




Kathy Dowd
 Med. AuD
 Clinical Audiologist
 Executive Director
 The Audiology Project
 Charlotte NC 28209

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Joanne Rinker
 MS, RN, LD, CDE, FFADE
 Registered Dietitian
 Director of Practice and Content Development
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**Diabetes Ear Disease:
 Hearing Loss And Risk of Falls**

Kathryn Dowd, AuD, Executive Director
 The Audiology Project
 Joanne Rinker MS, RD, CDE, LDN, FFADE
 American Association of Diabetes Educators

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Presentation Overview

- Diabetes and Audiology Disorders
 - Pathophysiology of diabetes
 - Comorbidity with hearing, balance, cognitive disorders
- Identification and Referral of Patients
- Audiology Evaluation, Diagnosis, Treatment
- Co-management of the Patient
 - Understanding & managing "diabetic ear disease"

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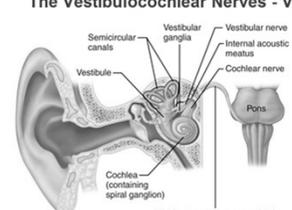
Diabetes and Hearing Loss

- Top health concerns
- 29.1 Million with Diabetes which is 9.3% of the population (2014 data)
- 48 Million (about 20% of population) with Hearing Loss
- According to ADA hearing loss is twice as common in people with diabetes
- Hearing loss 30% higher in those with pre-diabetes.

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Hearing and Balance Sensory Organs

The Vestibulocochlear Nerves - VIII



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Why Diabetes and Hearing Loss? (2011 Survey)

- Unknown complication (49% aware of the relationship between diabetes and hearing loss)
- 95% rarely or never refer patients for hearing screening
- 98% do not use any hearing screening tools
- Referral networks: 28% indicated good network; 10% indicated excellent

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Why Diabetes and Hearing Loss? (2017 Survey)

- **Known complication: 95% are aware**
- 76% rarely or never refer patients for hearing screening
- 96% do not use any hearing screening tools
- Referral networks are improving: 35% indicated good network; 7% indicated excellent

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Pathophysiology of Diabetes

- Diabetes is a number of diseases that involve problems with the hormone **insulin**.
- There is **no cure** for diabetes; people with diabetes need to manage their disease to stay healthy.
- **Blood sugar control** is at the center of any diabetes treatment plan.



Future diagrams will include ears!

- High blood sugar, or **hyperglycemia**, is a major concern and can affect people with Type 1 and Type 2 diabetes.
- People with diabetes get **hypoglycemia** (low blood sugar) when their bodies don't have enough sugar to use as fuel.

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Hearing and Balance

IDDM/NIDDM Common Pathophysiology

Cochlea

Vestibula

8th Nerve

Brain

- Microangiopathy
- Blood glucose effects

- Hearing degeneration
- Vestibular degeneration

- Microvascular effects on auditory cortex

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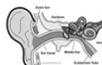
Similarities with Diabetic Eye Disease



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Diabetes and Hearing Disorders

- **Hearing impairment**
 - Outer ear
 - Middle ear
 - Inner ear
 - Auditory brain



- Other issues with hearing loss:
 - Reduced **sensitivity** to sound
 - Reduced **clarity** of words
 - Reduced **communication**
 - Impairs **social life**
 - Impairs **medical management**

* Pathophysiology that causes diabetes can also cause **progressive and permanent hearing loss**.

- Hearing loss in the inner ear has **no cure**, but can be treated with amplification and rehabilitation.



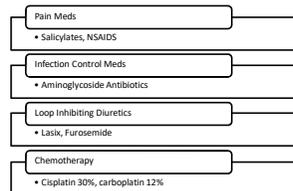
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Factors Affecting the Auditory System

- History of excess noise exposure
- Ototoxic medications (aminoglycoside) antibiotics, diuretics (Lasix, furosemide) salicylates (aspirin, acetaminophen), chemotherapy, quinine
- Otologic disease
- Cardio Vascular Disease
- Chronic Kidney Disease
- Hypothyroidism
- Diseases affecting Central Nervous System
 - Alzheimer's

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Medications: Ototoxic and Vestibulotoxic



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Diabetes and Vestibular Disorders

- **Vestibular impairment** can result from problems in the inner ear or the central vestibular system.
- The pathophysiology that causes diabetes can also cause **vestibular disorders**.
- Some vestibular problems can be resolved with **physical therapy**; the impact of other vestibular disorders can be reduced through **medication**.
- **Reduced ability** to freely move about the environment without assistance of some kind.
- Impact **worsened** by the diabetic impact on contributors to balance system:
 - vision & proprioception
- Increased **fall risk** with subsequent injuries such as bone fractures.
- Also associated with decline of **mental health**



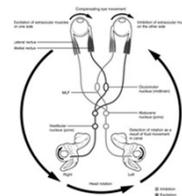
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Vestibular Symptoms

Vestibulo-Ocular Reflex (VOR)

Eyes and Ears are Connected!

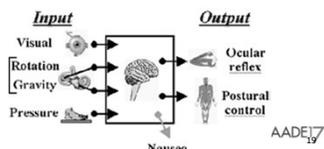
- **Nystagmus** is an involuntary, rapid and repetitive movement of the eyes
- Usually the movement is **side-to-side**, but it can also be up and down or circular
- Presence of nystagmus is reason for **referral** of the diabetic patient



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Vestibular: Balance, Risk of Falls

- **Inability to stand or walk**, unsupported, with eyes-open or eyes-closed can be a sign of a vestibular disorder and reason for **referral** of the patient.



Audiology Disorders and Diabetes

- Auditory System Complications
 - NHANES: 30% with diabetes = increased **hearing loss**
 - Skilled Nursing Facilities: 80% of residents have hearing loss
 - 27% of diabetes medications = side-effects on **hearing/tinnitus**
- Balance System Complications
 - AIB: 70% with diabetes = increased **vestibular disorders**
 - Comorbidity with retinopathy and neuropathy increase 'falls risk'
 - 81% of diabetes medications = side-effects on **balance**
- Cognitive System Complications
 - **Co-morbid** with auditory and vestibular disorders and medications
 - 61% of diabetes medications = side-effects on **cognition**.

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Relationship Between Diabetes and Hearing Loss

Factors increasing risks of hearing loss for the diabetes patient.

- Age (>60 years of age increases the prevalence)
- Duration of diabetes
- Diabetes is associated with hearing loss and could aggravate the hearing loss related to age.
- Increased BMI

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Case Study

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Question:
Who should refer for a hearing and balance evaluation with the audiologist?

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Making Referrals

- Referrals
 - Establish baseline hearing test/balance function
 - Audiologists require physician orders with medical necessity indicated
 - Orders are valid if from MD, DO, OD, NP, PA, Podiatrist, Clinical social worker
- Referrals are easier: no training, no office time for little or no compensation, qualified report with recommendations
- What to expect from referrals?
 - Reports and recommendations
 - Possible treatment plan

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Who Can Sign Orders for Audiology?

AUDIOLOGY REQUIRES A PHYSICIAN ORDER FOR TESTING/EVALUATION.

- Clinical Nurse Specialists
- Clinical Psychologists
- Clinical Social Workers
- Interns, Residents and Fellows
- Nurse Practitioners
- Physician Assistants
- Physicians (MD, DO)
- Others (DDS, DMD, DPM, ODC: Dentist, Podiatrist, Optometrist)



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Who Evaluates Hearing Loss?

Audiologists are the Experts

- Degrees
 - Masters, AuD, PhD
- Certifications
 - ABA, CCC-A
- Perform audiological and vestibular evaluations
- Audiologists refer to physicians when medical or surgical need is found

Diagnosis and Treatment

- Audiological management of hearing due to chronic disease or medications
- Aural rehabilitation including hearing aids
- Counseling for family, job, school communication
- Tinnitus evaluation and treatment methods

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Effects of Untreated Hearing Loss

- Embarrassment, fatigue, irritability
- Tension/stress
- Avoidance of social activities
- Withdrawal from personal relationships
- Depression, negativism
- Danger to personal safety
- Social rejection by others
- Impaired memory and ability to learn new tasks
- Reduced job performance and earning power
- Diminished psychological and overall health



(Better Hearing Institute, 2009)

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Impact of Hearing Loss

Symptoms for You to Observe

- Patient repeatedly saying 'huh?' or 'what?'
- "I can hear you but I can't understand you."
- Cues to watch for:
 - Cupped hand behind ear
 - Interpreter (3rd party)
 - Confusion

Strongly associated with decline in mental health and depression
Cognitive decline
Confusion
Isolation
Stress

Consequences for Management

- Failure to understand verbal instructions.
- Real-world consequences
 - Misunderstandings
 - Noncompliance

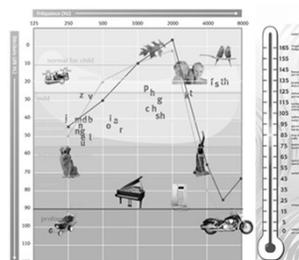


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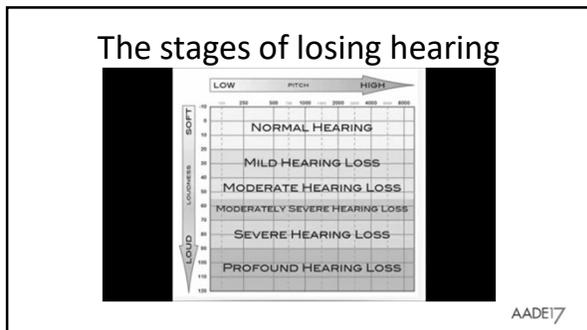
Auditory Deprivation

- Inability to hear affects the brain
 - Takes 6-12 for the brain to get acclimated to the new sounds!
- Problems understanding speech which may be impossible to regain

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Simple In-office Hearing Loss Help

- **Eliminate** all background sounds.
 - Radio, TV, music, other conversations
 - Close your office door and windows to outside sounds
- **Sit face-to-face** with good lighting.
 - Talk at a normal **pace** (not fast)
 - Talk at a normal **level** (not shouting)
 - Talk with **clarity** (emphasize sounds)
- **Move closer** to your patient
 - Your voice will automatically become louder to them
 - Cutting distance in half = Double the intensity of speech

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Characteristics of An Audiologist Visit

- Family member attends initial visit
- Patient's medical history and medications list
- Discussion of hearing, balance and risk of falls
- Consultation with referring primary or specialty care
- Reinforcement of team goals with diabetes educators
- Swift intervention for malignant otitis

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Treatment For Hearing Loss

- Hearing devices
- Hearing implants
- Assistive listening devices, alerting devices, communication aids
- Medical surgical treatment (10% of cases)
- Counseling for hearing loss and depression (referral to psychologist)
- Medications for depression if needed (through primary care physician)

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Vestibular / Falls Risk Evaluation

<p>Screening Protocols</p> <ul style="list-style-type: none"> • Interview for history of falls or elevated self-report fear of falling • Timed up-and-go test • Functional reach test • Dynamic gain index • Clinical test of sensory integration of balance • Modified Hallpike (BPPV) 	<p>Advanced Assessments</p> <ul style="list-style-type: none"> • Computerized dynamic posturography (CDP) • Videonystagmography (VNG) • Cervical vestibular evoked myogenic potential (cVEMP) • Rotary chair
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Auditory / Hearing Evaluation

<p>Screening Protocols</p> <ul style="list-style-type: none"> • Interview • Standardized Questionnaires (HHIE) • Otoscopy • Pure-tone screening • Otoacoustic Emissions (OAE) screen • PROs AND CONs 	<p>Advanced Assessments</p> <ul style="list-style-type: none"> • Audiometry • Tympanometry • Acoustic Reflexes • OAE (full battery) • Speech Intelligibility • Auditory Brainstem Response (ABR) • PROs AND CONs
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Insurance coverage for tests and hearing aids

- Medicaid coverage of hearing aids for adults varies state by state. Children always covered. Find your state:
 - <http://www.hearingloss.org/content/medicaid-regulations>
- Most insurances cover diagnostic audiological testing for hearing and vestibular assessment
- Some Employer insurances also have plans for hearing aid coverage (FedEx, Federal Employees, UPS, etc.)
- Medicare Advantage plans may cover part of hearing aids. Regular Medicare has no coverage for hearing aids

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Cost for Uninsured

- Children always covered for test and devices in all states
- Adults: in absence of coverage go to **Vocational Rehabilitation**
 - Independent Living
 - Mental Health
 - Hearing Impaired Svcs
- **Out of pocket usual and customary:**
 - Audiological eval: \$100-\$150.
 - Vestibular eval:
 - Aural rehabilitation:
 - Hearing aids: \$1000.-\$3000. per aid. Cost depends on lifestyle choices/needs.
 - Over the counter hearing aids available soon!

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Improved Hearing Leads To:

- Better family relationships and communication
- Less isolation and less prone to depression
- Better job performance
- More energy/less stress
- Better quality of life: involvement in church, family and group activities

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Integrating Into Practice

- North Carolina State Plan:
- Clinical Interventions
- “Improve screening for and management of diabetes by encouraging healthcare providers to follow ADA guidelines, and include oral health and auditory screening as part of baseline assessments for people with diabetes.”
- Counseling and Education
- “Raise awareness about diabetes uncommon comorbidities including hearing loss and sleep apnea.”

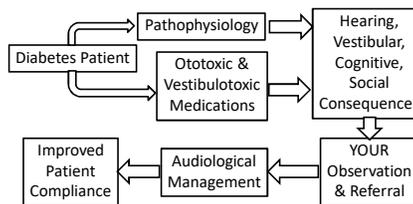
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New Apps For Deaf

- Captionfish
- DeafNation
- Sign 4 Me
- My Smart Hands Baby Sign Language Dictionary
- Signing Times Lite ASL

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Summary of Presentation



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Questions?

- Kathy Dowd
- Joanne Rinker

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