Diabetes and Hearing Loss

What Do Audiologists Need to Know

By: Noel Crosby, Al Turri and the FLAA TAP Cohort
Diabetes: What audiologists need to know

- What is Diabetes
- Statistics
- Diabetes and Hearing Loss: Causes
- Diabetes and Hearing loss: What tests to perform
- Diabetes and Hearing loss: What results will you see
- Diabetes and Hearing loss: The audiologists role
- What can we do to educate at the State/local level
- What have we done, what needs to be done
What is Diabetes

Diabetes mellitus refers to a group of diseases that affect how your body uses blood sugar (glucose). Glucose is vital to your health because it's an important source of energy for the cells that make up your muscles and tissues. It's also your brain's main source of fuel.

The underlying cause of diabetes varies by type. But, no matter what type of diabetes you have, it can lead to excess sugar in your blood. Too much sugar in your blood can lead to serious health problems.
• The first main type of diabetes is Type 1 diabetes, an Autoimmune disease where the pancreas produces very little insulin or no insulin at all. People who get Type 1 diabetes are usually under the age of 20, usually presenting itself when the person is a child or young adult.

Some scientists believe that Type 1 diabetes is a genetic condition where the cells of the Pancreas are attacked and then stop functioning. Others feel the disease may be caused by a virus that prompt the immune system to begin attacking the pancreas.

People who develop Type 1 diabetes will have the disease for life and will need treatment in the form of insulin shots or an insulin pump.
• **Type 2 diabetes** is normally found in people who are overweight as they get older. Although it is sometimes called adult onset diabetes, in some countries, such as the United States, more children and young adults are being diagnosed with Type 2 diabetes because they are not getting enough activity.

    About 90 percent of all cases of diabetes are Type 2 diabetes. The difference between Type 1 and Type 2 diabetes is that with Type 2 diabetes the pancreas does not produce enough insulin or the body does not properly use the it.

    Type 2 diabetes is sometimes considered a lifestyle disease because it is normally triggered by living a fairly sedentary life, being overweight and not participating in exercise. However, age is a factor as well as heredity.
• The third main type of diabetes is gestational diabetes, which is a condition that women can get when they are in the second trimester of pregnancy. About 4 percent of all pregnant women will develop gestational diabetes. Unlike Type 1 and Type 2 diabetes, gestational diabetes will disappear after the baby is born.
• **Pre Diabetes** also known as Impaired glucose tolerance is a condition where your Blood sugar level elevates to a level higher than the normal range for most people, but is still low enough not to be considered diabetes.
Statistics

30.3 MILLION HAVE DIABETES

84 MILLION HAVE PREDIABETES

7TH LEADING CAUSE OF DEATH
Complications of Diabetes

Macrovascular and microvascular resulting in:

- Cardio vascular problems
- Stroke
- Blindness
- Kidney problems
- Reduced circulation
- Hearing and balance problems
Hearing and Balance Disorders from Diabetes

The Audiology Project, Inc
www.theaudiologyproject.com
Diabetes: Webinars and other resources

- **July 24, 2018** — TAP White Paper-Hearing Loss and Diabetes Screening
- **June 26, 2018** — Diabetes and the Audiological Monitoring of Ototoxic/Vestibulotoxic Medications
- **May 22, 2018** — Dizziness, Vertigo and Falls in Persons with Diabetes
- **April 24, 2018** — PPOD & Audiology, a National Diabetes Education Program
- **March 27, 2018** — Diabetes Educators and Audiology: Improving Patient Outcomes
- **February 27, 2018** — Audiology Project #1
Diabetes: Webinars and other resources

• TAP website
  https://www.theaudiologyproject.com

• TAP FB page
  https://www.facebook.com/theaudiologyproject/
Diabetes and Hearing loss

- 48 million people have HL
- 30% higher in prediabetes
- Balance problems
- Patient with diabetes are 2 times more likely to have hearing loss
- Age 60 and above increases prevalence
Auditory

30% hearing loss prevalence (NHANES)

80% among skilled nursing facility residents

Vestibular

39% have balance disorders

Fall risk higher with retinopathy and neuropathy

Cognitive

Comorbid with auditory and vestibular disorders

Complications of Diabetes

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Diseases Affecting Hearing & Balance

- Diabetes
- Chronic renal disease
- Cardiovascular disease
- Hypothyroidism
- Alzheimer’s disease
- Paget’s disease
- Chron’s disease
Audiological Concerns: Diabetes

Hearing Loss
- Cochlear microangiopathy
- Neural degeneration

Balance & Fall Risk
- Foot neuropathy and vision effects
- Vestibular effects of diabetes

Diabetic Pain & Infection Control
- Ototoxicity
- Vestibulotoxicity
Audiological Concerns: Cardiovascular Disease

Hearing Loss
- Strokes: CVA
- DVT, PE, HBP

Balance & Fall Risk
- Fluid build up in extremities: loss of feeling
- Hypertension related (44% in NHANES)

Medication
- Loop inhibiting diuretics
- Pain Rx
How Are Diabetes and Hearing Loss Related?

01
Over time, high blood sugar levels can damage small blood vessels in the body.

02
Parts of the body most affected by damage to small blood vessels are eyes, kidneys, and nerves of the body.

03
Hearing depends on small blood vessels and nerves similar to those in other parts of the body that are affected by high blood sugar levels.
Diabetes and Hearing Loss causes

Elevated Blood sugar or elevated blood pressure...

Ear is highly vascularized and blood becomes very thick so not flowing through the blood stream as it should. Not flowing to tips of fingers and toes so also not flowing to other parts of the body including the ear. Blood not getting into the tiny blood vessels in the ear. So blood vessels start to break. Another way of explaining this is that there is damage to the lining of the blood vessels which creates the thickening of the vessels.

Also impacts the nerves and the message being sent from the ear to the brain

More infections because of reduced blood flow so Otitis externa
Diabetes Ear Disease

Cochlear Microangiopathy

Micro vascular effects of diabetes may damage stria vascularis and cochlear blood supply

Neural Degeneration

Affects 8th nerve and spiral ganglion
Microangiopathy

- **Microangiopathy** (or microvascular disease, or small vessel disease) is an angiopathy (i.e. disease of blood vessels) affecting small blood vessels in the body. It can be contrasted to macroangiopathy, or large vessel disease.
Vasculature of the Ear
Vestibular Symptoms

• Nystagmus - involuntary, rapid and repetitive eye movements
• Usually side-to-side but can be vertical or circular
• Reason to refer patients with diabetes
Vestibular Symptoms

• Diabetic retinopathy and vision
• Diabetic ear disease and vestibular input
• Neuropathy and proprioception
• Refer patients with diabetes who cannot stand or walk unsupported with eyes open or eyes closed
Diabetes & Vestibular Disorders

Causes & Treatment
• Problems in inner ear and central vestibular system → vestibular impairment
• Pathophysiology linked to diabetes
• May be resolved with physical therapy or symptoms treated with medication

Symptoms
• Reduced mobility and need of assistance
• Worsened by vision and proprioceptive deficits linked to diabetes
• Increased fall risk can lead to serious injuries

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Medication Therapy Management and Diabetes
Auditory/balance side effects of diabetes medications

<table>
<thead>
<tr>
<th>Oral medications 46</th>
<th>Auditory 14</th>
<th>Vestibular 43</th>
<th>Cognitive 31</th>
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<tr>
<td>Injectables 13</td>
<td>Auditory 2</td>
<td>Vestibular 7</td>
<td>Cognitive 5</td>
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Auditory: 27% have risk of hearing loss

Vestibular: 81% show vestibular risk

Cognitive: 61% list potential cognitive risk

Complications of Diabetes Insulin Medications

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What Auditory tests should we do

Screening Protocol

• Interview: Patient & Family Members
• Standardized Questionnaires (HHIE)
• Otoscopy
• Pure-tone screening
• Otoacoustic Emissions (OAE) screen
Advanced Assessments

• Interview: Patient & Family Members
• Standardized Questionnaires (HHIE)
• Audiometry
• Tympanometry
• Acoustic Reflexes
• OAE (full battery)
• Speech Intelligibility
• Auditory Brainstem Response (ABR)
• Quick Sin
• Some type of sound sensitivity test
• May need tinnitus assessment

What Auditory tests should we do
### Hearing Loss and Diabetes

<table>
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<th>Comment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>70% of patients with Type 2 diabetes will have some kind of hearing loss</td>
<td></td>
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<tr>
<td>15% of patients with diabetes have some type of conductive hearing loss</td>
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<tr>
<td>25% of patients with diabetes have some type of mixed hearing loss</td>
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<tr>
<td>Some fluctuating hearing loss reported due to changes in sodium/potassium</td>
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What you will see

If someone is under 60 and you find an unexplained HF SN hearing loss there is a 55% chance they may have diabetes. Research indicates that the hearing loss may actually be above 8K Hz. Ages 20-39

Many studies have indicated you might find a low frequency for flat moderate hearing loss in older adults or long term Diabetes

If hearing is normal then OAE and Quick sin may be helpful to see if they might have Hidden Hearing loss.

Some patients have reduced discrimination because of the reduced blood flow cutting of the blood supply to the ear.
ABR may have increased latency which is caused by the hypoglycemia

OAEs may show abnormal responses. Some studies show increase in OAE, some show decrease and some show minimal effect. Still evaluating.

Tymps may be abnormal if there is infection and mixed hearing loss. Reflexes may be abnormal but no specific info regarding this.

May have increased wax production but need to be careful removing because of risk of infection and blood thinners.
What follow up plan should you have as an Audiologist

- Baseline Hearing test
- 6 months from there
- Annual hearing test
- If there is a change in medication that has hearing loss as a side effect recheck also check vestibular function if the medication has a vestibular side effect.
- If there is a change in medical status with the patient.
- Or based on patient concern. Report of decreased hearing or balance problem.
Vestibular: Falls Risk Management

Screening Protocol

- Interview: fall history or increased fear of falling
- Timed up-and-go test
- Functional reach test
- Dynamic gain index
- Clinical test of sensory integration of balance
- Modified Hallpike (BPPV)
Vestibular: Falls Risk Management

Advanced Assessments

- Computerized dynamic posturography (CDP)
- Videonystagmography (VNG)
- Cervical vestibular evoked myogenic potential (cVEMP)
- Rotary chair
So how do we start involving the audiology world?
Loss of Hearing Leads to Loss of adhering
What can an audiologist do

Complete history covering questions that could indicate the presence of diabetes

Determine if the patient has been diagnosed yet or if you have concerns about it you can refer for evaluation

Balance screening. Asking questions about falling and doing a couple of easy quick balance screening tests

Dementia screening

Contact a diabetes educator

Just be there for the patient. Educate and refer.
Make New Friends

- Establish public and private partnerships.
- Professional orgs: AADE, ADA, AACE, PPOD professional orgs
- Consumer groups
- Leverage resources in the public domain: Example: VSP adaptation of PPOD Healthy Eyes Matter and 4 Steps to Control Your Diabetes for Life
Practice True Multidisciplinary Team Care!

- **Collaborate** with other health care providers, including podiatrists, pharmacists, optometrists, and dentists, primary care physicians, nurse practitioners, diabetes educators, physician assistants, and community health workers AND audiologists.

- **Network** with local associations and local chapters of national associations.

- Consider creating a **local PPOD coalition** in your state or community.

- **Tailor and use PPOD materials** for patients in your practice and providers in your coalition.
What Is PPOD?

PPOD is a collaborative team approach that:

• Engages many health care providers who treat patients with diabetes.

• Reinforces consistent diabetes messages across four disciplines:
  • Pharmacy
  • Podiatry
  • Optometry
  • Dentistry
2018 Annual Meeting & Forum

Audiology and PPOD Professions

- Align with Pharmacy for otovestibulotoxic monitoring
- Collaborate with Podiatry for better balance and foot care
- Ensure Optometry Evaluation to help lower risk of falls
- Counsel patients to see Dentist several times a year

Ongoing IPE and IPC/IPP with the other professions
What Can PPOD Providers Do?

PPOD providers can:

• Embrace a team approach to diabetes care.
• Recognize signs of diabetes and systemic concerns across all PPOD areas.
• Reinforce the importance of annual screenings and healthy habits.
• Educate patients about diabetes.
• Encourage self-management.
Why Do We Need PPOD?

- PPOD makes a difference for patients with diabetes.
- A team approach to diabetes care:
  - Reduces risk factors.
  - Improves diabetes management.
  - Lowers the risk for chronic disease complications.
A PPOD Provider May Be the First to See a Person Having a New Problem

• Patients may consult a PPOD provider about new symptoms that may be diabetes-related before consulting with a primary care provider.
• Regular communication provides an opportunity to keep diabetes on the patient’s radar screen.
A PPOD Provider May Be the First to See a Person Having a Problem

- PPOD providers are well positioned to advise and educate their patients about diabetes control and prevention.
- All providers need to give consistent messages, recognize early danger signs, and promote the team approach.
Working Together to Manage Diabetes

- Offers an overview of team approach to care.
- Includes details for each PPOD specialty area on:
  - Current data and trends
  - Common diabetes-related complications
  - Assessment techniques
  - Key warning signs
  - Patient education information
- Serves as a “cross-education” resource, **not** a comprehensive guide to subspecialty care.
Education

• Education for consumers: Example: *Take Charge of Your Diabetes*
  Simple language book, multiple chapters on diabetes control and complications, in process of being updated, print to digital, new topics

• Consider one pager like “If you have diabetes, saving your hearing matters”

• Education for providers: What would audiologists like other providers to know? Make the case.
Audiology is under recognized in diabetes care. It is very important to take good care of your ears (hearing and balance) when you have diabetes. If you don’t hear well, you will miss important information about your health plan. Good news! You can take steps now to keep your ears healthy.

How Can Diabetes Harm Your Ears?
- Diabetes damages small blood vessels in your inner ear and disrupts the hearing signals to the brain.
- Hearing loss is 30% higher in people with diabetes. 80% of residents in nursing homes have trouble hearing.
- You have a greater chance of falling with diabetes due to vision loss, foot neuropathy and the effects in the vestibular system.

What Types of Ear Diseases are Common Among People with Diabetes?

Sensorineural Hearing Loss
- Your audiologist will recommend treatment options or refer you to a medical ear specialist if your hearing loss is treatable with medication or surgery.

Balance problems
- You can be at greater risk of falling because of 1) the loss of sensation in your feet, 2) changes in your vision and 3) changes in your vestibular system.

Visit your audiologist right away if you:
- Hear ringing or other noise in your ears
- Have sudden changes in your hearing and balance
- Become dizzy with rapid head movements, fall or have a fear of falling
- Have a sudden change in how clearly you understand
- Struggle understanding in background noise or feel that people are mumbling

Developed by The Audiology Project, Kathy Dowd, Au.D. and Alexandra Tarvin, Au.D.
Schedule an audiology exam when you are first diagnosed.

- Ask a family member to join you at the appointment.
- Bring your medication list as well as your medical history of illnesses and hospitalizations.
- During the exam, you will respond to very soft and different pitch sounds. The audiologist will measure how clearly you understand speech. Other tests of hearing function will be explained.
- A balance screening will assess your risk of falls.
- Schedule a follow up appointment to monitor your hearing and balance.
- Find an audiologist:
  - webportal.audiology.org/Custom/FindAnAudiologist.aspx
  - audiologist.org/audiologist-directory

To-do List for Healthy Ears

- Get a baseline audiology exam for hearing and balance as soon as you are diagnosed with diabetes.
- Your audiologist will recommend the next evaluation based on your medical history.
- Contact your audiologist about changes in your ability to hear or your risk of falls.
- Wear ear protection around loud noises (lawn mowers, leaf blowers, chain saws).
- Manage your ABCs! Read the important information below.

Manage Your ABCs!

Ask your healthcare team to help you set and reach goals to manage your blood sugar, blood pressure, and cholesterol—also known as the ABCs of diabetes. Teach your family about your diabetes and the ABCs so they can help you, too.

- A1c: The goal set for many people is less than 7% for this blood test, but your doctor might set different goals for you.
- Blood pressure: High blood pressure causes heart disease. The goal is less than 140/90 mmHg for most people, but your doctor might set different goals for you.
- Cholesterol: LDL or “bad” cholesterol builds up and clogs your blood vessels. HDL or “good” cholesterol helps remove the “bad” cholesterol from your blood vessels. Ask what your cholesterol numbers should be.
- Don’t smoke: Call 1-800-QUIT-NOW (1-800-784-8669) for support.
Summary

Diabetic Patient

Pathophysiology

Ototoxic & Vestibulotoxic Medications

Hearing, Vestibular, Cognitive, Social Consequences

Improved Patient Compliance

Audiological Management

YOUR Observation & Referral

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What have we done in Florida and what needs to be done
Thank you

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Kathy Dowd,
The Audiology Project
Theaudiologyproject.com
Describe 2 pathophysiological effects of diabetes on hearing and balance

ANSWER:
Microangiopathy and neural degeneration
List 3 factors of diabetes related hearing loss that will influence medical treatment/patient outcomes

ANSWER
Patient understanding, patient compliance and patient outcomes
Answer to Question 3

List one target agency in FL TAP advocacy for federal, state and local advocacy

• ANSWER

Deaf and HH, Chronic Disease, Diabetes, Skilled Nursing, Public Health

(any one of these)
The Hearing loss puzzle
REAL COMMUNICATION COMES FROM HEARING WHAT'S NOT BEING SAID. IT'S LISTENING FOR THE UNSPOKEN.

~ Tony Robbins