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Co-managing Comorbidities in Audiological Medicine

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Disclosure Statements

Financial Disclosure

- Nothing to declare
- No known conflicts of interest

Intellectual Disclosure

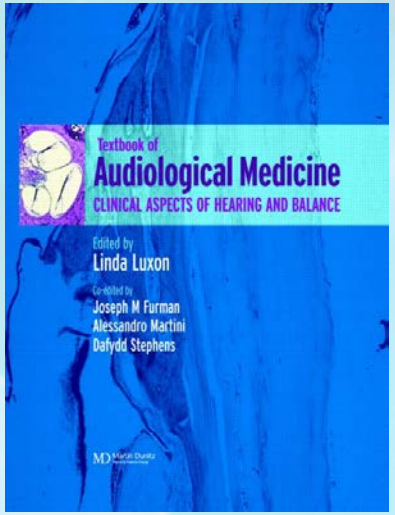
- Nothing to declare
- Just some facts …
  - Which are public domain
- And some opinions …
  - Which are my own

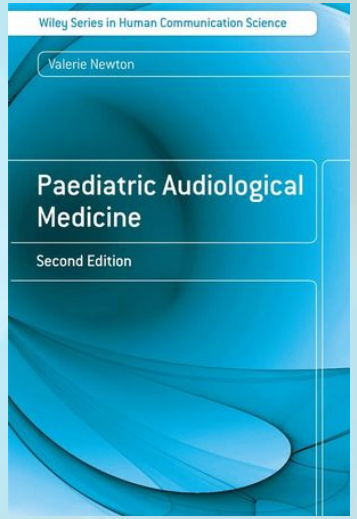
Abstract (1 of 4)

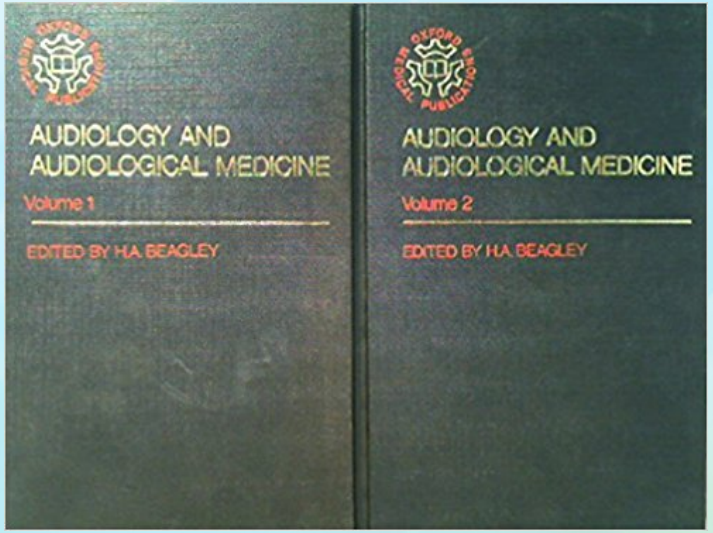
- Audiology is striving to transition from allied-health status to physician-equivalent autonomy.
- Part of the transition was to move the Clinical Master's degree to the Clinical Doctorate degree.
- Another part of the transition is to use the expanded knowledge of the Clinical Doctorate in Audiology to become involved in Audiological Medicine.
- *This transition is supported by, but not dependent on, achieving LLPhysician status.*

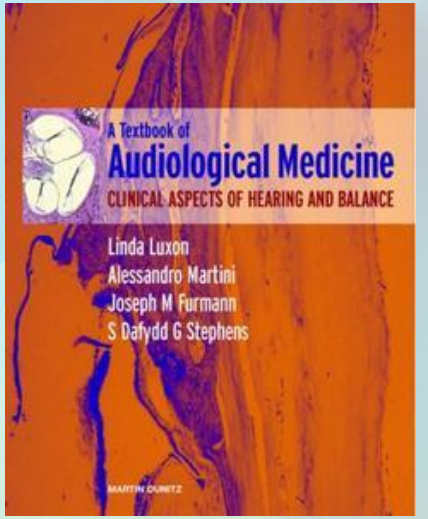
Learning Objective

- 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.









What is Audiological Medicine?

- ***Audiological Medicine***
  - 2003 - 2012
- ***Hearing, Balance and Communication***
  - 2013 - current
- Published by the International Association of Physicians in Audiology (IAPA)

- Diagnosis, rehabilitation and medical management of auditory and vestibular disorders
- Communication disorders
- Otoneurological evaluation of children and adults
- Tinnitus
- Genetics of hearing and balance
- Internal ear pharmacology
- Neuroplasticity

What is Audiological Medicine?

Pennsylvania Audiology SoP

- "Assessment and **nonmedical** diagnosis and treatment of hearing and vestibular disorders …"
- "**Referral** of persons with auditory and vestibular dysfunction abnormalities **to an appropriate physician** for medical evaluation …"

LLPhysician Status?

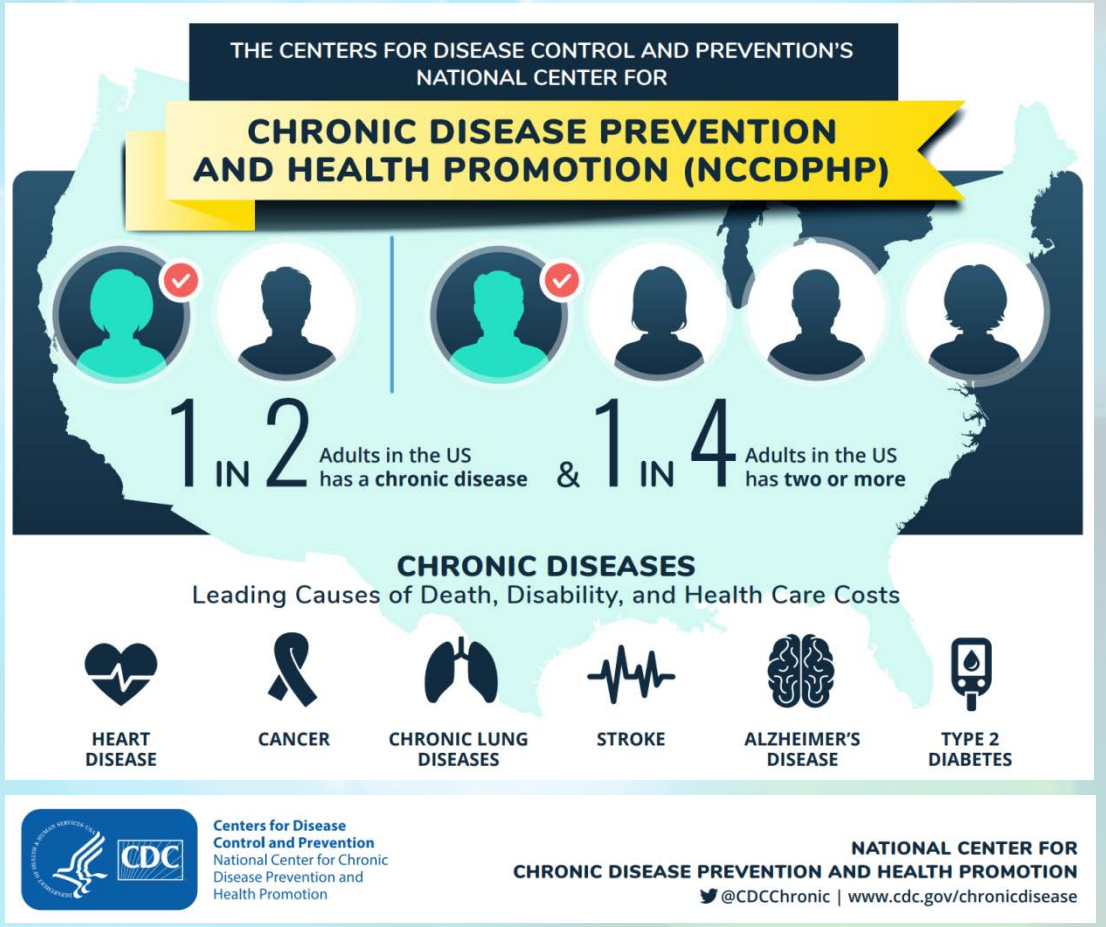
- No changes planned in scope of practice
- Become "point-of-entry" for healthcare
  - *Must identify and refer appropriately*
- Dependent on whether or not audiology can prove to multiple constituencies that
  - *We add public-health value, and*
  - *We are not a danger to patient safety*

Abstract (2 of 4)

- Approximately 1 in 2 audiology patients will present themselves with comorbid conditions that will require medical management that may be beyond the knowledge, skills, and scope-of-practice of the typical audiologist.
- *This knowledge is available to us today.*

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.
- *Do you want to co-manage?*



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Abstract (3 of 4)

- Audiologists, as part of the medical-management team, must identify these comorbid conditions, understand the comorbid impact on the audiology patient, and appropriately refer these patients for co-management of the comorbid conditions.
- *Foundational element of inter-professional practice (IPP).*

Learning Objective

- Acquire the knowledge base covering many co-morbid conditions that audiology patients may present to audiologists as part of hearing and balance care in the audiology private practice.

http://www.betterhearing.org/

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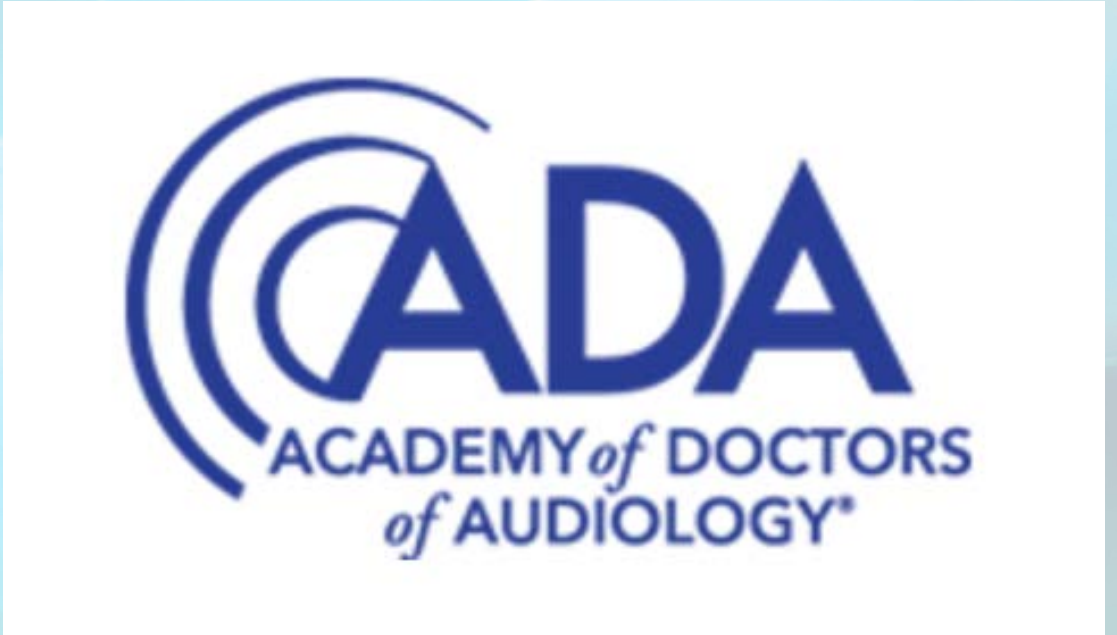
Abstract (4 of 4)

- This requires that audiologists practice Audiological Medicine and properly identify, refer, communicate, and co-manage patient treatment plans.
- In doing so, we can demonstrate to physicians that we are capable of safely holding the point-of-entry position, thereby turning our professional adversaries into our professional colleagues.
- *This is certainly within our current scope of practice.*

Learning Objective

- Identify and utilize the hearing care professionals that the audiologist would be engaging with in order to co-manage audiology patients with comorbid conditions.



Define Comorbidity

- Comorbidity is the simultaneous presence of two or more chronic conditions or diseases in a patient.
  - *A chronic condition can be defined as a health condition or disease that is persistent or otherwise long-lasting in its effects.*
- Comorbidity is associated with worse health outcomes, more complex clinical management, and increased health care costs.
- Comorbidity also implies interactions between the illnesses that affect the course and prognosis of both.

Question 1

Comorbidity is the simultaneous presence of two or more _____ conditions or diseases in a patient.

A. Audiologic
B. Chronic
C. Lethargic
D. Pathologic
E. Psychotic

Define Chronic Disease

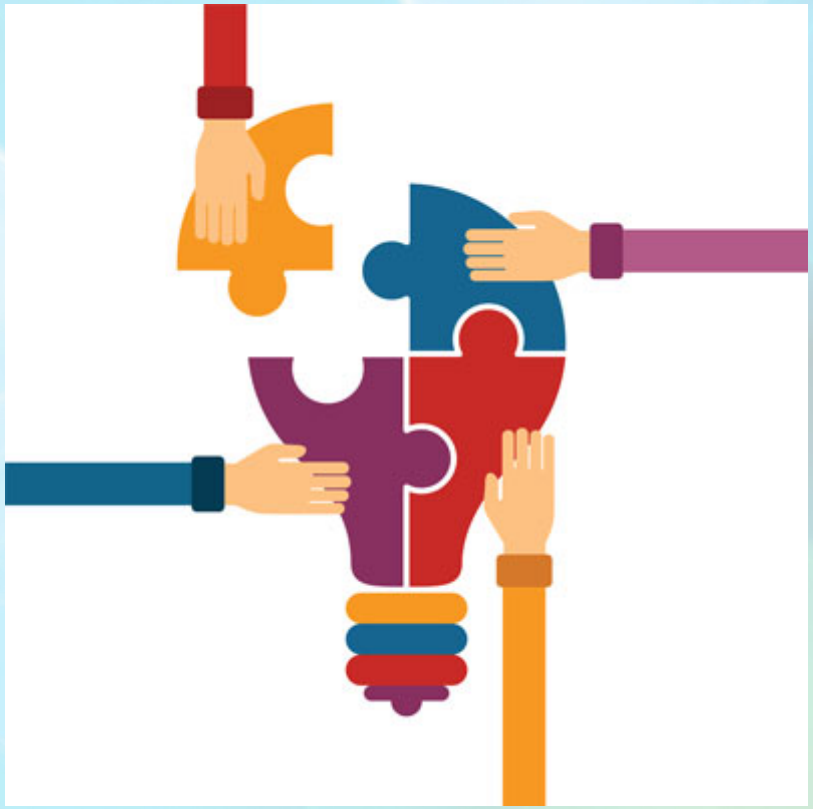
- Chronic diseases are diseases of long duration and generally slow progression. (WHO)
- Chronic diseases have a long course of illness. They rarely resolve spontaneously, and they are generally not cured by medication or prevented by vaccine.
- Chronic diseases are ongoing, generally incurable illnesses or conditions, such as heart disease, asthma, cancer, and diabetes.
- Many chronic diseases are preventable, and often managed through early detection, improved diet, exercise, and treatment therapy.

Define Co-management (medical, formal)

- Co-management is a hospital/physician alignment strategy to elevate hospital service line performance.
- A co-management arrangement is an organized and formal mechanism to actively engage a group of physicians to achieve greater operational efficiencies and improved patient care outcomes.
- The goal and objective of the co-management arrangement is to recognize and appropriately reward participating medical groups for their efforts in developing, managing and improving quality and efficiency of a hospital service line. *Hospital Association of South California*

Define Co-management (informal)

- To manage jointly
- The practice of managing something jointly
- Co-management Objective:
  - To achieve greater operational efficiencies and improved patient care outcomes



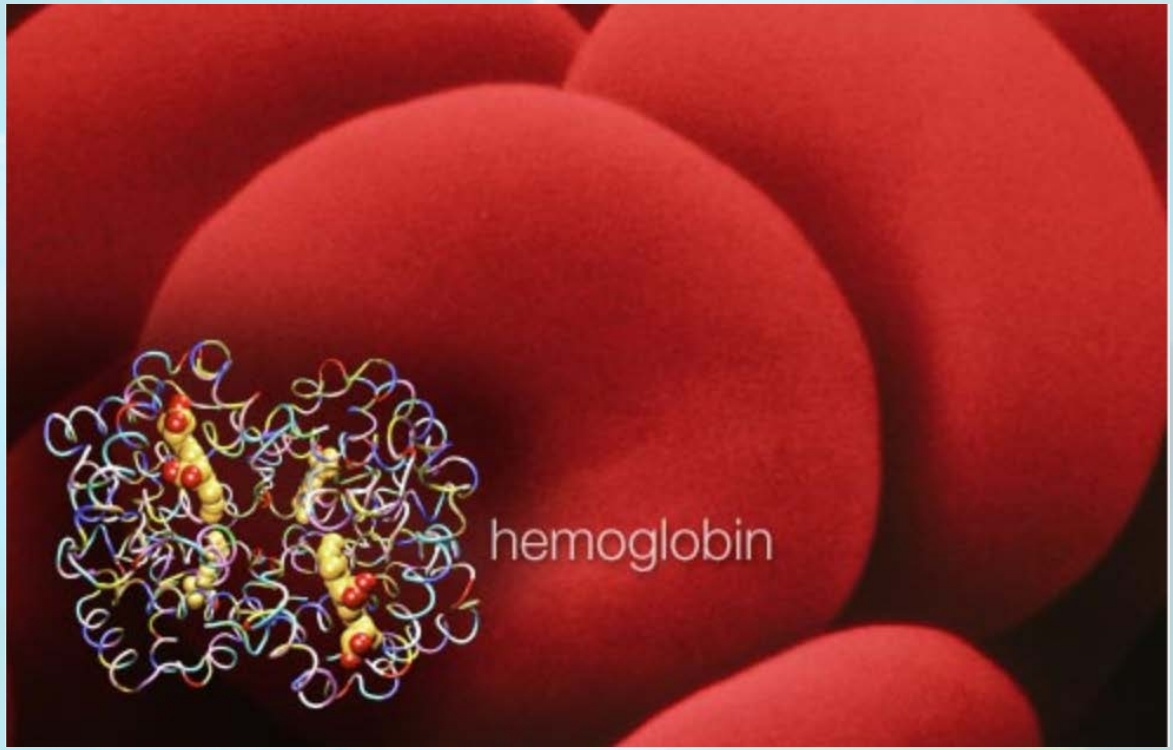
Understanding Odds Ratio

- An odds ratio (OR) is a measure of association between an exposure and an outcome.
- The OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure.
- Odds ratios are used to compare the relative odds of the occurrence of the outcome of interest (e.g. disease or disorder), given exposure to the variable of interest (e.g. health characteristic, aspect of medical history).
- The odds ratio can also be used to determine whether a particular exposure is a risk factor for a particular outcome, and to compare the magnitude of various risk factors for that outcome.
- **OR=1 Exposure does not affect odds of outcome**
- **OR>1 Exposure associated with higher odds of outcome**
- **OR<1 Exposure associated with lower odds of outcome**

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2938757/

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.



Anemia

- Anemia is a condition that develops when the blood lacks enough healthy red blood cells or hemoglobin.
- Hemoglobin is a main part of red blood cells and binds oxygen.
- If there are too few or abnormal red blood cells, or the hemoglobin is abnormal or low, the cells in the body will not get enough oxygen.
- Symptoms of anemia, like fatigue, occur because organs aren't getting what they need to function properly.
- Anemia is the most common blood condition in the U.S.
- It affects about 3.5 million Americans.
- Women, young children, and people with chronic diseases are at increased risk of anemia.

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*

- Vascular events play a big part in the development of sudden sensorineural hearing loss (SSNHL), but only those associated with sickle-cell anemia have been previously associated with SSNHL.
- **This study demonstrates an association between SSNHL and prior iron-deficiency anemia (IDA)**

Hearing Loss and Anemia

- We found that the OR for previous IDA among the participants with SSNHL was 1.34 (95% CI, 1.11-1.61) (P < .01)
- Adjustments for monthly income, geographic region, urbanization level, and comorbidities (*hypertension, diabetes, hyperlipidemia, renal disease, and coronary heart disease*).

Conclusions and Relevance

- There is an association between SSNHL and prior IDA.
- **Patients with IDA, especially those younger than 60 years, should be more aggressively surveyed and managed to reduce hearing-related morbidities.**

Sudden sensorineural hearing loss associated with iron-deficiency anemia: a population-based study.

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Hearing Loss and Anemia

- Why Iron Deficiency Anemia (IDA) might be linked to hearing loss is not yet fully understood, but there are a few potential pathways.
- For instance, blood supply to the inner ear via the labyrinthine artery is highly sensitive to ischemic damage (damage caused by reduced blood flow), which could certainly play a role.
- Additionally, 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, a waxy substance that coats nerves and 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, both of which are important in energy production 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

Cognitive Decline & Dementia

- Dementia is a syndrome that involves a significant global impairment of cognitive abilities such as attention, memory, language, logical reasoning, and problem-solving severe enough to interfere with social or occupational functioning.

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

Cognitive Decline & Dementia

- Dementia is not temporary confusion or forgetfulness that might result from a self-limited infection, underlying illness, or side effects of medications.
- Dementia typically worsens over time.

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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."*

Hearing Loss & Cognitive Decline

- A striking finding from a recent large-scale population study has revealed a **strong statistical connection between the appearance and degree of hearing loss and all-cause dementia**.
  - *Lin FR. Hearing loss and cognition among older adults in the United States. J. Gerontol. Med. Sci. 2011*
- Indeed, as Lin and colleagues have shown, this relationship persists *even when adjusted for sex, age, race, education, diabetes, smoking history and hypertension*.
  - *Lin FR, et al. Hearing loss and incident dementia. Arch. Neurol. 2011*
- Examination of the effect of subtle individual differences in hearing ability and the function and structure of brain regions supporting speech comprehension.
- Discovered relationship between hearing ability and regional brain volume, *one is bound to ask whether improving hearing ability through the use of hearing aids might help in preserving either cortical health or cognitive ability.*
- *Although this is an appealing suggestion, at this point it is too early to draw any firm conclusions.*

Hearing Loss & Cognitive Decline

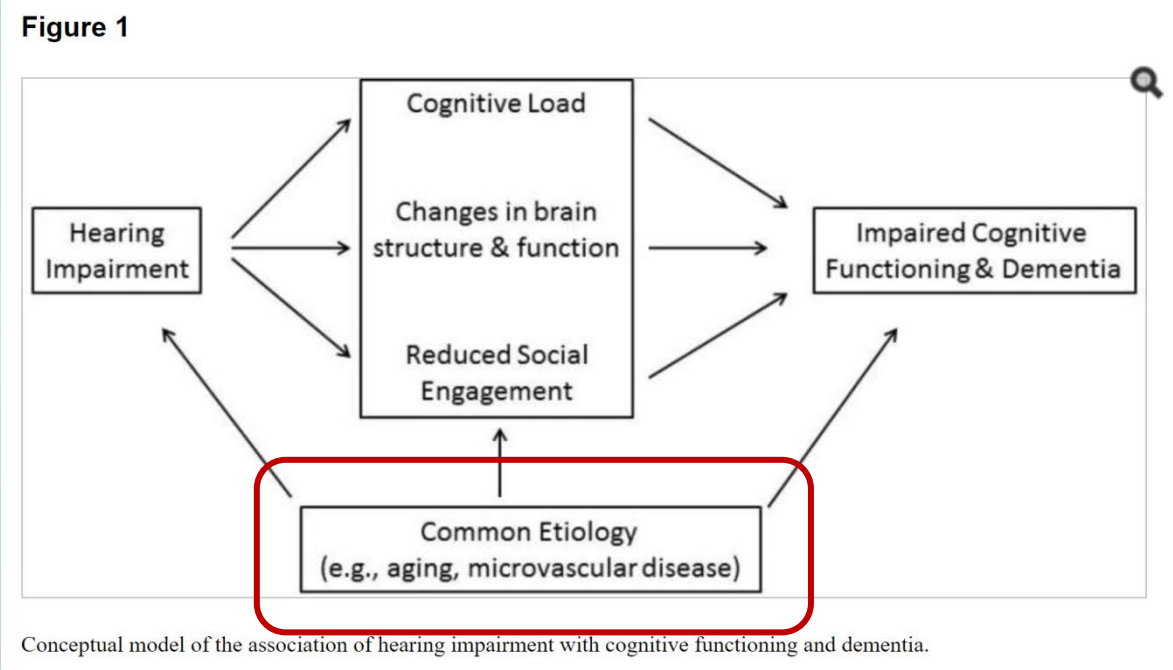
- **Hearing Loss and Cognitive Decline in Older Adults**
- *JAMA Intern. Med. 2013;173(4):293-299.*
- *Lin, Yaffe, Xia, et al.*
- Background: Whether hearing loss is independently associated with accelerated cognitive decline in older adults is unknown.
- **Conclusions: Hearing loss is independently associated with accelerated cognitive decline and incident cognitive impairment in community-dwelling older adults.**
- *Further studies are needed to investigate what the mechanistic basis of this association is and whether hearing rehabilitative interventions could affect cognitive decline.*

Hearing Loss & Dementia

- **Hearing Loss and Dementia – Who's Listening?**
- *Aging Ment Health. 2014 Aug; 18(6): 671–673.*
- *Frank R. Lin and Marilyn Albert*
- *The potential public health impact of hearing loss in the context of dementia is substantial given the high worldwide prevalence of hearing loss in older adults and the ready availability of existing hearing rehabilitative interventions which remain risk-free and underutilized.*

- Compared to individuals with normal hearing, those individuals with a mild, moderate, and severe hearing impairment, respectively, had a 2-, 3-, and 5-fold increased risk of incident all-cause dementia over >10 years of follow-up (Lin, Metter, et al., 2011).
- Neuroimaging studies have also demonstrated independent associations of hearing impairment with reduced cortical volumes in the auditory cortex (Peelle, et al., 2011) and accelerated rates of lateral temporal lobe and whole brain atrophy (Lin et al., 2014).

Hearing Loss & Dementia



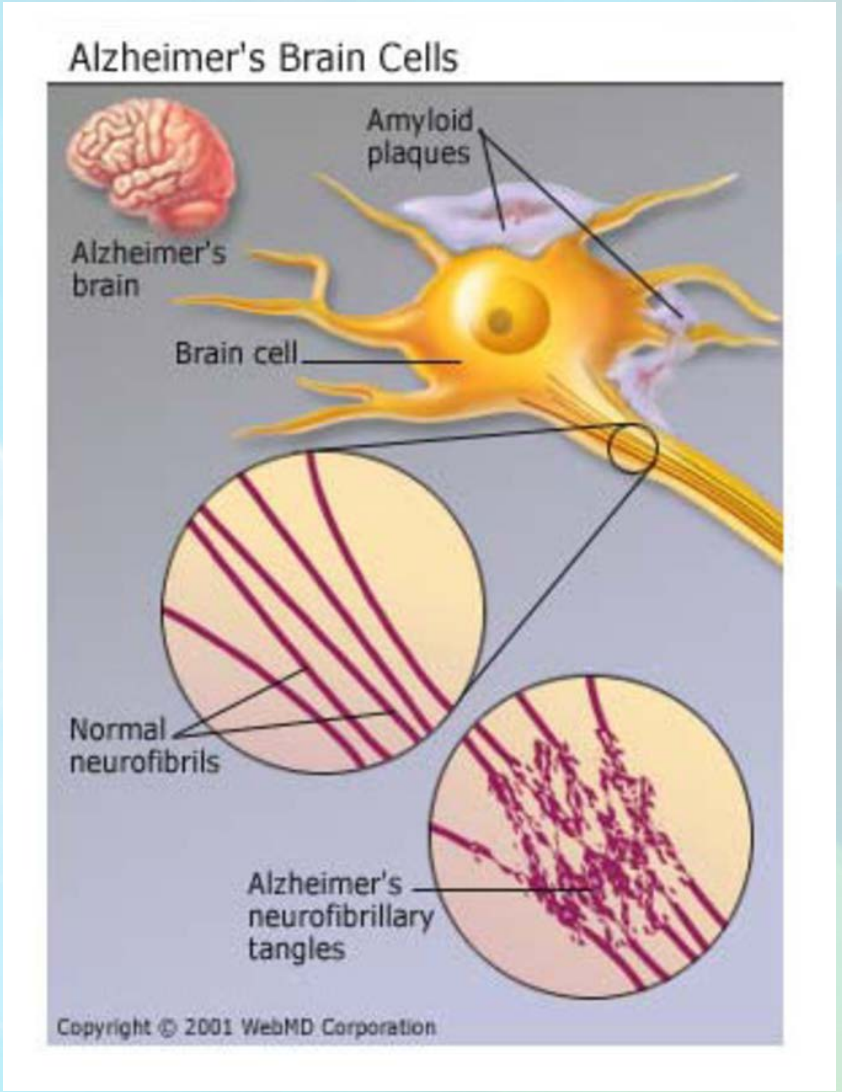
- ***While definitive evidence of the effects of hearing treatment on dementia is years away***, the benefits of early screening and management of hearing loss are likely significant and without risk.
- Importantly, challenges currently exist in developing affordable and accessible approaches toward hearing health care, but these issues are increasingly coming to the forefront and being addressed at the national level (*Institute of Medicine, 2014*).

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

Alzheimer's Disease

- The disease isn't a normal part of aging.
- The symptoms seem to come from two main types of nerve damage:
  - Nerve cells get tangles, called neurofibrillary tangles.
  - Protein deposits called beta-amyloid plaques build up in the brain.
- Damage could be associated with a protein in blood called ApoE (for apolipoprotein E), which the body uses to move cholesterol in the blood.

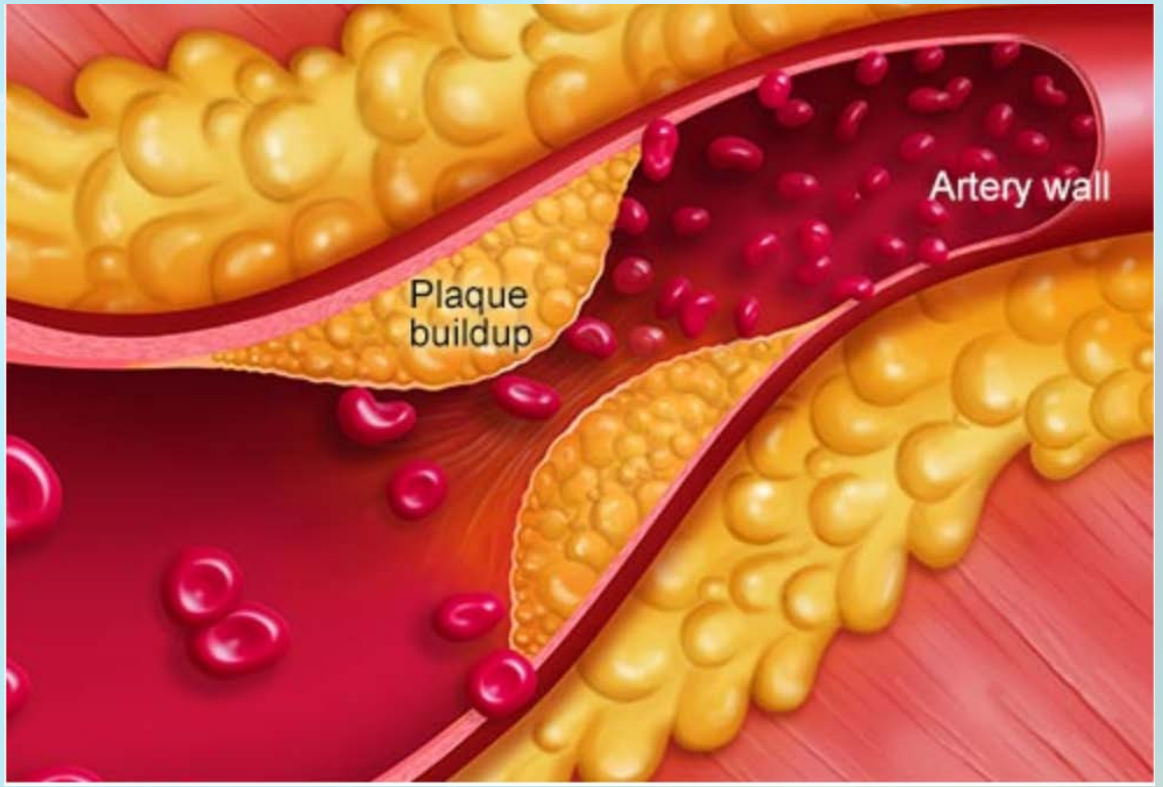


Cardiovascular Disease

- Heart disease, such as coronary heart disease, heart attack, congestive heart failure, and congenital heart disease, is the leading cause of death for men and women in the U.S.
- Prevention includes quitting smoking, lowering cholesterol, controlling high blood pressure, maintaining a healthy weight, and exercising.

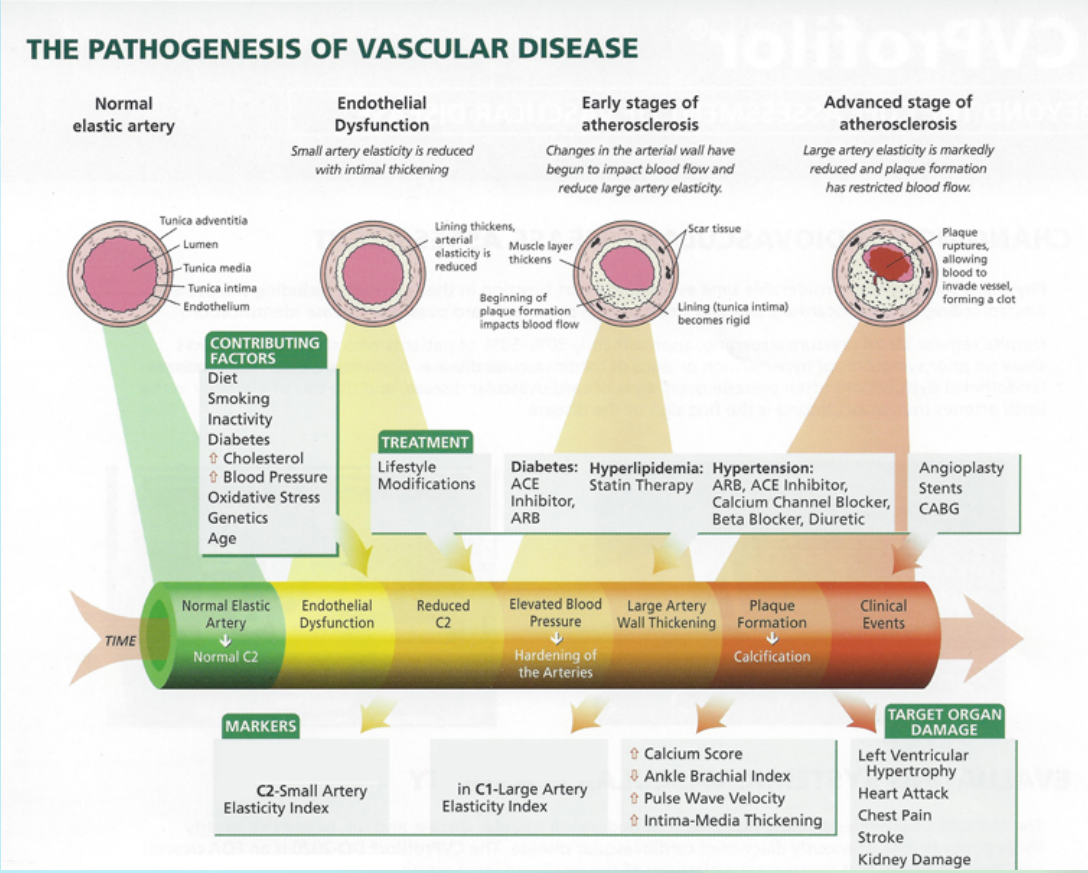
Coronary Artery Disease

- The arteries, which start out smooth and elastic, get plaque on their inner walls, which can make them more rigid and narrowed.
- This restricts blood flow to the heart, which can then become starved of oxygen.
- The plaque could rupture, leading to a heart attack or sudden cardiac death.



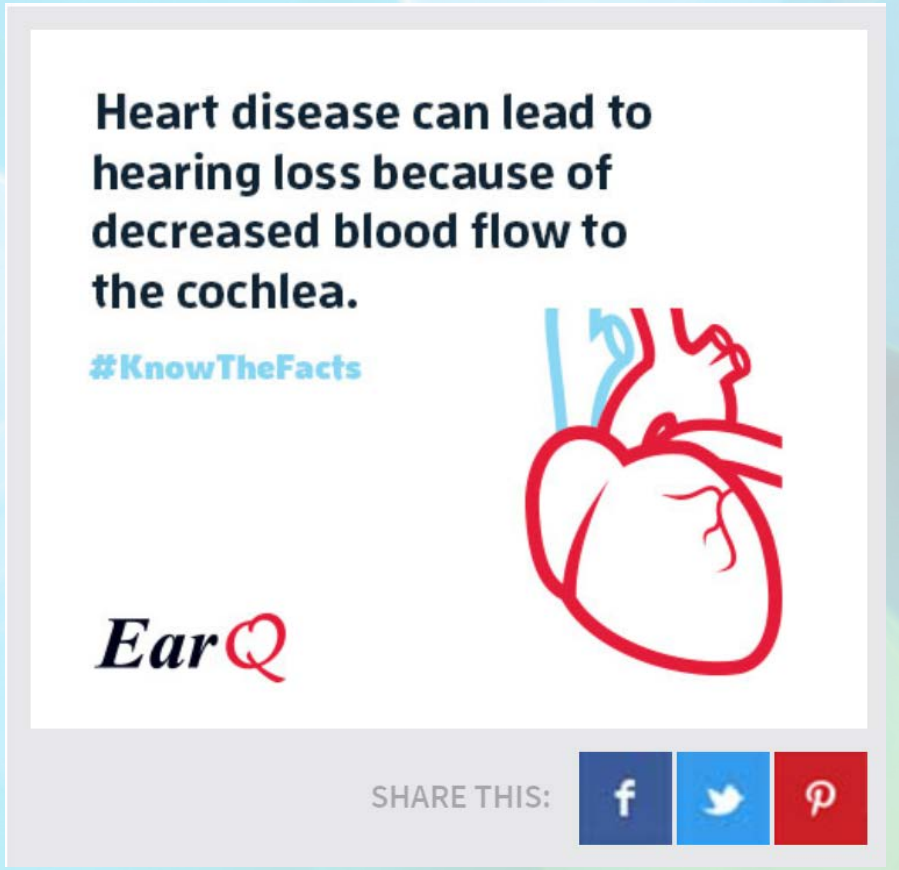
Vascular Disease (Blood Vessel Disease)

- Circulatory system vessels move fluids throughout your body.
- Arteries move blood away from the heart.
- Veins return blood to the heart.
- Lymph vessels and lymph nodes are part of a cleaning system that removes damaged cells from your body.



Vascular Disease (Blood Vessel Disease)

- Blockage in coronary arteries can cause chest pain (angina).
- Blockage in the carotid arteries that supply the brain can lead to a stroke (transient ischemic attack, TIA).
- Blockage in the kidneys can lead to uncontrolled high blood pressure and heart failure.



Question 2

Which of the following choices is not directly associated with heart health and disease?

A. Cardiovascular Disease
B. Cerebrovascular Disease
C. Coronary Artery Disease
D. Vascular Disease (Blood Vessel Disease)

Hearing Loss & Heart Disease

- **Hearing loss and ischemic heart disease.**
- *Am J Otol. 1988 Sep;9(5):403-8.*
- *Susmano A, Rosenbush SW.*

- One hundred three patients with ischemic heart disease (IHD) were compared with 29 patients with organic heart disease and normal coronary arteries (OHD) and with a control group of 101 patients free of heart disease and matched for age and sex.
- **HL always preceded the clinical manifestation of IHD and appears to be an important "early marker" of a vascular or generalized arteriosclerotic process.**

Hearing Loss & Heart Disease

- **Audiometric pattern as a predictor of cardiovascular status: Development of a model for assessment of risk**
- *Laryngoscope Volume 119, Issue 3, March 2009, Pages 473–486*
- *Friedland, Cederberg, Tarima*

- Objectives/Hypothesis: This study hypothesizes that low-frequency hearing loss is associated with underlying cardiovascular disease.
- **Results: A significant association was found between low-frequency hearing loss and cardiovascular disease and risk factors.**

Hearing Loss & Heart Disease

- When controlling for age, *hypertension, diabetes, smoking, and hyperlipidemia*, **low-frequency presbycusis was significantly associated with intracranial vascular pathology such as stroke and transient ischemic attacks**.
- **Significant associations were also seen with *peripheral vascular disease, coronary artery disease, and a history of myocardial infarction.***

- Audiogram pattern correlates strongly with cerebrovascular and peripheral arterial disease and may represent a screening test for those at risk.
- Patients with low-frequency hearing loss should be regarded as at risk for cardiovascular events, and appropriate referrals should be considered.

Audiometric pattern as a predictor of cardiovascular status: Development of a model for assessment of risk

Hearing Loss & Heart Disease

- **The Ear is a Window to the Heart: A Modest Argument for a Closer Integration of Medical Disciplines**
- *Otolaryngology 2:e108.*
- *Bishop*

- There are current studies that show a compelling relationship between acquired hearing impairment and poor cardiovascular fitness and hypertension.
- Additionally, cardio-metabolic disorders (e.g., metabolic syndrome, Type 2 diabetes) and high risk behaviors, such as smoking, have been implicated in acquired hearing impairments.
- Conversely, moderate alcohol consumption has been described as a potential protective factor.

Hearing Loss & Heart Disease

- Does cardiovascular disease cause hearing loss, or not?
- Can hearing loss be an indication, or biomarker, for underlying cardiovascular disease?
- **What we can say with confidence is that states of disease, whether cardiovascular or cardio-metabolic in nature, which result from patterns of behavior generally linked to poor nutrition, lack of exercise, stress, and smoking, are clearly related to loss of hearing acuity in older adults.**

- What the current data shows is that *the specialized medical professions,* including the specialty of otolaryngology and her allied disciplines, *can no longer function in a vacuum*.
- One should not argue for a new model of care, but rather, for an enhanced model, *where all otolaryngology professionals seek out and maintain collaborations with other specialties*, making it a point to routinely engage patients on all aspects of their general health and wellness.

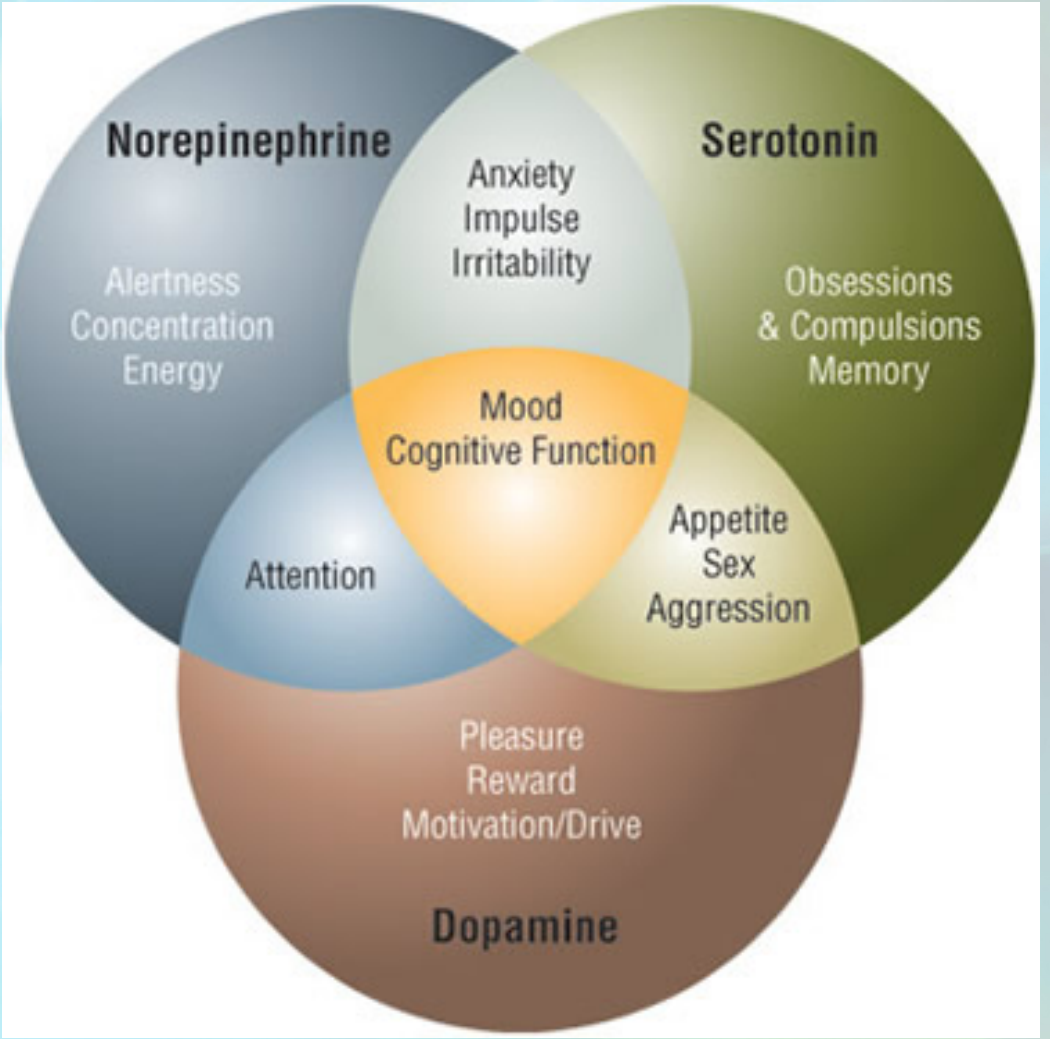
Depression

- 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 compression.
- Depression commonly occurs with other illnesses such as anxiety, obsessive compulsive disorder, panic disorder, phobias, and eating disorders.

https://i.pinimg.com

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.



Question 3

- Which of the following choices is not a neurotransmitter directly associated with mental health or disease?

A. Calcium
B. Dopamine
C. Norepinephrine
D. Serotonin

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

Hearing Loss & Depression

The National Council on the Aging
May 1999

Study conducted by the
Seniors Research Group,
An alliance between The National Council on the Aging and Market Strategies Inc.

The National Council on the Aging
409 Third Street, SW Suite 200
Washington, DC 20024
202-479-1200

www.ncoa.org

Results

Older people with hearing impairments that go untreated suffer many negative effects. Compared to older, hearing-impaired people who use hearing aids, those who do not use hearing aids are more likely to report

- sadness and depression;
- worry and anxiety;
- paranoia;
- less social activity;
- emotional turmoil and insecurity.

These difference remains when controlling for other factors such as the respondent's age, gender, and income.

On the other hand, seniors whose hearing loss is treated often report benefits that include

- better relationships with their families;
- better feelings about themselves;
- improved mental health;
- greater independence and security.

Hearing Loss & Depression

- **Hearing Impairment Associated With Depression in US Adults, National Health and Nutrition Examination Survey 2005-2010**
- *JAMA Otolaryngol Head Neck Surg. 2014;140(4):293-302.*
- *ChuanMing Li, Xinzhi Zhang, Hoffman, et al.*

- Objective: To estimate the prevalence of and risk factors for depression among adults with hearing loss.
- Design, Setting, and Participants: Adults aged 18 years or older (N = 18,318) who participated in the National Health and Nutrition Examination Survey (NHANES), 2005-2010, a nationally representative sample.
- Interventions: Multistage probability sampling of US population.

Hearing Loss & Depression

- Using excellent hearing as the reference, after adjusting for all covariates, multivariate odds ratios (ORs) for depression were
  - 1.4 (95% CI, 1.1-1.8) for good hearing,
  - 1.7 (1.3-2.2) for a little trouble,
  - 2.4 (1.7-3.2) for moderate trouble,
  - 1.5 (0.9-2.6) for a lot of trouble, and
  - 0.6 (0.1-2.6) for deaf.

Hearing Impairment Associated With Depression in US Adults, National Health and Nutrition Examination Survey 2005-2010

- Conclusions and Relevance: After accounting for health conditions and other factors, including trouble seeing, **self-reported HI and audiometrically determined HI were significantly associated with depression, particularly in women**.
- Health care professionals should be aware of an increased risk for depression among adults with hearing loss.

Hearing Loss & 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

- Compared to other medical co-morbidities, HL is more strongly associated with the development of depression in older adults.
- Whether hearing rehabilitative treatment may mitigate the possible effects of HL on depression remains unclear.

Hearing Loss & Depression

- Data were analyzed using stepwise multivariate logistic models to investigate the association of HL as a continuous variable (per 25 dB) and hearing aid use with MDD and any depressive symptoms, *adjusting for demographic characteristics and cardiovascular risk factors*.
- Hearing aid use was defined as wearing a hearing aid at least 5 hours a week in the twelve months prior to the interview.

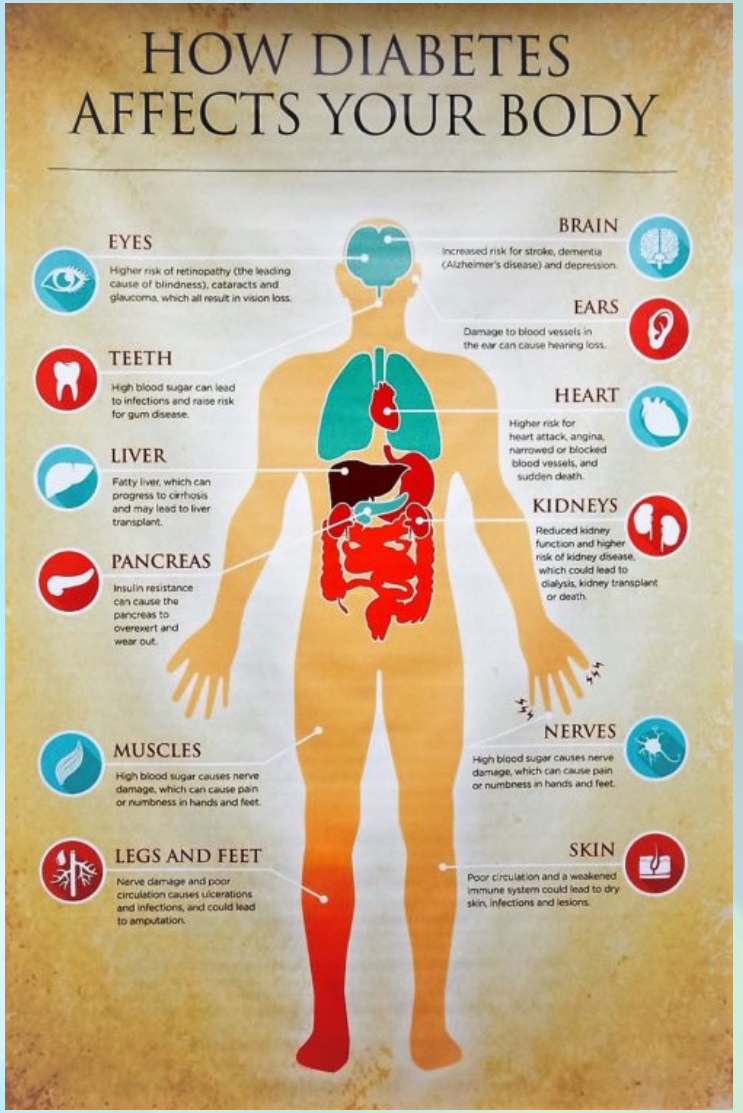
- **In summary, hearing aid use is independently associated with reduced odds of MDD and depressive symptoms.**
- The basis of this association and whether hearing rehabilitative interventions could actually reduce depressive symptoms will require further study in other prospective studies or a randomized clinical trial.

Hearing Loss and Depression in Older Adults

Diabetes

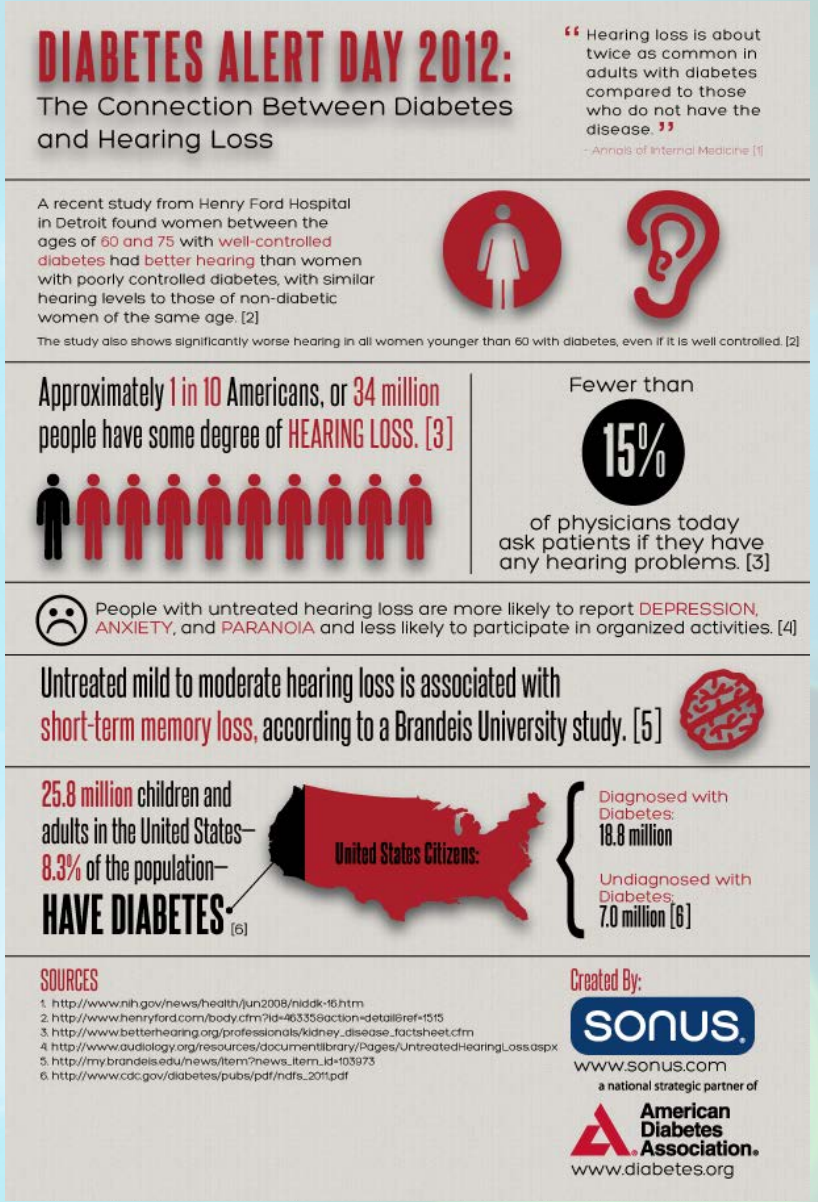
Diabetes occurs when one of the following occurs:

- When the pancreas does not produce any insulin
- When the pancreas produces very little insulin
- When the body does not respond appropriately to insulin, a condition called “insulin resistance”



Diabetes

- Diabetes is a lifelong disease; as yet, there is no cure.
- Approximately 18.2 million Americans have the disease and almost one third (or approximately 5.2 million) are unaware that they have it.
- An additional 41 million people have pre-diabetes.
- People with diabetes need to manage their disease to stay healthy.



Hearing Loss & Diabetes

- **Diabetes and Hearing Impairment in the United States: Audiometric Evidence from the National Health and Nutrition Examination Survey, 1999 to 2004**
- *Ann Intern Med. 2008;149(1):1-10.*
- *Bainbridge, Hoffman, Cowie*

- Background: Diabetes might affect the vasculature and neural system of the inner ear, leading to hearing impairment.
- Objective: To determine whether hearing impairment is more prevalent among U.S. adults with diabetes.
- Design: Cross-sectional analysis of nationally representative data.
- Participants: 5,140 noninstitutionalized adults age 20 to 69 years who had audiometric testing.

Hearing Loss & Diabetes

- Results: Hearing impairment was more prevalent among adults with diabetes.
- Age-adjusted prevalence of low- or mid-frequency hearing impairment of mild or greater severity in the worse ear was 21.3% (95% CI, 15.0% to 27.5%) among 399 adults with diabetes compared with 9.4% (CI, 8.2% to 10.5%) among 4741 adults without diabetes.
- Similarly, age-adjusted prevalence of high-frequency hearing impairment of mild or greater severity in the worse ear was 54.1% (CI, 45.9% to 62.3%) among those with diabetes compared with 32.0% (CI, 30.5% to 33.5%) among those without diabetes.
- The association between diabetes and hearing impairment was independent of known risk factors for hearing impairment, *such as noise exposure, ototoxic medication use, and smoking* (adjusted odds ratios for low- or mid-frequency and high-frequency hearing impairment were 1.82 [CI, 1.27 to 2.60] and 2.16 [CI, 1.47 to 3.18], respectively).

Diabetes and Hearing Impairment in the United States: Audiometric Evidence from the National Health and Nutrition Examination Survey, 1999 to 2004

Hearing Loss & Diabetes

- **Diabetes and risk of hearing impairment in adults: a meta-analysis.**
- *J Clin Endocrinol Metab. 2013 Jan; 98(1):51-8*
- *Horikawa, Kodama, Tanaka, et al.*

- Objective: Our objective was to compare the prevalence of hearing impairment between diabetic and nondiabetic adults.

- Data Sources: We performed a systematic literature search using MEDLINE (1950 to May 30, 2011) and EMBASE (1974 to May 30, 2011).
- Study Selection: Cross-sectional studies were included if data on numbers of hearing-impaired and non-hearing-impaired cases with diabetes were presented.
- Hearing impairment was limited to that assessed by pure-tone audiometry that included at least 2 kHz of frequency range and was defined as progressive, chronic, sensorineural, or without specified cause.

Hearing Loss & Diabetes

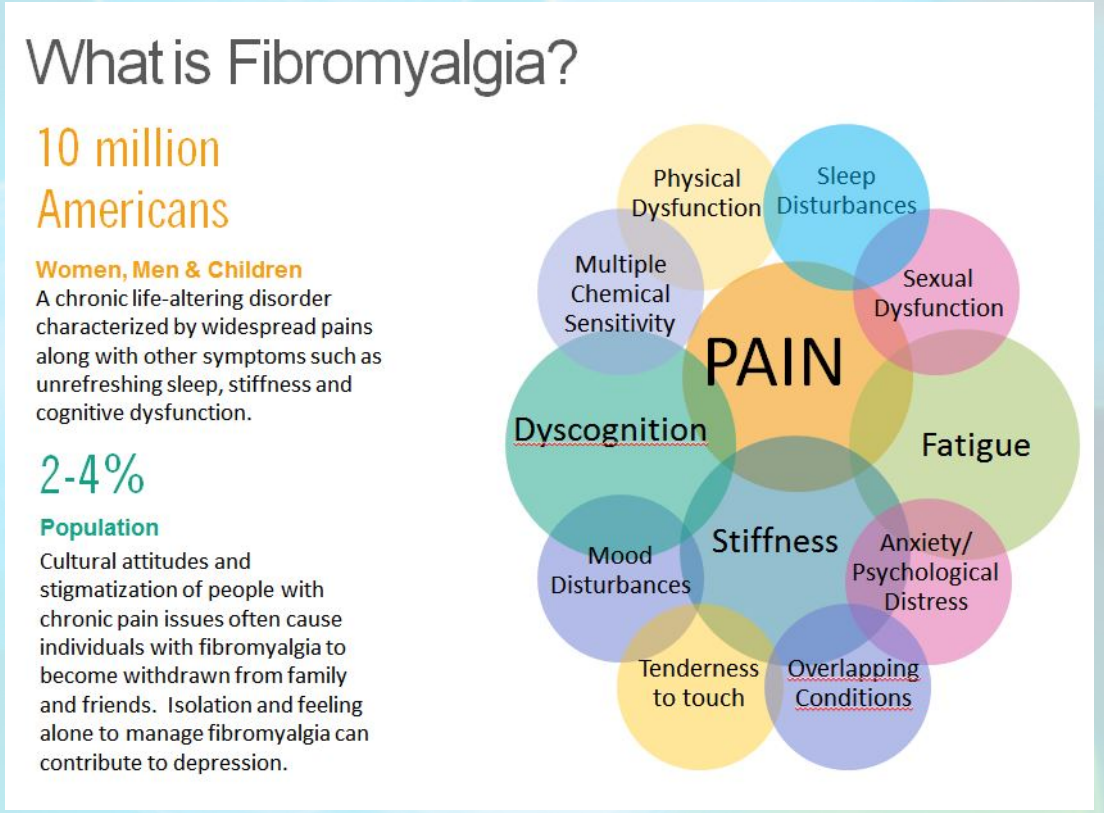
- Data Synthesis: Data were obtained from 13 eligible studies (20,194 participants and 7,377 cases).
- Overall pooled OR (95% confidence interval) of hearing impairment for diabetic participants compared with nondiabetic participants was 2.15 (1.72-2.68).
- OR was higher in younger participants (mean age, ≤60 yr) than in those over 60 yr among which the OR remained significant (2.61 and 1.58, P = 0.008).
- The strength of the association between diabetes and prevalence of hearing impairment was not significantly influenced by whether participants were matched for age and gender (P = 0.68) or whether participants chronically exposed to noisy environments were excluded (P = 0.19).
- **Conclusions: Current meta-analysis suggests that the higher prevalence of hearing impairment in diabetic patients compared with nondiabetic patients was consistent regardless of age.**

American Diabetes Association (ADA)

- Right now we don't know how diabetes is related to hearing loss.
- It's possible that the high blood glucose levels associated with diabetes cause damage to the small blood vessels in the inner ear, similar to the way in which diabetes can damage the eyes and the kidneys.
- But more research needs to be done to discover why people with diabetes have a higher rate of hearing loss.

Fibromyalgia

- Fibromyalgia syndrome affects the muscles and soft tissue.
- Symptoms include chronic muscle pain, fatigue, sleep problems, and painful tender points or trigger points, which can be relieved through medications, lifestyle changes and stress management.



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*

- Methods: The study includes 44,494 persons from the second health survey in Nord-Trøndelag (HUNT2) who had undergone audiometry and answered a comprehensive questionnaire that mapped fibromyalgia, musculoskeletal pain at various sites and subjective hearing loss.

Hearing Loss & Fibromyalgia

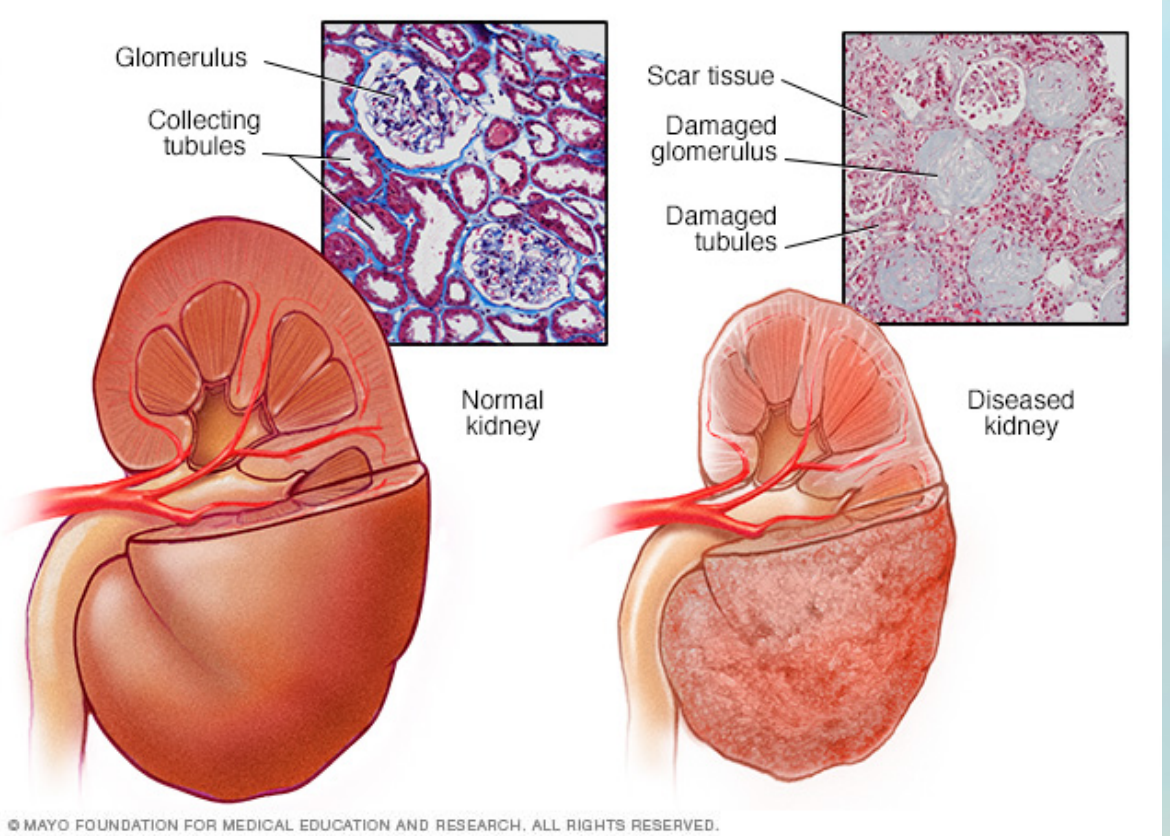
- Results: In adjusted analysis, **individuals with fibromyalgia had increased likelihood to report subjective hearing loss**, compared to persons without fibromyalgia or other musculoskeletal pain
  - Female OR 4.6, 95% CI 3.6–5.8
  - Male OR 4.5, 95% CI 3.1–6.6

- Conclusions: Our findings are consistent with the hypothesis that fibromyalgia is related to a general dysregulation of the central nervous system.
- The same might also be the case for other local and, in particular, other widespread, musculoskeletal pain.

Are persons with fibromyalgia or other musculoskeletal pain more likely to report hearing loss? A HUNT study

Kidney Disease

- Kidney disease affects the body's ability to clean blood, filter extra water out of blood, and help control blood pressure.
- When kidneys are damaged, waste products and fluid can build up in the body. That can cause swelling in the ankles, vomiting, weakness, poor sleep, and shortness of breath.
- Without treatment, the damage can get worse, and the kidneys may eventually stop working which can be life-threatening.

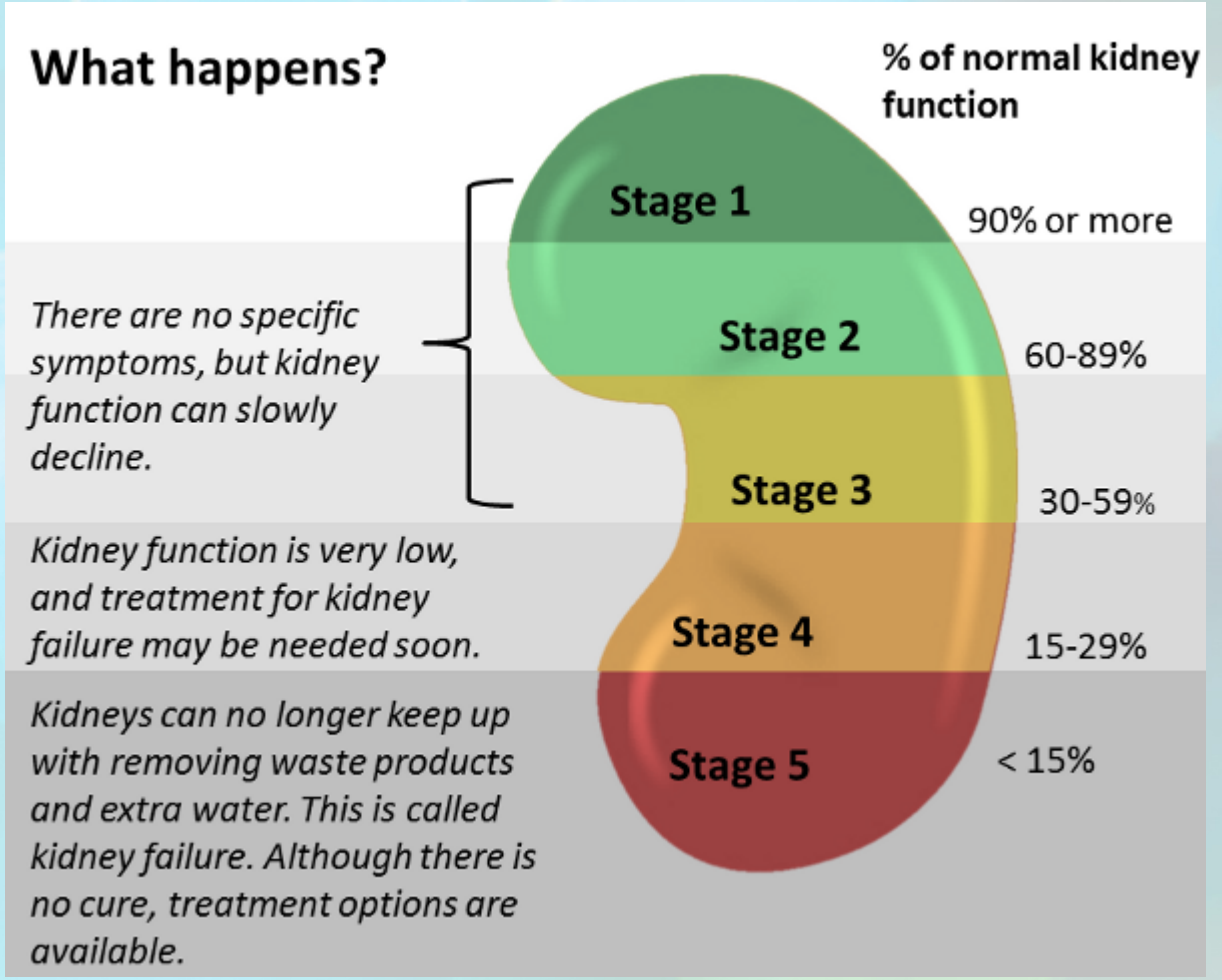


WebMD | AuDACITY | ADA Academy of Doctors of Audiology

Kidney Disease

Healthy kidneys:

- Keep a balance of water and minerals (such as sodium, potassium, and phosphorus) in your blood
- Remove waste from your blood after digestion, muscle activity, and exposure to chemicals or medications
- Make renin, which your body uses to help manage your blood pressure
- Make a chemical called erythropoietin, which prompts your body to make red blood cells
- Make an active form of vitamin D, needed for bone health and other things



Chronic Kidney Disease

- Chronic kidney disease occurs when the kidneys don't work well for longer than 3 months
- Diabetes (types 1 and 2) and high blood pressure are the most common culprits.
- High blood sugar levels over time can harm the kidneys.
- High blood pressure creates wear and tear on the blood vessels, including those that go to the kidneys.

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*

- Background: Chronic kidney disease (CKD) has long been associated with hearing loss in certain syndromes.
- Reported evidence to date has come from only small observational studies.
- We present the first community-based study to show an association between nonsyndromal CKD and hearing loss.

Hearing Loss & Kidney Disease

- Study Design: Cross-sectional population-based study to examine the relationship between CKD and age-related hearing loss.
- Setting & Participants: The Blue Mountains Hearing Study is a survey of age-related hearing loss conducted in 1997-2004; a total of 2,564 participants had audiometric testing and complete renal data.
- Predictor or Factor: Moderate CKD, defined as estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m^2.
- Outcomes: Bilateral hearing loss, defined as average pure-tone threshold >25 dB for measurements at frequencies of 0.5, 1.0, 2.0, and 4.0 kHz.

- Results: Moderate CKD was independently associated with hearing loss (OR, 1.43; 95% CI, 1.10-1.84; *P* = 0.006) after adjusting for *age; sex; noise exposure; education; diabetes, hypertension, and stroke histories; and smoking*.
- **Conclusions: Moderate CKD per se was associated independently with hearing loss.**
- Recognizing this link could lead to earlier hearing assessment with appropriate interventions to preserve the hearing of patients with CKD.

The Association Between Reduced GFR and Hearing Loss: A Cross-sectional Population-Based Study

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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."

See previous slide, study author Professor David Harris

Rheumatoid Arthritis

- Arthritis means inflammation in a joint. That inflammation causes redness, warmth, swelling, and pain within the joint.
- Rheumatoid arthritis affects joints on both sides of the body, such as both hands, both wrists, or both knees. This symmetry helps to set it apart from other types of arthritis.
- 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 joints and sometimes other organs.
- Some experts think that a virus or bacteria may change the immune system, causing it to attack the joints.

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.**
- The hearing impairment in RA seems to be a multifactorial condition; however the mechanisms of injury, as well as the relative risk factors, are not completely clear.

American Arthritis Foundation

- Clinical trials have found higher rates of sensorineural hearing loss – a type of hearing loss usually caused by poor function of the hair cells in the cochlea – in patients with rheumatoid arthritis (RA).
- For example, one study published in 2006 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. A 2012 study published in *The American Journal of Epidemiology* found that women who took ibuprofen (*Advil, Motrin*) or acetaminophen (*Tylenol*) two or more days per week were more likely to report hearing loss than those who rarely took the painkillers.

Thyroid Disease

- Hypothyroidism is when the thyroid gland does not produce enough thyroid hormone, leading to fatigue, constipation, dry skin, and depression.
- The underactive gland can cause slowed development in children.
- Some types of hypothyroidism are present at birth.

- Hyperthyroidism results when the thyroid gland, located in the front of the neck, produces too much thyroid hormone.
- The thyroid controls metabolism, so if it is overactive, it may lead to weight loss, hair loss, a fast heartbeat, sweating, tiredness, shakiness, and moodiness.

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, Oz uguz, Erden, Aydin, Dagli, Guler*

- Hearing loss has commonly been reported in association with thyroid disorders.
- The aim of this cross-sectional, case-control study was to investigate hearing loss in patients with Graves' Disease (GD).
- **Our results are highly suggestive of a decrease in hearing ability in patients with GD, particularly at high frequencies.**

Comorbid Conditions Related to Hearing Loss

Physiological Conditions

- Anemia
- Arthritis
- Cardiovascular Disease
- Diabetes
- Kidney Disease
- Thyroid Disease
- Vascular Disease

Psychosocial Conditions

- Alzheimer's Disease
- Cognitive Decline
- Communication Disorders
- Dementia
- Depression
- Quality of Life
- Social Isolation

Comorbidity Co-management Team

Physiological Conditions

- Audiologists
- Endocrinologists
- Gerontologists
- Nephrologists
- Neuropsychologists
- Primary Care Physicians

Psychosocial Conditions

- Audiologists
- Gerontologists
- Neuropsychologists
- Primary Care Physicians
- Psychiatrists
- Psychologists

Top 10 Chronic Conditions in Adults 65+

1. Hypertension (high blood pressure)
2. High Cholesterol
3. Arthritis
4. Coronary Artery Disease (ischemic heart disease)
5. Diabetes
6. Chronic Kidney Disease (CKD)
7. Heart Failure
8. Depression
9. Alzheimer's Disease and Dementia
10. Chronic Obstructive Pulmonary Disease (COPD)

National Council on Aging, NCOA Blog, February 2017

Top 10 Chronic Conditions in Adults 65+

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National Council on Aging, NCOA Blog, February 2017

20 Tracked Chronic Diseases (OASH)
Office of the Assistant Secretary for Health

- Blood
  - HIV / AIDS
  - Hypertension
  - Hyperlipidemia
- Bone
  - Arthritis
  - Osteoporosis
- Brain
  - Autism Spectrum Disorder
  - Dementia / Alzheimer's
  - Schizophrenia
  - Stroke
- Heart
  - Cardiac Arrhythmias
  - Congestive Heart Failure
  - Coronary Artery Disease
- Kidney
  - Chronic Kidney Disease
- Liver
  - Hepatitis
- Lungs
  - Asthma
  - COPD
- Mental Health
  - Depression
  - Substance Abuse
- Pancreas
  - Diabetes
- Whole Body
  - Cancer

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  - ***Cancer***

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Learning Objective 1

- Acquire the knowledge base covering many co-morbid conditions that audiology patients may present to audiologists as part of hearing and balance care in the audiology private practice.

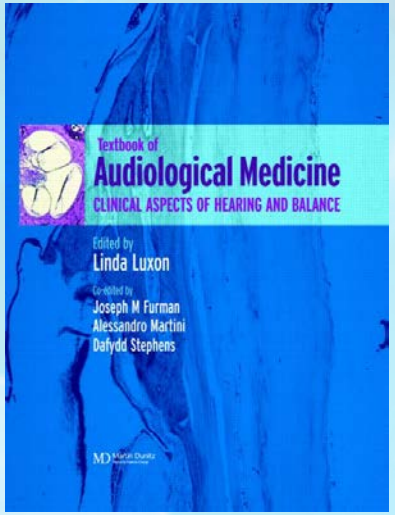
http://www.betterhearing.org/

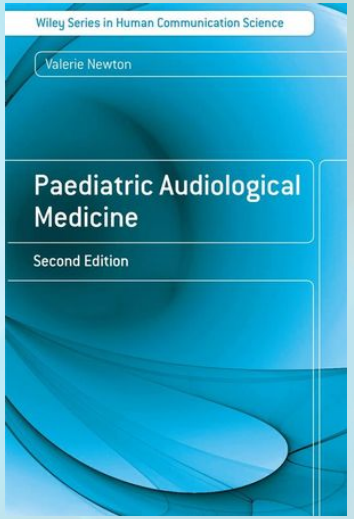
Learning Objective 2

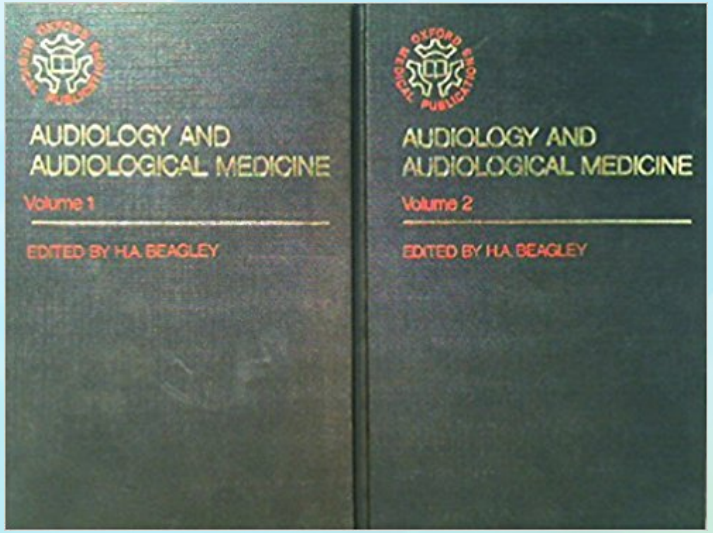
- Identify and utilize the hearing care professionals that the audiologist would be engaging with in order to co-manage audiology patients with comorbid conditions.

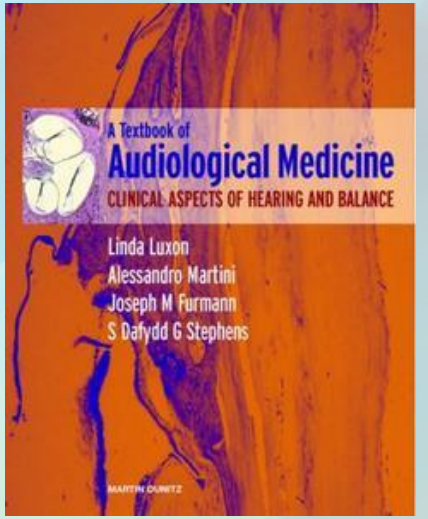
Learning Objective 3

- 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.



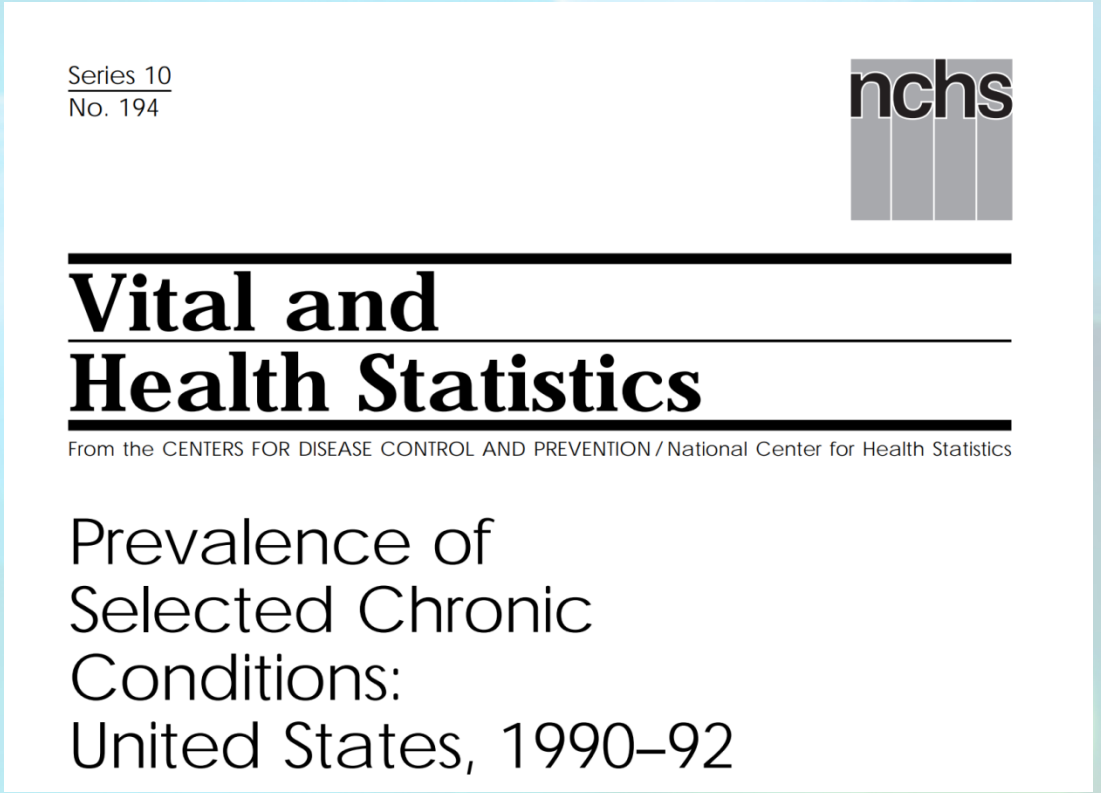






Vital and Health Statistics
Collins (1997) HHS / CDC / NSHS

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.



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

Chronic Conditions

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)

Causes of Death

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

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: Less than $10,000	Family income: $10,000–$19,999	Family income: $20,000–$34,999	Family income: $35,000 and over	Geographic region: Northeast	Geographic region: Midwest	Geographic region: South	Geographic region: 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)

[1]Includes unknown family income.
[2]Indicated 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.

Deafness & hearing impairment = 6th most prevalent chronic condition

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Question 4

According to the 1997 Collins report from the CDC, the sixth most prevalent chronic condition is _____

A. Arthritis
B. Asthma
C. Bronchitis
D. Deafness and other hearing impairments
E. Dermatitis

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)*

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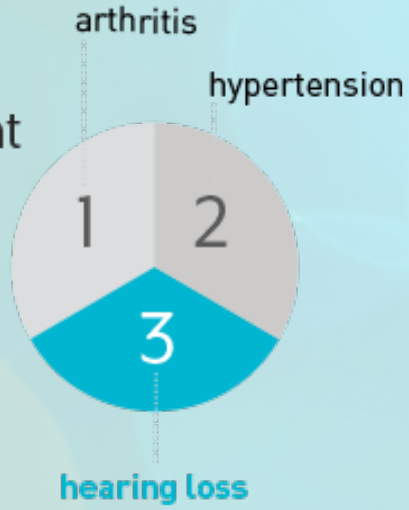
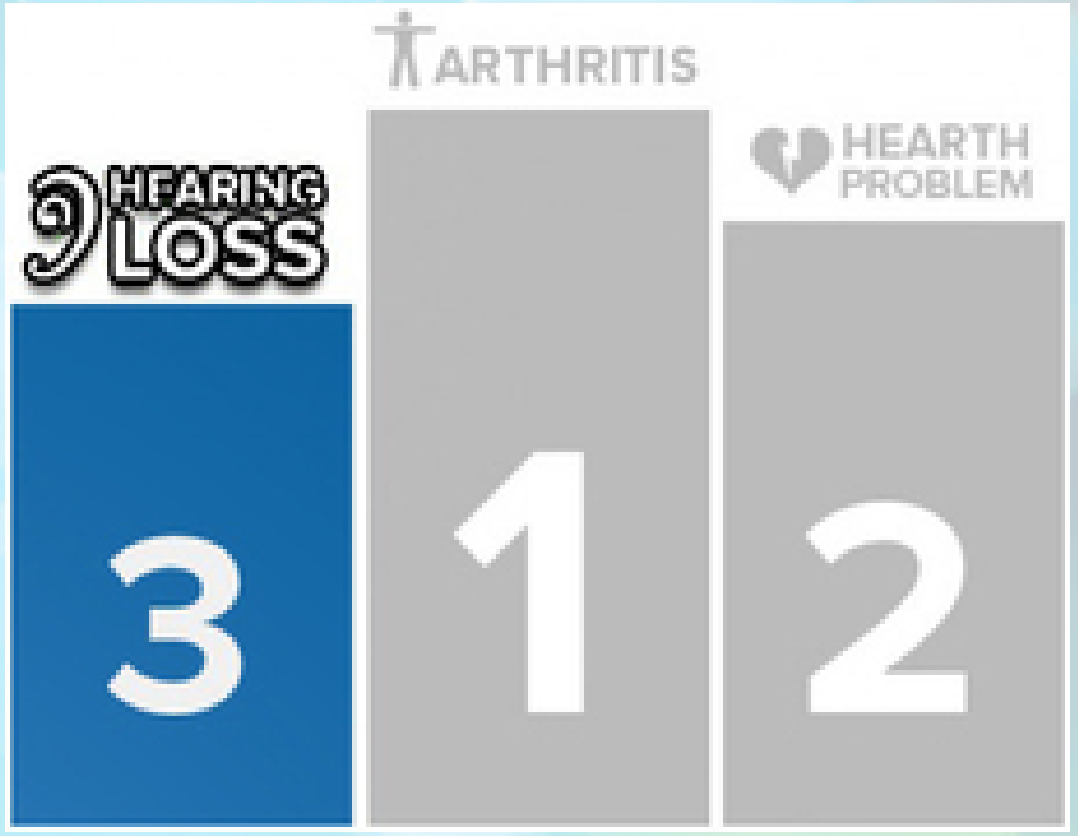
Public Information

Hearing loss is the **THIRD MOST** prevalent age-related disability following arthritis and hypertension suffered by adults 75+.





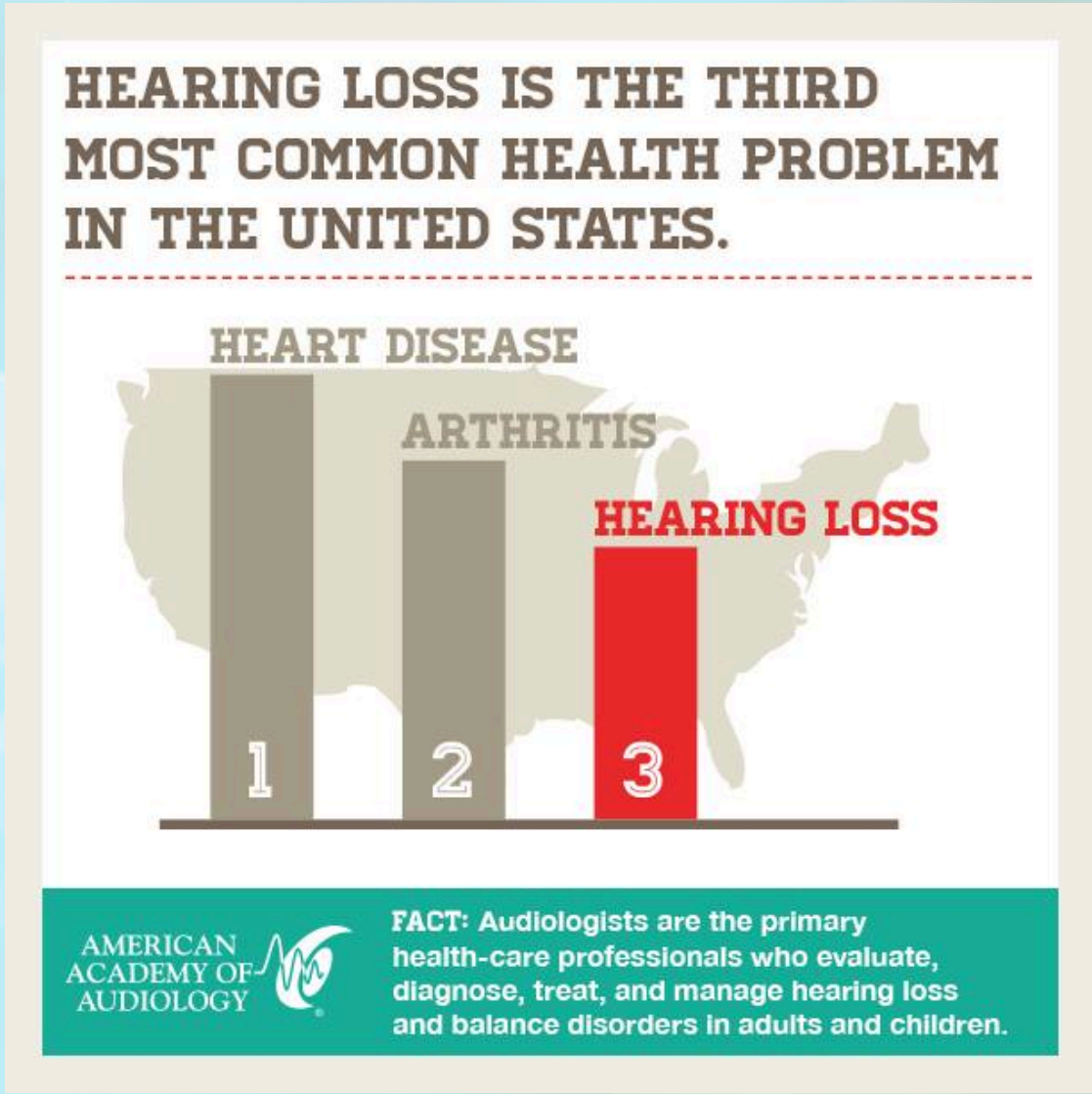
Public Misinformation

Hearing loss is a major public health issue.

It is the **third most common physical condition** after arthritis and heart disease.

Source: Hearing Loss Association of America

Starkey Hearing Technologies



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Question 5

According to the 1997 Collins report from the CDC, the third most prevalent chronic condition in the elderly is _____

A. Arthritis
B. Deafness and other hearing impairments
C. Heart Disease
D. High Blood Pressure

The Audiologist's Call-to-Action

- **Age-Related Hearing Loss and Communication Breakdown in the Clinical Setting**
- *JAMA Otolaryngol Head Neck Surg. Published online August 24, 2017.*
- *Cudmore, Henn, Colm, O'Tuathaigh, et al.*

- **Hearing Loss and Patient-Physician Communication**
  - *The Role of an Otolaryngologist*
- *JAMA Otolaryngol Head Neck Surg. Published online August 24, 2017.*
- *Weinreich*

The Audiologist's Call-to-Action

- 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

The Audiologist's Call-to-Action

- Failures in clinical communication are considered to be the leading cause of medical errors.[2]
- Walsh and colleagues[3] 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.

The Audiologist's Call-to-Action

- 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.

The Audiologist's Call-to-Action

- 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.

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

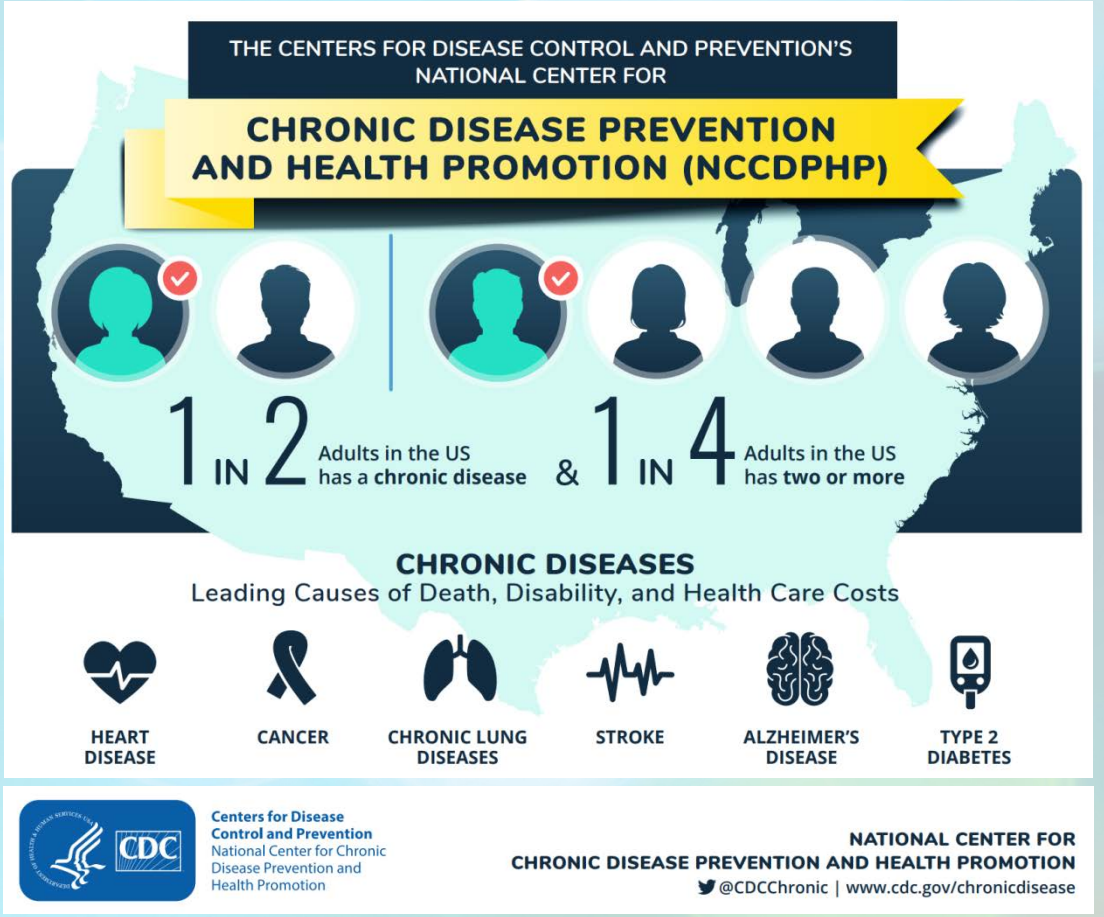
- RECOMMEND A FUNCTIONAL NEEDS ASSESSMENT

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*

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.

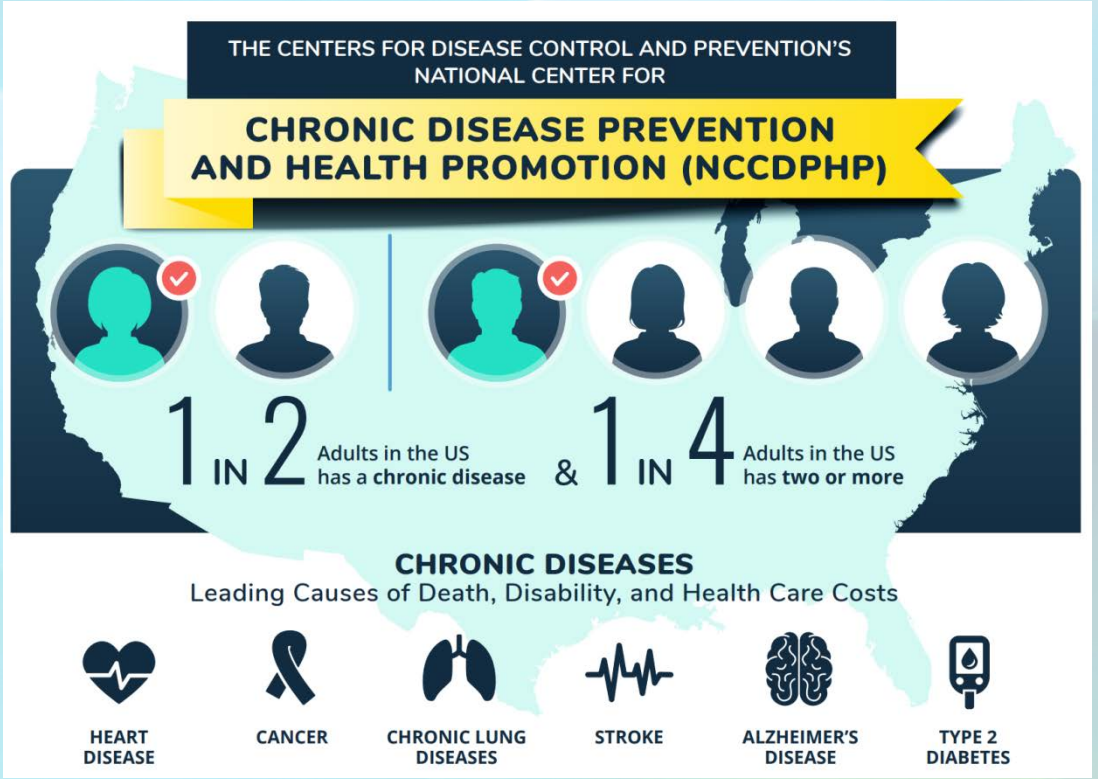


CDC – Chronic Disease Prevention

Chronic Diseases are the leading causes of

- death,
- disability, and
- health care costs

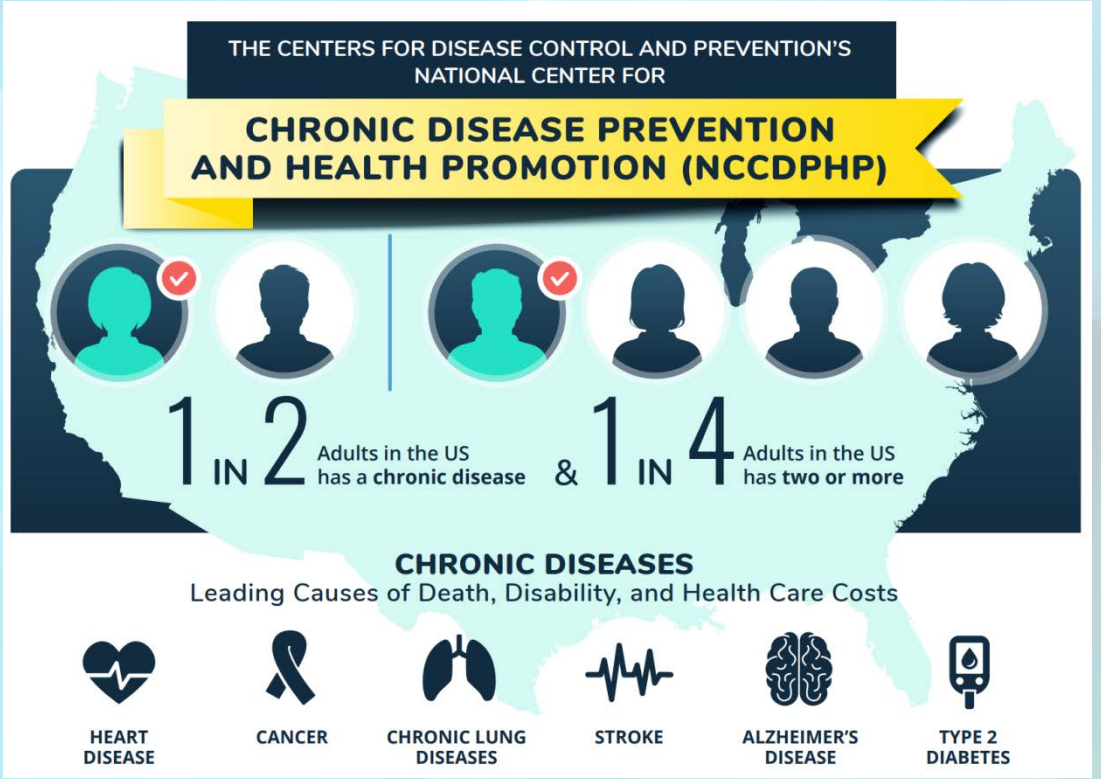
in the USA.



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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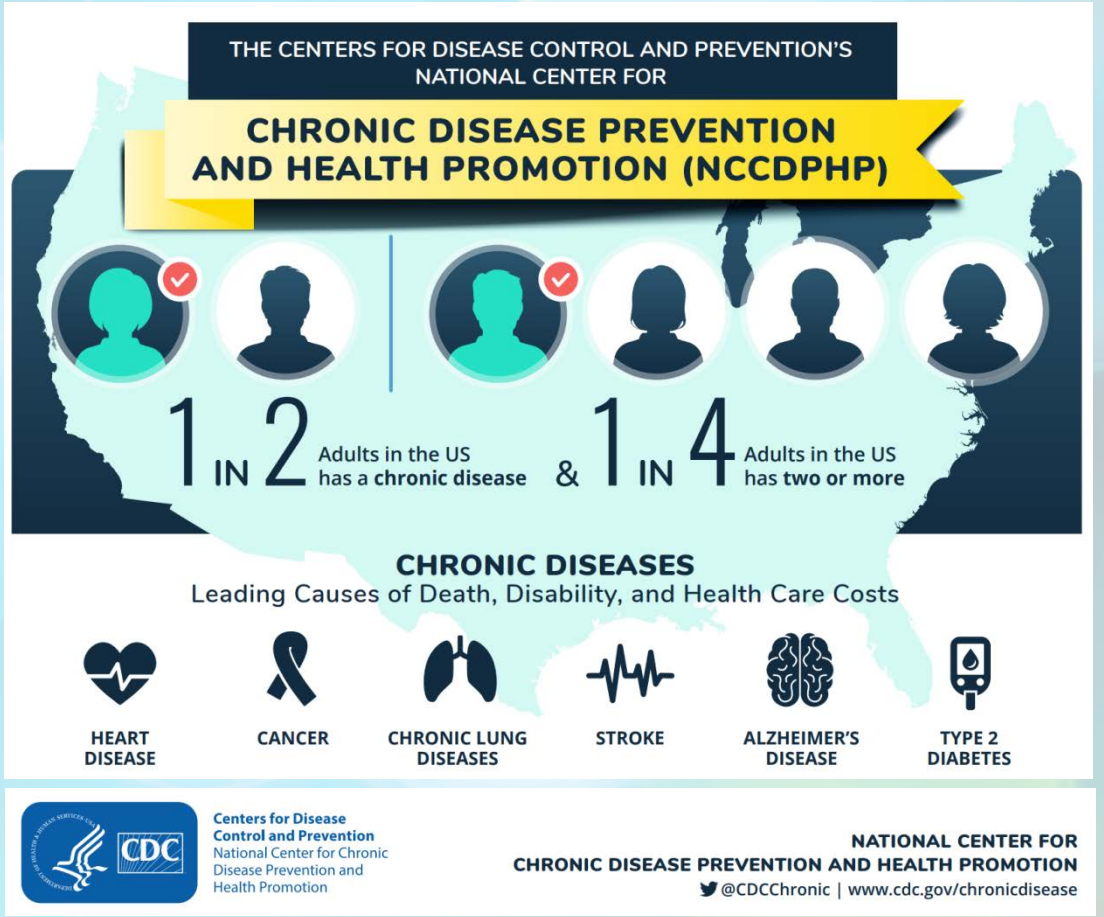
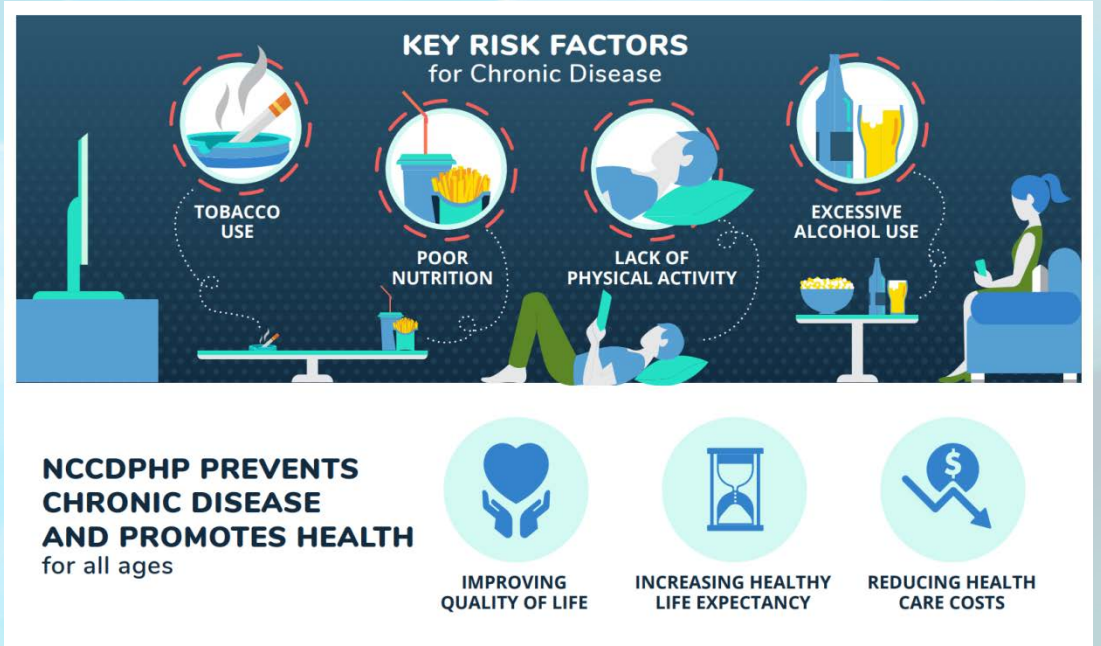


CDC – Chronic Disease Prevention

Prevent Chronic Disease

Promote Health & Wellness

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



CDC – Chronic Disease Prevention

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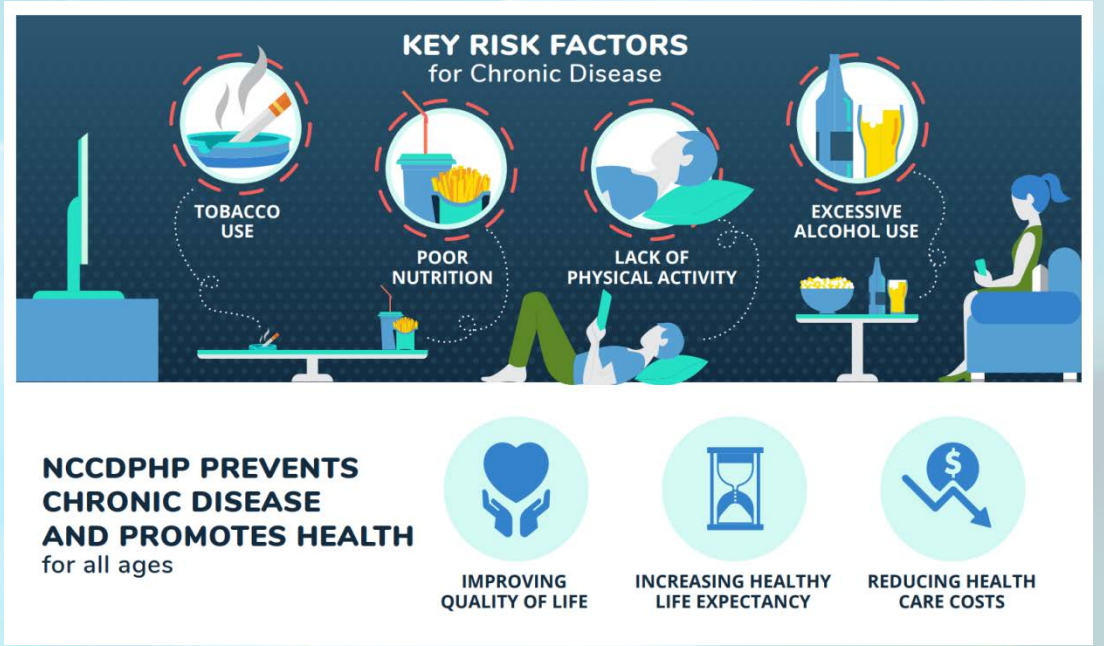
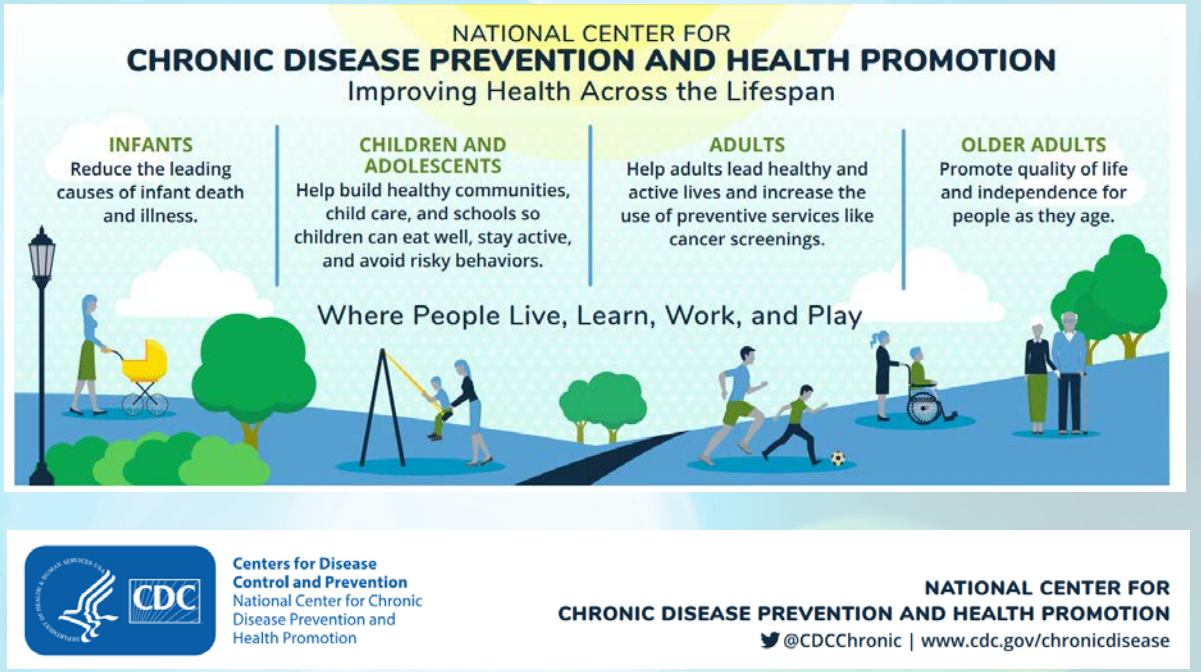


CDC – Chronic Disease Prevention

Older Adults

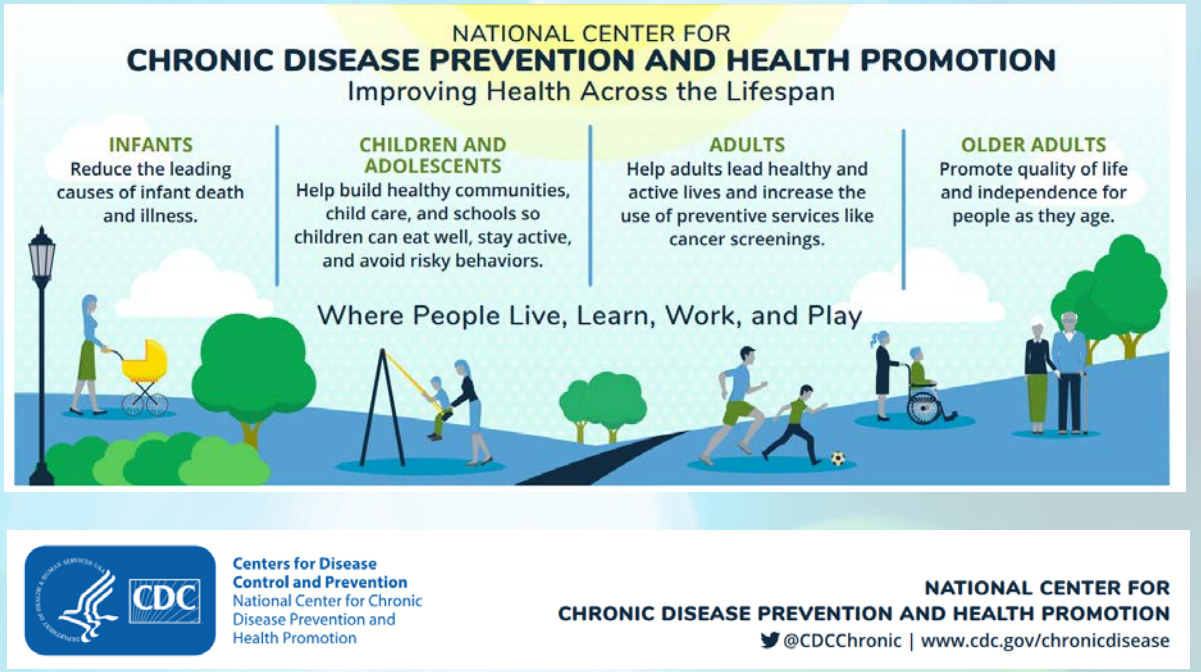
- Promote Quality of Life and Independence for People as They Age



CDC – Chronic Disease Prevention

Older Adults

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



Co-managing Comorbidities in Audiological Medicine

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27 September 2017

AuDACITY
Defy convention.

Co-managing Comorbidities in Audiological Medicine

27 September 2017, Academy of Doctors of Audiology

1. Comorbidity is the simultaneous presence of two or more _____ conditions or diseases in a patient.

    a. Audiologic
    b. Chronic
    c. Lethargic
    d. Pathologic
    e. Psychotic

2. Which of the following choices is not directly associated with heart health and disease?

    a. Cardiovascular Disease
    b. Cerebrovascular Disease
    c. Coronary Artery Disease
    d. Disease (Blood Vessel Disease)

3. Which of the following choices is not a neurotransmitter directly associated with mental health or disease?
    a. Calcium
    b. Dopamine
    c. Norepinephrine
    d. Serotonin

4. According to the 1997 Collins report from the CDC, the sixth most prevalent chronic condition is _____.
    a. Arthritis
    b. Asthma
    c. Bronchitis
    d. Deafness and other hearing impairments
    e. Dermatitis

5. According to the 1997 Collins report from the CDC, the third most prevalent chronic condition in the elderly is _____
    a. Arthritis
    b. Deafness and other hearing impairments
    c. Heart Disease
    d. High Blood Pressure

Invited Commentary

Hearing Loss and Patient-Physician Communication: The Role of an Otolaryngologist

Communication is essential in the patient-physician relationship. A report published in 2001 by The Institute of Medicine[1] highlighted that effective communication is necessary for patient-centered care because it facilitates knowledge transfer and shared decision making. What impact does hearing loss have on communication and health? The work of Lin et al[2] and The Health ABC Study[3] have examined the long-term effects on health with the association with dementia and cognitive decline. But what about the short-term effects?

Related article

The Research Letter by Cudmore et al[4] in this issue of *JAMA Otolaryngology–Head and Neck Surgery* explores this issue. The study examines the impact of hearing loss by eliciting patient perspectives.

The study is a convenience sample of patients from an outpatient clinic. A semistructured interviewed obtained responses to questions. The responses were then coded by 2 investigators to perform a qualitative analysis, a method that has been described and validated.[5] This study provides insight into the patient's perspective and the impact of hearing loss. Almost 50% of patients with hearing loss report mishearing their nurses or physicians and age was not a factor. Patients are missing instructions. They are missing diagnoses. They are missing medication information. When a health care provider speaks too quickly or quietly and/or background noise is present, patients with hearing loss will miss messages from physicians and nurses even if they are using the right language.

A limitation of the study by Cudmore et al[4] is that only 50% of patients underwent audiological testing, and the remaining self-reported a hearing loss. However, the hearing loss prevalence in this sample is similar to published age cohorts. The study[4] also does not make the association of hearing loss with medical errors. However, this Research Letter[4] is a call to examine the immediate effects of hearing loss on patient health knowing we have a breakdown in communication. Does this miscommunication lead to medical errors, repeated visits and/or testing, failure to complete treatment plans, or delays in care?

Although performed in Ireland, the perspective is applicable to US readers. By sheer numbers, miscommunication resulting from hearing loss has the potential to be public health issue. Lin et al[6] estimated that approximately 30 million individuals in the United States older than 12 years have bilateral hearing loss, and this prevalence increases with age, starting with 27% in patients age 60 to 69 years and rising to almost 80% in patients 80 years or older.[6] With the aging baby boomer population, a greater percentage of patients are older. The US Census Bureau estimates that by 2030, more than 20% of US residents are projected to be 65 years and older.[7]

The Research Letter by Cudmore et al[4] highlights that the medical community needs to know if their patients have hearing loss; we need to change how we communicate with hearing loss patients; and we need to do something about the hearing loss.

First, medical professionals, as well as patients, need to recognize that hearing loss is a problem and look for it. The US government supports the Healthy People 2020 initiative and has a mission to increase the proportion of adults who receive hearing examinations. However, access to hearing evaluations is limited. In one study,[8] about 50% adults aged 70 years had not had their hearing tested within 5 years, and it has been suggested that regular access to health care could potentially allow for greater access to health evaluations.[9]

Second, we need to change our communication style, and this may include addressing reimbursement. In a delivery model where seeing more patients in less time while facing a computer screen is the norm, we are compromising communication, especially among patients with hearing loss. Hearing loss is associated with poorer ratings of patient-physician communication and health care quality. Using data from Medical Expenditure Panel Survey Household Component and Consumer Assessment of Healthcare Providers and Systems, Mick et al[10] found that individuals with hearing loss had approximately 10% lower odds of having favorable ratings of their patient-physician communication and approximately 6% lower odds of having favorable ratings of their health care experiences than individuals with normal hearing.[10] The Research Letter by Cudmore et al[4] provides evidence for speculations that this effect on quality may be from poor understanding especially in the context of noisy environments. With the Medicare Access and Children's Health Insurance Program Reauthorization Act pushing for quality payments while health systems push for quantity of patients, health care providers and patients are stuck in the middle.

Third, we need to intervene to help patients hear well. Speaking louder, slowing down, typing and/or writing for clarity when necessary, taking time with patients, or providing temporary amplification may be methods. On a global scale, supporting legislation for hearing device coverage, opening doors to alternative hearing devices, and pushing for standardization of technology like personal sound amplifiers are methods.

As Cudmore et al[4] state, otolaryngologists are in a unique position. Like me, many of you sit in an examination room with a hearing test before you and change how you communicate with your patient. Along with our audiology colleagues, otolaryngologists can provide the voice to make our patients, medical colleagues, policy makers, and payers recognize that hearing loss is not just an inconvenience we accept as we age. There are potential immediate short-term and long-term impacts of miscommunication with patient. We need more research into the medical errors and costs caused by hearing loss and to examine methods to provide effective communication so as to deliver high-quality patient-centered care.

Heather M. Weinreich, MD, MPH

Letters

RESEARCH LETTER

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

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] Failures in clinical communication are considered to be the leading cause of medical errors.[2] Walsh and colleagues[3] 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. 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 semistructured interview data collected in 100 older adults 60 years and older. 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.

Invited Commentary

Table 1. Overview of the Study Population

Characteristic	Age Groups, y			
	Total	60-69	70-79	≥80
Total, No. (% female)	100 (39)	35 (34)	38 (37)	27 (48)
Age, mean (SEM), y	73 (0.9)	64 (0.5)	75 (0.4)	84 (0.7)
Hearing loss type, No.				
Unilateral	21	6	8	7
Bilateral	36	9	15	12
No hearing loss	43	20	15	8
Previous noisy work environment, No.	43	17	17	9

Abbreviation: SEM, standard error of mean.

Methods | A convenience sample of participants were enrolled from the outpatients department at Cork University Hospital. Informed consent (oral) was obtained, exclusion criteria included cognitive impairment and lack of spoken English. Two authors independently reviewed the responses, coding all comments and developing an initial thematic framework. This study was approved by the Cork Clinical Research Ethics Committee.

Results | Of 100 older adults interviewed, 57 reported some degree of hearing loss, with higher rates of unilateral and bilateral loss reported by adults 80 years or older relative to

Table 2. Response Theme, Example, and Frequency of Common Words 59 Patients With Hearing Loss Misheard

Theme	Example of Patient Comment	No. (%)
Consultation content		
Occasions when problems of mishearing and/or misinterpretation are focused on illness-related or treatment-related information (eg, diagnosis, prognosis, medication dose/regimen)	"I suppose when the doctors are speaking, you know, they have their own words and you'd have to ask." "I think definitions of illness…" "Instructions they're giving me…" "Just explaining your condition or even medication…"	21 (36)
Nonspecific and/or unlimited		
Occasions when problems of mishearing are not limited to a discrete aspect of the consultation	"…you can't bring it down to one word at all, like, you know, like, it's general." "I wouldn't hear a whole sentence sometimes maybe." "I probably miss half of what he says to me."	17 (29)
Doctor-patient or nurse-patient communication breakdown		
Occasions when problems of mishearing and/or misinterpretation are attributed to difficulties in verbal or non-verbal communication between the physician/nurse and the patient	"Some people talk so fast you'd miss what they're saying…" "…if there's 2 or 3 people talking together…" "…it depends on how loud or how low he talks to you." "If you're talking to me, look at me."	16 (27)
Use of language		
Occasions when problems of mishearing are language-dependent	"It depends on how one pronounces things." "Similar sounding words would be the ones that would catch you."	6 (10)
Selective deafness		
Occasions when problems of mishearing are deliberate or intentional	"You're not listening to what you don't want to hear."	4 (7)
Occasions of hospital setting-specific mishearing	"…if there's a bit of noise around I can't hear." "…if there's a bit of noise around, you know?"	2 (3.5)

all other groups (**Table 1**); 50% of the study population had previously undergone audiometric testing, and 26% used a hearing aid device. Forty-three adults reported having misheard a physician and/or nurse in a primary care or hospital setting, and frequency of reported mishearing did not vary according to age group. When asked to elaborate on context of mishearing in a clinical setting, emergent themes consisted of (in descending order of citation frequency): general mishearing, consultation content, physician-patient or nurse-patient communication breakdown, hospital setting, and use of language (**Table 2**).

Discussion | The prevalence of reported hearing loss our sample population is comparable with expected estimates from similar age cohorts. This qualitative analysis confirms that age-related hearing loss has a negative effect on clinical communication across both hospital and primary care clinical settings. A recent report of the National Academies of Sciences, Engineering, and Medicine, acknowledged that hearing aids improve hearing acuity but are limited in their capacity to "…restore normal hearing or fully improve communication abilities especially in noise."[5] The latter point was highlighted in the present study, as well as a recent report[6] that demonstrated that both phonemic contrast and contextual factors can contribute to miscommunication in clinical settings in adults with moderate and severe hearing impairment. Otolaryngologists are in a strong position to understand and address the needs of older patients with hearing impairments, recognizing that the circumstances of medical conversations vary widely not only in relation to environmental background noise but also the attendant pain and fear and distress of illness or injury, lack of familiarity with medication names, diagnoses, and the other essential components of medical discourse. Few of these elements are part of routine audiometric assessment. We recommend that content-related and setting-related factors identified as barriers to communication in adults with hearing impairment be incorporated within a patient-centered approach to clinical communication with this patient population.

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Study concept and design: All authors.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: All authors.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Cudmore, Henn, O'Tuathaigh.
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Administrative, technical, or material support: Cudmore, O'Tuathaigh, Smith.
Study supervision: Cudmore, O'Tuathaigh.

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