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- Email customerservice@AudiologyOnline.com
Audiology: Diabetes Hearing & Balance Care

Pathophysiology
Audiology Medical Management
Inter Professional Education and Collaboration

Dr. Kathy Dowd, AuD Executive Director
The Audiology Project

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- Dr. Dowd has no financial restrictions to disclose
Learning Outcomes

After this course, participants will be able to:

1) Describe the pathophysiology of diabetes on the cochlea and vestibular canals, neural systems and perception of hearing and balance.

2) Explain how audiology medical management will ensure the best patient outcomes for diabetes care.

3) Explain how to work toward interprofessional education and collaboration in their state and local venues for the inclusion of audiology in diabetes care.

What is happening in the body with diabetes

- Microangiopathy and Neural degeneration
- More susceptibility to infections
- Domino effect with other chronic diseases: CVD, CKD, etc.
- 9-12 years to identify diabetes or pre diabetes
Hearing loss is higher among individuals with diabetic retinopathy.

Weakened immunity with advancing age...

- Increase prevalence of chronic disease
- Ototoxic meds more common
- Risk of falls due to vision loss, neuropathy, vestibular issues
- Increased prevalence of hearing loss
Why is hearing loss not easily detected?

- Anosognosia is a confounding factor:
  - Patient’s lack of awareness, signs and symptoms of an illness. It’s not merely a denial: it’s an actual neurological deficit.
  - Wikipedia: a deficit of self-awareness, a condition in which a person who suffers some disability, seems unaware of his or her disability
  - ‘Denial of illness’ by the patient

Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

1990- CDC Division of Diabetes Translation (DDT): Prevalence of diabetes reaches 4.9%
1993- DDT Translation Advisory Committee (TAC)

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

1995

CDC's Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data

1996

CDC's Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

1997

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data

1998

1998- Prevalence of diabetes 6.5% - an increase of +33% from 1990

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

1999

Missing data
4.5%–5.9%
7.5%–8.9%
≥9.0%

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data

Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

2000

Missing data
4.5%–5.9%
7.5%–8.9%
≥9.0%

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data

2001

2002

CDC's Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

2003

Missing data 4.5%–5.9% 6.0%–7.4% ≥9.0%

7.5%–8.9%

2004

Missing data 4.5%–5.9% 6.0%–7.4% ≥9.0%

7.5%–8.9%

CDC's Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

2005

CDC's Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data

Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

2006

CDC's Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

2007

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CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data

2008

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Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

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CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

2011

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data

2012

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

2013

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data

2014

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data
Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults

2015

CDC’s Division of Diabetes Translation. United States Surveillance System available at http://www.cdc.gov/diabetes/data

Diabetes & Hearing Loss

High blood glucose levels associated with diabetes cause damage to the small blood vessels in the inner ear (microangiopathy), similar to the way in which diabetes can damage the eyes and the kidneys.

Figure 1: The Outer, Middle, and Inner Ear
Why balance is important in diabetes care

- Poor balance contributes to fall risk and fear of falling
- Risk of falls contributes to lack of exercise and falling leads to potential bone fractures
- Risk of falls impedes diabetes care
Fall risk: where does vestibular impact occur

The American Diabetes Association lists bone fractures as a comorbid condition of diabetes, without mentioning fall risk.

Chromically high blood sugar levels damage nerves not only in your extremities but also in other parts of your body. These damaged nerves cannot effectively carry messages between the brain and other parts of the body.

**BALANCE PARAMETERS** include

- vision loss
- loss of sensation in feet
- vestibular disruption
Hearing and balance systems pathophysiology

- Inner Ear
  - Microvascular Damage
  - Macrovascular Damage

- Auditory Pathways
  - Auditory Degeneration
  - Vestibular Degeneration

- Brain
  - Temporal Lobe
  - Auditory Cortex

Rx for neuropathy, infections, other diseases = oto-vestibulo toxicity

- Pain Meds
  - Salicylates, NSAIDS

- Infection Control Meds
  - Aminoglycoside Antibiotics

- Loop Inhibiting Diuretics
  - Lasix, Furosemide

- Chemotherapy
  - Cisplatin 30%, carboplatin 12%
Audiology medical management of hearing loss

- Baseline hearing test at time of diabetes diagnosis
- No hearing loss on pure tone audiogram: may indicate need for otoacoustic emissions or speech in noise for *hidden hearing loss*
- Case history is critical to know all factors influencing potential hearing loss
- Recommendations to MD on report set rationale for future monitoring program
- ALWAYS refer for diabetes education!!

Audiology Management

- Medications
- Chronic diseases
- Hospitalizations
- Trauma/accidents
- Noise exposure
- Complaints of hearing or balance issues

Case History
Audiology Management

- Pure Tone audiogram
- Speech discrimination
- Speech in noise
- OAEs
- Balance screening

Balance Screening

☐ Have you fallen in the past few months?

☐ Do you have a fear of falling?

☐ Vision problems? Neuropathy?
Audiology medical management of balance

Balance Testing

- VNG test battery: includes ocular motility, positional testing/BPPV, and caloric testing
- cVEMP, oVEMP, rotary chair, vHIT, posturography
- Foot neuropathy

Recommend

- Retest hearing in ___ years due to _________
- Refer for diabetes education
- Amplification
- Refer to Fall Prevention clinic
Working together to manage diabetes:

- Give consistent diabetes messages. Recognize early danger signs. Promote the team approach to care. Integrated, comprehensive care benefits everyone involved—
  - pharmacy, podiatry, optometry, dental and audiology

Pharmacy:
Are your patients taking their meds?

In the US 15% of prescriptions are never filled

50% of patients stop their Rx regimen within 6 months
Podiatry and Foot Care

Neuropathy and Diabetes

- More than 60% of non-traumatic lower-limb amputations occur in people with diabetes.
- Patients with diabetes are 15-26 times more likely to have an amputation than patients without diabetes.
- Up to 20% of diabetes patients who participate in routine foot care will have a treatable foot care problem.

Vision Health

Key Questions to Ask Your Patients About Eye Health

Patients should be referred to an optometrist if the answers to these questions are “no” or “unsure”:

- Do you get a full eye exam with dilated pupils at least once a year?
- Do you know how diabetes can affect your eyes?
- Do you know what to do if you have vision changes?
Dentistry and Oral Health

Oral Health and Diabetes

- 85% of patients with type 2 diabetes report that they have received no information on the association between diabetes and oral health.
- Periodontal disease has been associated with poor glycemic control.
- Tobacco use and poor nutrition are risk factors for compromised oral health.

Audiology and PPOD

- Align with Pharmacy for oto-vestibular toxicity monitoring
- Collaborate with Podiatry for better foot care and balance
- Ensure Optometry evaluation for lower risk of falls
- Counsel patients to see the dentist several times a year
- Ongoing IPE and IPC with other professions
Family and Internal Medicine

Consequences of Hearing Loss

- Asks for repetition
- Brings 3rd party interpreter
- Associated with cognitive decline and depression
  - Social isolation
  - Stress
  - Confusion

Medical Management

- Misses verbal instructions
- Noncompliance
- Worse patient outcomes

Hearing screening will start the process
Educate about Audiology

Audiology Scope of Practice

- Audiology evaluation & management of hearing
- Balance screening and evaluation
- Treatment of hearing loss and balance problems
- Counseling for social, job and personal
- Tinnitus, cochlear implants, pediatric specialties

How to Advocate for Audiology in this Emerging Issue

- Join The Audiology Project state cohorts: [https://www.theaudiologyproject.com/contact](https://www.theaudiologyproject.com/contact)
- Reach out to national, state and local level agencies and groups to educate medical professional. Offer to present to their group councils
- Align with PPOD professional organizations to host meetings for interprofessional education and collaboration
- Diabetes Educators (CDE) are the linchpin of diabetes care: CONNECT with a CDE close to your clinic. Offer to present to their groups or screen hearing.
Educate yourself about diabetes

Learn the ABCs of diabetes

A1c
Blood pressure
Cholesterol control
Stop smoking!!

References

- Seminars in Hearing Issue 04 · Volume 40 · November 2019
- Research articles
  https://www.theaudiologyproject.com/education-materials
- Hearing screening app
  https://www.theaudiologyproject.com/hearscreenusa