breakdown in hospital and primary care settings among adults reporting hearing loss.
- We also identified common, discrete aspects of a clinical consultation that older adults with hearing loss may find difficult and which may be contributing toward medical error.
- **RECOMMEND A FUNCTIONAL NEEDS ASSESSMENT^{VB}**

Age-Related Hearing Loss and Communication Breakdown in the Clinical Setting

55

The Grand Opportunity for Audiology

- Probability is high that a majority of your audiology patients have one or more comorbid conditions.
 - *Check for this in your case history*
- Many comorbid conditions, especially if vascular in nature, involved hearing and balance disorders.
 - *Check for this in your database*
- For the comorbid conditions, communicate with the treating physician, mentioning the comorbidity.
 - *Goal is to co-monitor status*
- Convey in your messaging the importance of communication in the doctor-patient relationship.
 - *Goal is to have them to refer to you for Needs Assessment*

56

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A HOLISTIC APPROACH TO MANAGING HEARING LOSS AND ITS COMORBIDITIES

Bray, *The Hearing Journal*, November 2018

57

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Audiometric Evaluation

- **The first step** is to conduct an audiological evaluation following best practices protocols.
- Determination should be made as to whether or not hearing loss is present.
- Do the test results indicate sensorineural impairment?

58




Case History

- **The second step** in the process is to review the case history for presence of chronic conditions.
- The CDC list includes 14 chronic diseases that we have discussed throughout the day.
- A method of identification of these illnesses should be included in the case history.

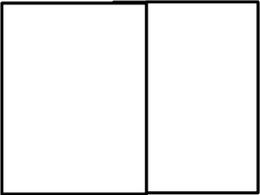







Comorbid Condition?

- **The third step** is determination if SNHL and another chronic condition are present.
- If so, comorbidity is present in the patient.
- Comorbidity is associated with:
 - worse health outcomes,
 - complex clinical management,
 - increased health care costs.





CONTINUED



Increased Odds Ratio?

- **The fourth step** is to determine if there are increased odds ratio of the chronic disease (from the case history) and SNHL.
- With regard to SNHL, elevated ORs have been found for:
 - vascular diseases, heart disease, high blood pressure, stroke, kidney disease;
 - neurological disorders, Alzheimer's disease, dementia;
 - metabolic syndrome associated with diabetes.

61

CONTINUED



Manage Patient

- The detection of cochlear loss is critical.
- The inner ear is susceptible to the pathophysiology associated with many chronic diseases.
- The inner ear is highly vulnerable to vascular disease and ischemia.
- The inner ear has fragile structures with high metabolic demand.
- The inner ear is sensitive to functional degradation resulting from hypoxia, toxicity and vessel disease.

62

Opportunity to Co-manage

- **The fifth step** of the plan.
- The audiologist must conduct a self- evaluation towards co-management of the patient's comorbid conditions.
- The audiologist must answer the questions:
 - "Do I want become involved with other healthcare providers ?
 - Do I want to work towards the goal of improved patient outcomes?"

63

Communicate with MD, PA, or NP

- **Initiate step six,** communications toward team management of the comorbid, chronic conditions.
- Typically these communications will be with the patient's primary care provider (MD, PA, or NP).

64



Unique Value of Audiologists

- **First**, the audiologist can comprehensively assess inner ear function.
- **Second**, audiologists provide treatment to ameliorate the effects of SNHL.
- **Third**, audiologists inform other healthcare professionals of the presence of hearing disorders and appropriate expectations regarding patient communications.

65



Summary Comments

- The audiologist must:
 - be aware of whole-body health,
 - understand interactions between chronic diseases and SNHL,
 - be prepared to contribute in new ways in inter-professional practice,
- Remember that the path to our preferred future includes:
 - comprehensive evaluation,
 - case history chronic conditions,
 - comorbid SNHL,
 - increased odds ratio.

66




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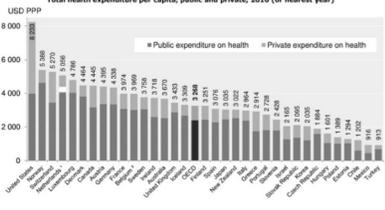
We Have A Public Health Problem

USA Healthcare Expenditures

USA Healthcare Outcomes

US spends two-and-a-half times the OECD average

Total health expenditure per capita, public and private, 2010 (or nearest year)



Source: OECD Health Data 2012.

COUNTRY RANKING

	AUS	CAN	FRA	GER	GBR	ICL	IRL	ITA	JPN	KOR	FIN	DNK	ESP	SVK	UK	US
HEALTH CARE	4	18	9	5	5	7	7	2	2	1	1	1	1	1	1	1
Effective Care	4	7	9	6	5	2	11	18	8	1	1	1	1	1	1	1
Safe Care	3	18	7	6	7	9	11	18	8	1	1	1	1	1	1	1
Continental Care	4	9	18	18	9	2	7	11	11	1	1	1	1	1	1	1
Personal Care/ Care	8	8	18	7	3	4	11	9	2	1	1	1	1	1	1	1
Home	8	9	11	2	4	7	18	4	2	1	1	1	1	1	1	1
Care Related Problem	8	9	18	4	6	6	2	1	1	1	1	1	1	1	1	1
Timeliness of Care	8	11	18	4	7	7	1	9	1	1	1	1	1	1	1	1
Efficiency	4	18	9	9	7	2	4	7	1	1	1	1	1	1	1	1
Quality	5	9	7	4	8	18	1	1	1	1	1	1	1	1	1	1
Healthy Lives	4	9	7	3	9	9	4	2	1	1	1	1	1	1	1	1
Health Expenditure/ Capita, 2010**	\$3,800	\$4,822	\$4,518	\$4,095	\$5,099	\$3,182	\$5,609	\$3,505	\$5,642	\$3,405	\$3,405	\$3,405	\$3,405	\$3,405	\$3,405	\$3,405

Notes: * Excludes the US. ** Expenditure based on 2010 PPP (purchasing power parity) adjusted to 2010 US dollars. Source: Calculated by the Commonwealth Fund based on 2011 International Health Policy Survey of Global Health, 2011 International Health Policy Survey of Primary Care Physicians, 2011 International Health Policy Survey, Commonwealth Fund National Center for 2011 Global Health, Organization and Organization for Economic Co-operation and Development, © 2012 Health Care, 2012 (Page 102), Nov. 2012.




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CDC – Chronic Disease Prevention

- 1 in 2 adults in the USA has a chronic condition.
- 1 in 4 adults in the USA has two or more chronic conditions.
- *These are your patients.*



THE CENTERS FOR DISEASE CONTROL AND PREVENTION'S NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION (NCCDPHP)

1 IN 2 Adults in the US has a chronic disease & 1 IN 4 Adults in the US has two or more

CHRONIC DISEASES
Leading Causes of Death, Disability, and Health Care Costs

HEART DISEASE, CANCER, CHRONIC LUNG DISEASES, STROKE, ALZHEIMER'S DISEASE, TYPE 2 DIABETES

Centers for Disease Control and Prevention National Center for Chronic Disease Prevention and Health Promotion

NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION @CDCChronic | www.cdc.gov/chronicdisease




CDC – Chronic Disease Prevention

Chronic Diseases are the leading causes of

- death,
- disability, and
- health care costs in the USA.



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69




CDC – Chronic Disease Prevention

Major chronic conditions of concern are:

- *Heart disease*
- *Cancer*
- *Chronic Lung Disease*
- *Stroke*
- *Alzheimer's Disease*
- *Type 2 Diabetes*



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70




CDC – Chronic Disease Prevention

Prevent Chronic Disease
Promote Health & Wellness

- *Improving Quality of Life*
- *Increasing Healthy Life Expectancy*
- *Reducing Health Care Costs*



NCCDPHP PREVENTS CHRONIC DISEASE AND PROMOTES HEALTH
 for all ages

IMPROVING QUALITY OF LIFE INCREASING HEALTHY LIFE EXPECTANCY REDUCING HEALTH CARE COSTS

 Centers for Disease Control and Prevention
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NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION
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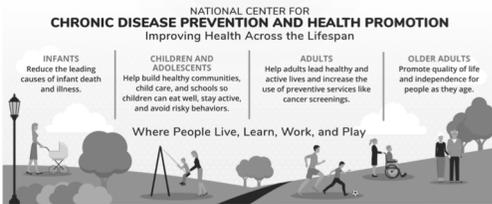
71




CDC – Chronic Disease Prevention

Older Adults

- *Promote Quality of Life and Independence for People as They Age*



NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION
 Improving Health Across the Lifespan

INFANTS
 Reduce the leading causes of infant death and illness.

CHILDREN AND ADOLESCENTS
 Help build healthy communities, child care, and schools so children can eat well, stay active, and avoid risky behaviors.

ADULTS
 Help adults lead healthy and active lives and increase the use of preventive services like cancer screenings.

OLDER ADULTS
 Promote quality of life and independence for people as they age.

Where People Live, Learn, Work, and Play

 Centers for Disease Control and Prevention
 National Center for Chronic Disease Prevention and Health Promotion

NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION
 @CDCChronic | www.cdc.gov/chronicdisease

72

Traditional Medicine

OBSERVATIONS

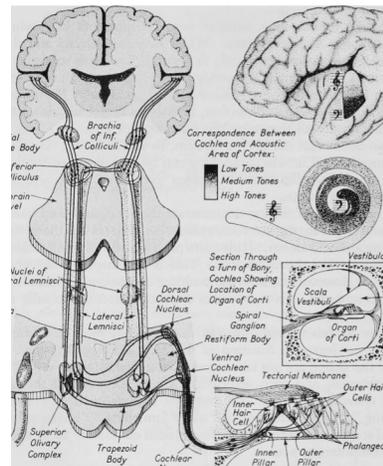
- Blood, urine, tissue samples
- Respiration, temperature,
- Pulse, blood pressure, blood O₂ saturation

PROCEDURES

- Noninvasive
 - simple imaging
- Semi-invasive
 - Biopsies
- Invasive
 - Surgery

73

The Human Auditory System



74

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Think of the Ear as a Canary in the Coal Mine



https://share.america.gov/wp-content/uploads/2014/11/canary_art22.jpg

75

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Key Takeaways from Today

- Acquire the knowledge base covering many comorbid conditions that audiology patients may present to audiologists as part of hearing and balance care in the audiology private practice.
- Develop awareness and take action, inside the audiology practice, as part of healthcare system and holistic patient care.

76

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Key Takeaways from Today

- Identify and utilize the healthcare professionals that the audiologist could be engaging with, in order to co-manage audiology patients with comorbid conditions.
- Transition the audiology private practice focus from selling products to providing services, including audiological medicine and the co-management of comorbid conditions with the other doctoring professions.

77