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- Email customerservice@AudiologyOnline.com

ONLINE CONTINUING EDUCATION FOR THE LIFE OF YOUR CAREER

Comorbidities, Part 1

Victor Bray

Part 1 Learning Outcomes

2

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

Part 2 Learning Outcomes

4

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

Key Words for the Webinars …

Chronic

Comorbid

Co-management

Communications

6

CONTINUED SALUS UNIVERSITY Osborne College of Audiology

AN INTRODUCTION TO COMORBID CHRONIC DISEASES ENCOUNTERED IN THE PRACTICE OF AUDIOLOGY

Bray, *Audiology Practices*, October 2018

Bray (2018) Audiology Practices

7

CONTINUED SALUS UNIVERSITY Osborne College of Audiology

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.

8

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.
- Audiologists must begin to think of audio-vestibular disorders as chronic diseases which can contribute to comorbidity effects in patients.

9

Define Co-management (medical, formal)

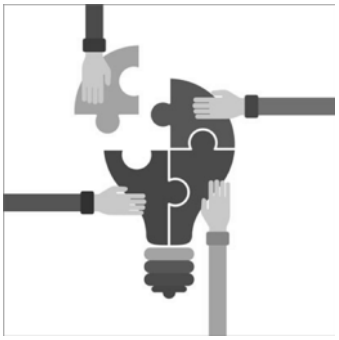
- Co-management is a hospital/physician alignment strategy to elevate hospital service line performance.
- A co-management arrangement is an organized and formal mechanism to actively engage a group of physicians to achieve greater operational efficiencies and improved patient care outcomes.
- The goal 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

10

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"



11

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

12

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 …"

Audiology Patient Choice Act

- No changes planned in audiology 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,*
  - *We are not a danger to patient safety*

13

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

14

20 Tracked Chronic Diseases (OASH)

Office of the Assistant Secretary for Health

- Blood
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  - *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***

15

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

16

Top 10 Chronic Conditions in Adults 65+

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National Council on Aging, NCOA Blog, February 2017

17

Chronic Disease Lists

- Arthritis
- Brain Diseases
- Cancer
- Chronic Kidney Disease
- Diabetes Mellitus
- Heart Disease
- Hypertension
- Hyperlipidemia
- Lung Disease
- Neurological Disorders
- Obesity
- Osteoporosis
- Tooth Decay

Sources: CDC, CMS, WHO

18

Chronic Disease Lists

- Arthritis
- Brain Diseases
- Cancer
- Chronic Kidney Disease
- Diabetes Mellitus
- Heart Disease
- Hypertension
- Hyperlipidemia
- Lung Disease
- Neurological Disorders
- Obesity
- Osteoporosis
- Tooth Decay

Sources: CDC, CMS, WHO

19

Comorbid Conditions Related to Hearing Loss

Physiological Conditions	Psychosocial Consequences
▪ Anemia	▪ Alzheimer's Disease*
▪ Arthritis	▪ Cognitive Decline*
▪ Cardiovascular Disease	▪ Communication Disorders
▪ Diabetes	▪ Dementia*
▪ Kidney Disease	▪ Depression
▪ Thyroid Disease	▪ Quality of Life
▪ Vascular Disease	▪ Social Isolation

20

Comorbidity Co-management Team

Physiological Conditions	Psychosocial Consequences
▪ Audiologists	▪ Audiologists
▪ Cardiologists	▪ Gerontologists
▪ Endocrinologists	▪ Neuropsychologists
▪ Gerontologists	▪ Primary Care Physicians
▪ Nephrologists	▪ Psychiatrists
▪ Neuropsychologists	▪ Psychologists
▪ Primary Care Physicians	

Physicians, Nurse Practitioners, Physician Assistants

21

Understanding Odds Ratio (OR)

- 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 with exposure, compared to the odds of the outcome occurring without exposure.
- ORs compare the relative odds of the disease or disorder, given exposure to the health characteristic or aspect of medical history.
- The OR 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/

22

Illnesses and Diseases (Webinar)

- Anemia
- Cardiovascular Disease
  - ✓ Coronary Artery Disease
  - ✓ Heart Disease
  - ✓ Vascular Disease
- Diabetes
- Fibromyalgia
- Kidney Disease
- Rheumatoid Arthritis
- Thyroid Disease
- Cognitive Decline
  - ✓ Alzheimer's Disease
  - ✓ Dementia
- Psychosocial
  - ✓ Anxiety
  - ✓ Depression
  - ✓ Loneliness

23

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.

24

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.

25

CO-MANAGEMENT OF COMORBID, CHRONIC DISEASES IN THE AUDIOLOGY PATIENT

Bray, *Audiology Practices*, January 2019

26

Macrovascular Disease

- Cerebrovascular (brain)
- Coronary (heart)
- Peripheral Artery Disease (limbs)
- Ischemic heart disease
  - Angina and death
- Ischemic brain disease
  - Stroke and dementia

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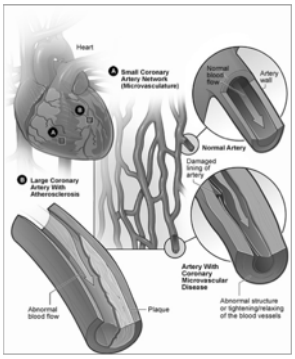
27

Microvascular Disease



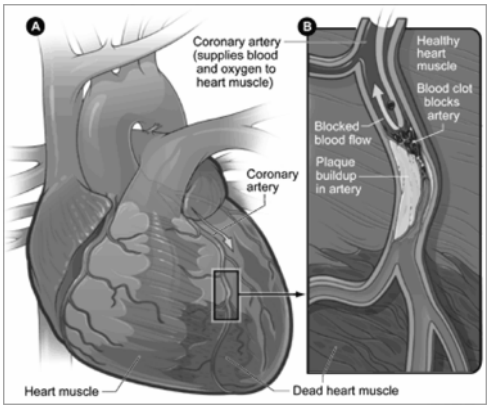
https://www.nhlbi.nih.gov/health-topics/coronary-microvascular-disease

- Atrial fibrillation
- Diabetes
- Hyperlipidemia
- Hypertension
- Ischemic heart disease
- Ischemic brain disease

28

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.

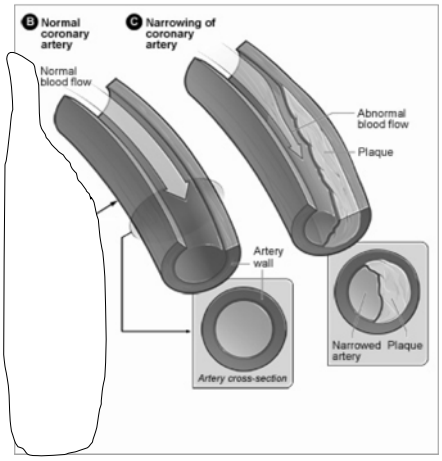


Attribution: NIH: National Heart, Lung and Blood Institute [Public domain], via Wikimedia Commons

29

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.



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30

Hearing Loss & Heart Disease

- 1988: Hearing loss and ischemic heart disease.
- 1993: The relation of hearing in the elderly to the presence of cardiovascular disease and cardiovascular risk factors.
- 2009: Audiometric pattern as a predictor of cardiovascular status: development of a model for assessment of risk.
- 2012: The Ear is a Window to the Heart: A Modest Argument for a Closer Integration of Medical Disciplines.

31

Hearing Loss & Heart Disease

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

- 103 patients with ischemic heart disease (IHD) were compared with 29 patients with organic heart disease and normal coronary arteries (OHD).
- HL always preceded the clinical manifestation of IHD and appears to be an important "early marker" of a vascular or generalized arteriosclerotic process.

32

Hearing Loss & Heart Disease

- The relation of hearing in the elderly to the presence of cardiovascular disease and cardiovascular risk factors.
- *Archives of Otolaryngology Head and Neck Surgery, 1993; 119:156-161.*
- *Gates, Cobb, D'Agostino & Wolf.*

- 1662 elderly men and women with 30-year history of cardiovascular disease.
- Low-frequency hearing (loss) was related to cardiovascular disease, more in men than women.
- Odds Ratio
  - ✓ F LF 40 dB HL & CVD = 3.06
  - ✓ M LF 40 dB HL & Stroke = 3.46

33

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.

34

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

35

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.

36

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 [audiology^{VB}] 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 [audiology^{VB}] 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.

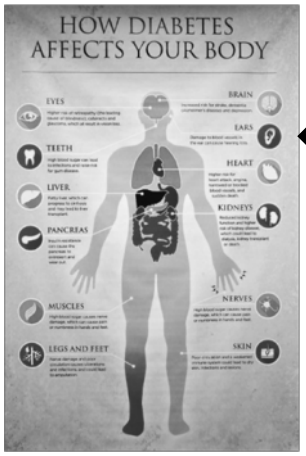
The Ear is a Window to the Heart:
A Modest Argument for a Closer Integration of Medical Disciplines

37

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"



https://fenfuro.com

38

Diabetes

- Diabetes is a lifelong disease.
- 18 million Americans diabetes.
- 5 million are unaware.
- 41 million people pre-diabetes.
- Disease management is critical to stay in good health.

39

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.

40

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

41

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.
- 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.

42

Hearing Loss & Diabetes

- Data Synthesis: Data were obtained from 13 eligible studies (20,194 participants and 7,377 cases).
- Overall pooled OR of hearing impairment for diabetic participants compared with nondiabetic participants was 2.15.
- OR was higher in younger participants (≤60)than in those over 60 yr among which the OR remained significant (2.61 and 1.58).

- Conclusions: Current meta-analysis suggests that the higher prevalence of hearing impairment in diabetic patients compared with nondiabetic patients was consistent regardless of age.

Diabetes and risk of hearing impairment in adults: a meta-analysis.

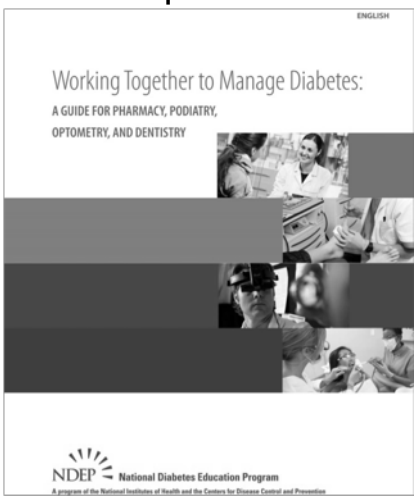
43

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.

44

Example of Co-management



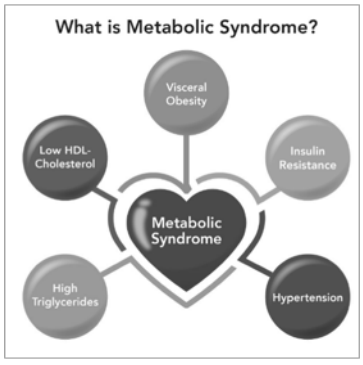
- Diabetes Management
- CDC PPOD
  - Pharmacy
  - Podiatry
  - Optometry
  - Dentistry

https://www.cdc.gov/diabetes/ndep/toolkits/ppod.html

45

Metabolic Syndrome

- Metabolic syndrome increases the risk of cardiovascular disease, ischemic brain disease, **diabetes** and other diseases related to hyperlipidemia.

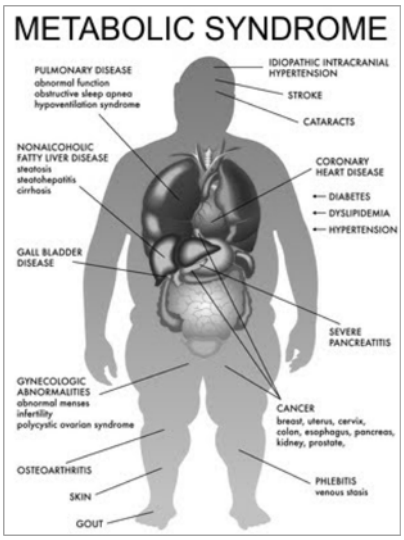


Cutting-edge epigenetics research reveals new genes linked to metabolic syndrome in humans

46

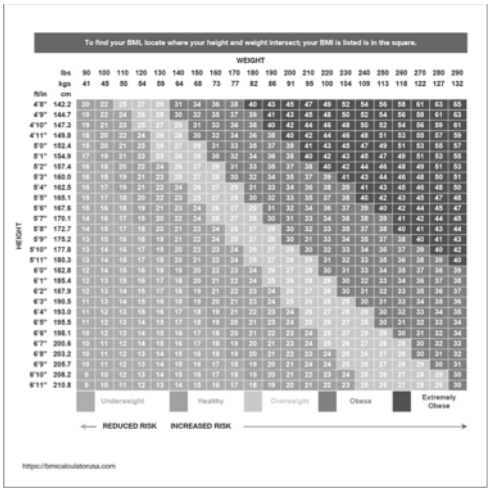
Metabolic Syndrome

- Causes of metabolic syndrome:
  - Overweight, obesity, physical inactivity
  - Genetic factors, age
- Metabolic syndrome has elevated odds ratio of comorbidities of vascular diseases, neurological disorders, and audio-vestibular disorders.



47

Body Mass Index (BMI)



< 19 Underweight

19 – 24 Healthy

25 – 29 Overweight

30 – 39 Obese

> 39 Extremely Obese

48

Takeway #1

- 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.
- The next 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, passage of the Audiology Patient Choice Act.*

49

Takeaway #2

- 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 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.
- *Understanding of this knowledge is becoming available to us today.*

50

Takeaway #3

- 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) which is the future of heath cares and a key component of audiology success as a profession.*

51

Takeaway #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.*
- *Stay tuned for Part 2 next week … where we will cover more chronic conditions and delve into cognitive decline and some psychosocial aspects of hearing loss.*

52