

# Hearing and Balance Disorders from Diabetes

Dr. Kathryn Dowd, AuD  
Executive Director  
The Audiology Project, Inc.

- Average time to diagnosis and treatment:  
**7 years**
- **Largest unmet medical need:** only 20% of hearing impaired ID and treated
- **Link to chronic diseases and infectious diseases: unknown** to many MDs and health organizations: the invisible handicap

**Hearing Loss: the silent epidemic**

"denial of illness" by patient.

a deficit of self-awareness, a condition in which a person who suffers some disability seems unaware of the existence of his or her disability...Wikipedia

the lack of awareness of the deficits, signs and symptoms of an illness. It is not merely a denial; it is an actual neurological deficit.

**Anosognosia**

**A confounding factor**

- Diabetes
- Chronic Renal Disease
- Cardiovascular Disease
- Hypothyroidism
- Alzheimer's disease
- Paget's disease
- Chron's disease
- Infectious diseases

**Diseases affecting hearing**

- **Causes**

- Insulin is a **hormone that acts like a key**. *It unlocks your cells to let in glucose from your blood to make energy.* **Sometimes this lock and key process does not work.** *Then glucose builds up in your blood, even when you are making more insulin.* Chances of becoming insulin resistant go up if you are overweight, smoke, do not exercise, or have high blood pressure

- **Symptoms**

- Hunger and fatigue
- Urinating more often and being thirstier
- Dry mouth and itchy skin
- Blurred vision

**Diabetes: IDDM, NIDDM**

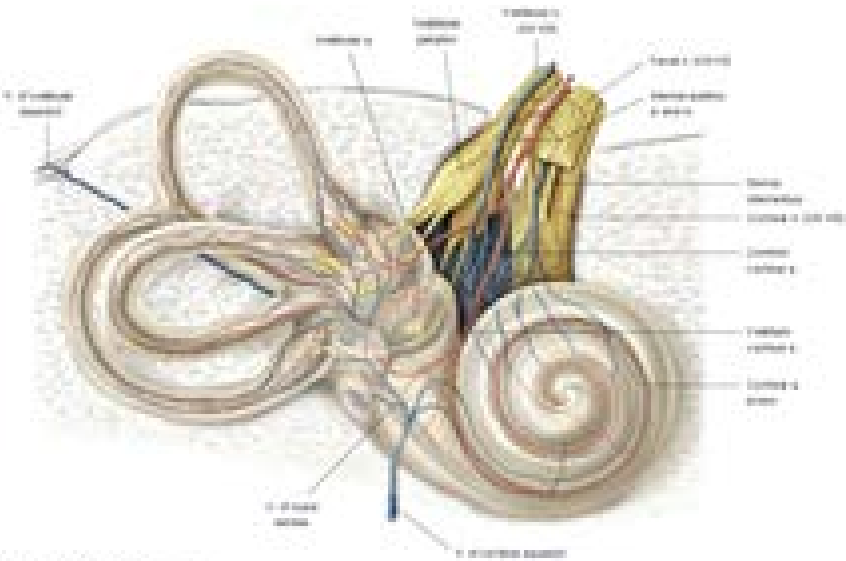
- **Impact on Hearing**

- **Cochlear microangiopathy** Diabetes affects the vascular system. Delicate stria vascularis blood system in cochlea may be implicated
- **Neuronal degeneration** The nervous system of the ear, 8<sup>th</sup> nerve and spiral ganglia is affected
- Up to 30% of adults with diabetes will experience hearing loss

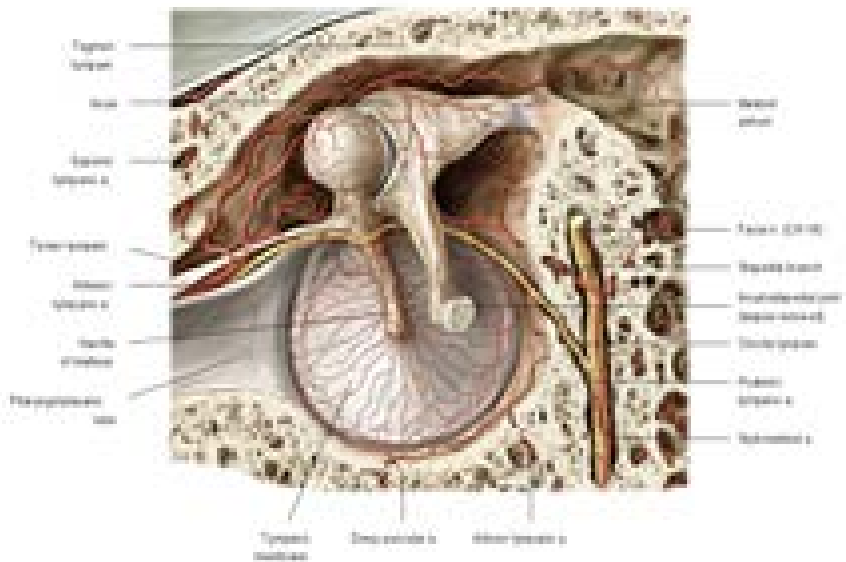
**Diabetic Ear Disease**

# VASCULATURE OF THE EAR

## Blood Vessels of the Inner Ear



## Arteries of the Middle Ear





Diabetic eye disease refers to a group of eye problems that can occur as a result of diabetes. Without diagnosis and treatment, diabetic eye disease can

# Diabetic Retinopathy



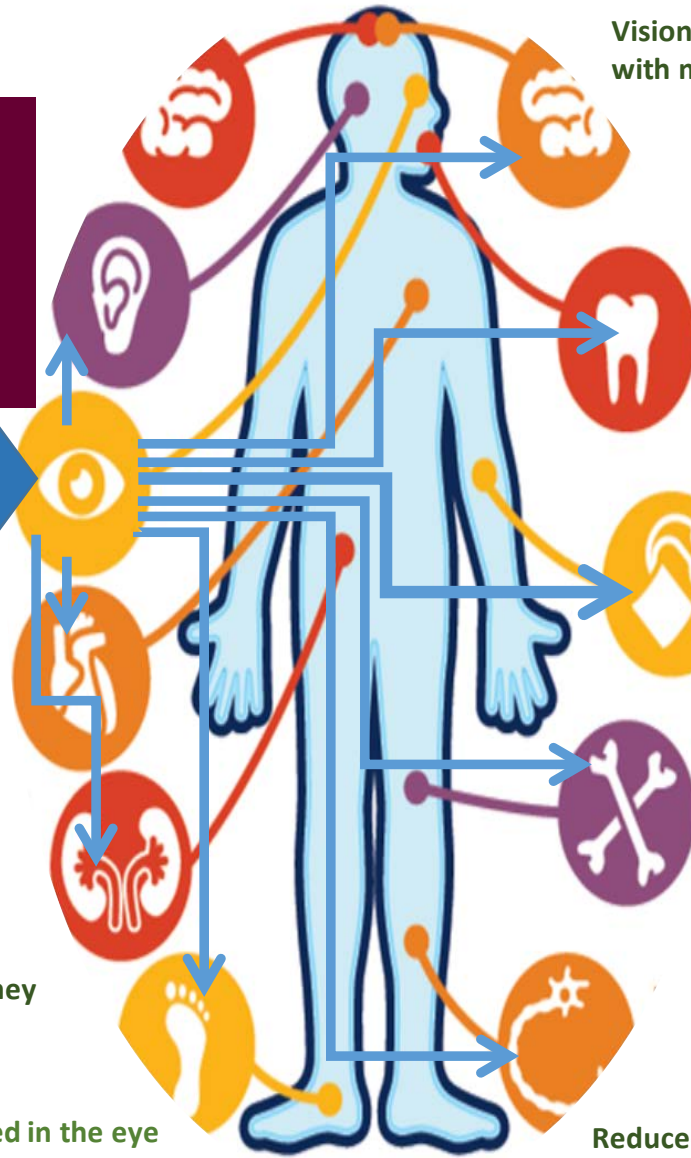
Hearing loss is higher among individuals with diabetic retinopathy. <sup>25</sup>

Comprehensive Eye Exam

Retinal plaque signals obstructive vascular disease of the heart or carotid artery. <sup>24</sup>

Diabetic retinopathy is associated with early kidney disease-Albuminuria. <sup>23</sup>

Signs of diabetes detected in the eye are associated with peripheral neuropathies of the foot and foot ulcers. <sup>22</sup>



Vision loss due to diabetes is associated with major depression. <sup>17</sup>

Diabetic retinopathy is associated with periodontal disease. <sup>18</sup>

Worsening diabetic retinopathy is associated with elevated diastolic blood pressure. <sup>19</sup>

65% of individuals with Vision Impairment could achieve normal vision with an eye exam and new glasses, reducing falls leading to fractures. <sup>20</sup>

Reduced corneal sensitivity, dry eye, and ocular muscle palsies are early indicators of diabetes and associated neuropathies. <sup>21</sup>



## Diabetes and Hearing Loss

- Cochlear microangiopathy
- Neural degeneration



## Balance and Fall Prevention

- Foot neuropathy and vision effects
- Vestibular effects of diabetes



## Diabetic Pain and Infection Control

- Ototoxicity
- Vestibulotoxicity

- Heart disease is noted on 68% of diabetes related death certificates among people aged 65 years or older
- Adults with diabetes have heart disease death rates about 2 to 4 times higher than adults without diabetes, and

The risk for stroke is 2 to 4 times higher people with diabetes

**Cardiovascular disease**

# Cardio Vascular Disease



## Hearing Loss

- Strokes: CVA
- DVT, PE, HBP



## Balance/Risk of Falls

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

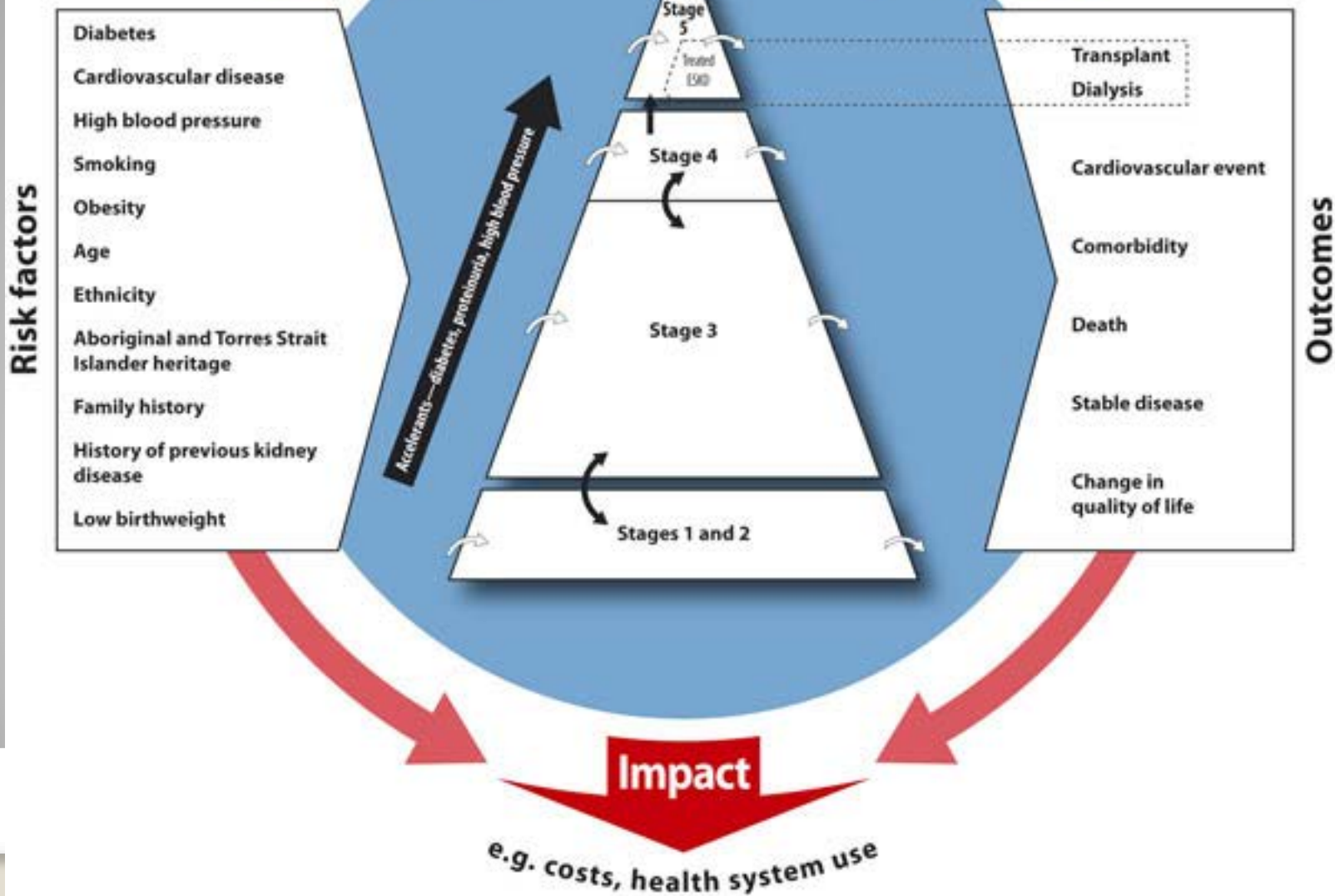


## Medication

- Loop inhibiting diuretics
- Pain Rx

# Intervention

## Chronic kidney disease



# CHRONIC KIDNEY DISEASE & HEARING LOSS

- **Association of CKD & Hearing Loss Known for Decades**
- **Kidney & Stria Vascularis of Cochlea Share Physiologic, Ultrastructural and Antigenic Similarities**
- **Diabetes Often Results in Chronic Renal Disease**
- **Therefore, the Link Between Diabetes and Hearing Loss May Be Indirect But Exists**



## Impact on Hearing

Hypothyroidism (underactive thyroid) is commonly linked with hearing loss. **About half of people with low thyroid function have hearing losses.**

About **3% of people with Meniere's syndrome** have hypothyroidism; and in some, control of the thyroid disease eliminates the symptoms of Meniere's syndrome.

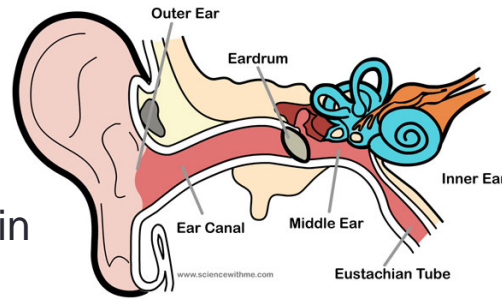
Hypothyroidism now linked to diabetes according to CDC

# Hypothyroidism

# Diabetes and Hearing Disorders

- **Hearing impairment**

- Outer ear
- Middle ear
- Inner ear
- Auditory brain



- 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.

- Other serious concerns with impact of hearing loss:

- Reduced **sensitivity** to sound
- Reduced **clarity** of words
- Reduced **communication**
- Impairs **employment**
- Impairs **social life**
- Impairs **medical management**





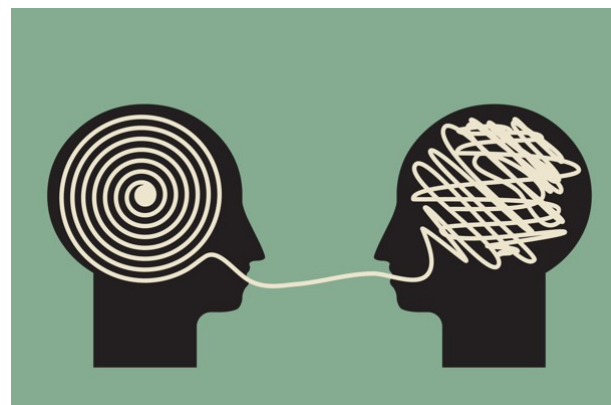
# Impact of Hearing Loss on Understanding

## 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 (3<sup>rd</sup> party)
  - Confusion
- Strongly associated with **decline in mental health** and with **depression**
  - Cognitive decline
  - Confusion
  - Isolation
  - Stress

## Consequences for Management

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

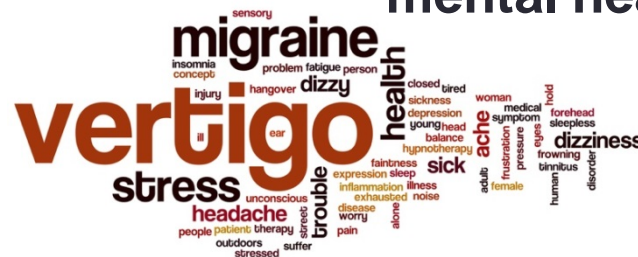


# The stages of losing hearing



# 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**

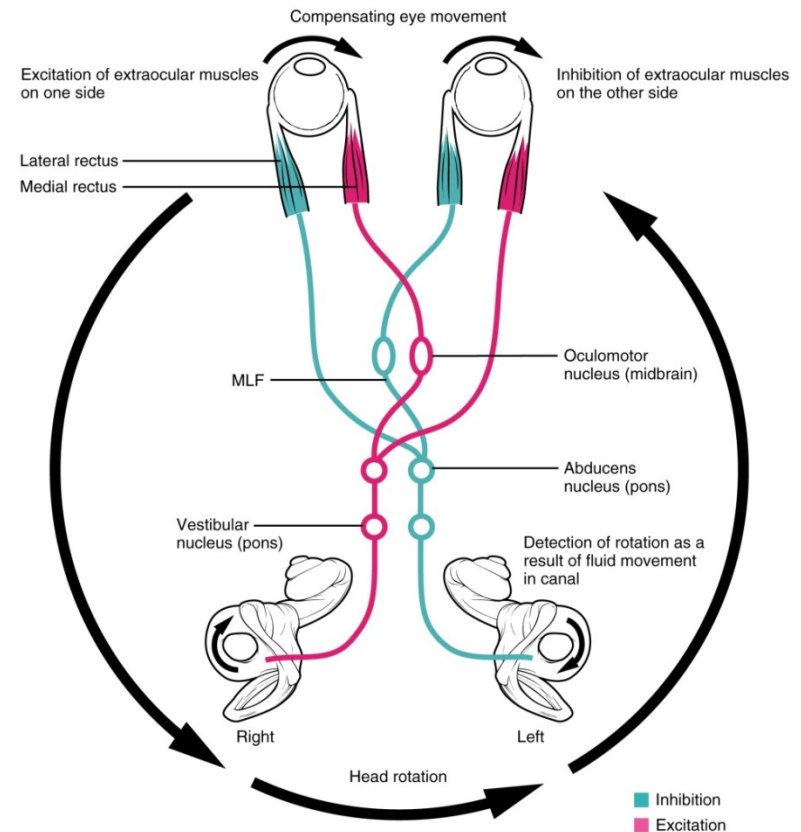


# Vestibular Symptoms

## Vestibulo–Ocular Reflex(VOR)

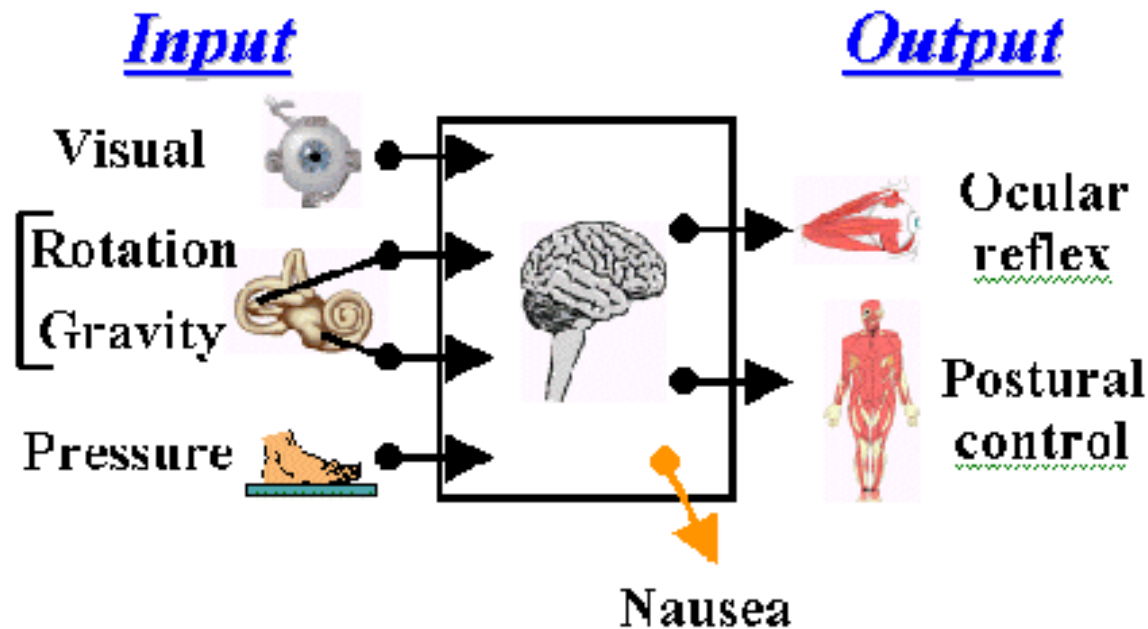
- **Nystagmus** is an involuntary, rapid and repetitive movement of the eyes
- Usually the movement is **side-to-side**, but it can also be up and down or circular
- Presence of nystagmus is reason for **referral** of the diabetic patient

## Eyes and Ears are Connected!



# Vestibular Symptoms

- **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 diabetic 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 diabetic medications ≈ side-effects on **hearing/tinnitus**
- Vestibular System Complications
  - AIB: 70% with diabetes ≈ increased **vestibular disorders**
  - Comorbidity with retinopathy and neuropathy increase 'falls risk'
  - 81% of diabetic medications ≈ side-effects on **balance**
- Cognitive System Complications
  - **Co-morbid** with auditory and vestibular disorders and medications
  - 61% of diabetic medications ≈ side-effects on **cognition**.

# Who Needs Hearing & Balance Evaluations?

## Diabetes

- Baseline hearing test at time of diagnosis
- Annual test to monitor hearing levels
- Audiologist may Rx more often if ototoxic meds or other chronic diseases are present

## Prediabetes

- Baseline hearing test to chart present hearing levels
- Audiologist may Rx evals more often with ototoxic meds or other chronic diseases

# 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, OD:  
Dentist, Podiatrist, Optometrist)





# 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

# Vestibular / Falls Risk Management

## Screening Protocols

- 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)

## Advanced Assessments

- Computerized dynamic posturography (CDP)
- Videonystagmography (VNG)
- Cervical vestibular evoked myogenic potential (cVEMP)
- Rotary chair

# Auditory / Hearing Management

## Screening Protocols

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

## Advanced Assessments

- Audiometry
- Tympanometry
- Acoustic Reflexes
- OAE (full battery)
- Speech Intelligibility
- Auditory Brainstem Response (ABR)

## Insurance Coverage: Procedures & Devices

- **Adult Medicaid coverage** of hearing aids *varies state by state*.
- Children *always* covered by Medicaid and insurance.
- 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

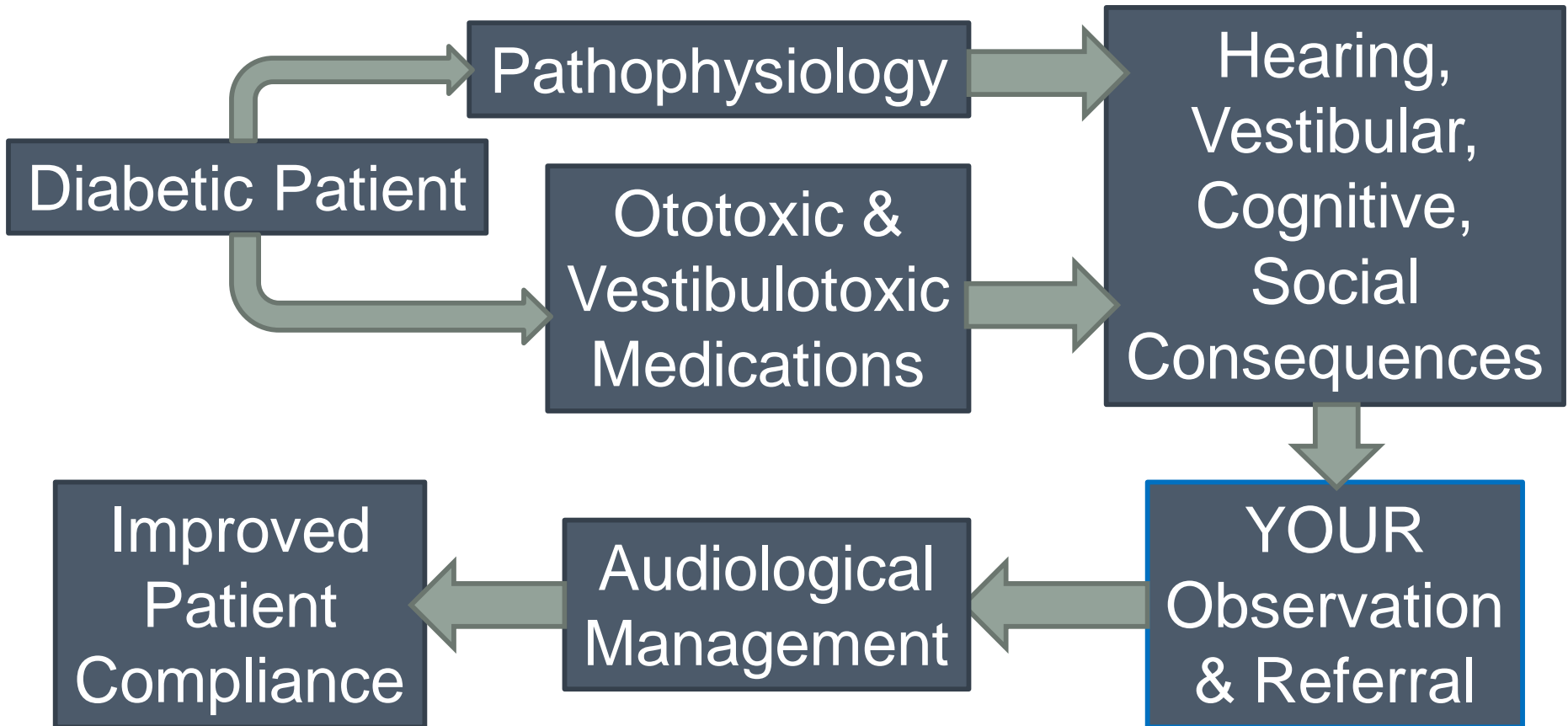
# Cost for Uninsured

- **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

## **Adult out-of-pocket**

- Audiological evaluation
- Vestibular evaluation
- Rehabilitation
  - Hearing / Balance
- Hearing aids
  - Cost depends on lifestyle choices/needs.
  - Normal recommendation is both ears

# Summary of Presentation



## Universities

- Students in training

## Local Medical Societies

- Hospital and independent medical providers (MD, DO), endocrinologists, gastroenterologists, PCP, IM, NP, PA
- Local health departments

## Local intercollaboration groups

- Optometry, podiatry, pharmacy, dentistry, OT, PT, SLP, psychology, clinical social workers

# Local level outreach

## State professional organizations

- MSHLA
- Michigan Optometric Association
- MPA: Michigan Pharmacists Assn

## Michigan state agencies

- Diabetes prevention and control
- **Michigan Deaf, DeafBlind and Hearing Impaired division**
- Heart disease and stroke

## Other Michigan Deaf and HI Services

- Education Dept
- Michigan AGBell.org
- HLAA

**State Level collaboration**



## NCOA.ORG

- [Diabetes Recognition Program](#) (DRP)
- [Heart/Stroke Recognition Program](#) (HSRP)

## HEALTHY PEOPLE.GOV

- **MI - Michigan**
- Ms. Debra Scamarcia Tews Public Health Performance Improvement Manager
- Michigan Department of Community Health Capitol View Building  
7th Floor, 201 Townsend St.
- Lansing, MI 48913
- Email:  
• [tewsd@michigan.gov](mailto:tewsd@michigan.gov)
- Phone: 517-335-9982

## NDEP

- partnership of the National Institutes of Health, the Centers for Disease Control and Prevention, and more than 200 public and private organizations: diabetes education

# Michigan links to national programs

## **Clinician (Physician) Programs**

- **Diabetes Recognition Program (DRP)**
  - Voluntary program is designed to recognize clinicians who use evidence-based measures and provide excellent care to their patients with diabetes
- **Heart/Stroke Recognition Program (HSRP)**
  - Voluntary program is designed to recognize clinicians who use evidence-based measures and provide excellent care to persons with cardiovascular disease (CVD) or who have had a stroke.

# POSTER SESSION R15

## Can you hear me? The Link Between Diabetes, Hearing Loss and Depression

**Screening Tools**

**Depression Screening  
Two Question Screen**

A quick way of screening patients you think may be depressed requires asking patients these two questions:

During the past month, have you often been bothered by:

1. Little interest or pleasure in doing things | Yes | No  
2. Feeling down, depressed or hopeless? | Yes | No

• If the patient's response to both questions is "no", the screen is negative.  
• If the patient responded "yes" to either question, consider asking more detailed questions or using PHQ-9 patient questionnaire.

**Effects of Hearing Loss:  
(from National Council on Aging)**

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

**Treatment**

1. hearing aids, and the cost of hearing help can improve symptoms of depression
2. Medical treatment (surgery or medications) will alleviate hearing problems for about 10% of patients who have hearing loss.
3. counseling for hearing loss and depression
4. medications for depression if needed

**Outcomes**


1. Improved job performance
2. Improved memory
3. Improved mood
4. Less loneliness
5. Increased alertness and ability to
6. Decreased risk for personal safety
7. Increased social activity
8. Less fatigue, tension, stress, anger
9. Better relationships with family
10. Better feelings about themselves
11. Improved mental health
12. Greater independence and confidence

**Referral**

**Referral Websites for audiologists:**  
Academy of Doctors of Audiology (ADA)  
<http://locator.ada.org/>  
American Academy of Audiology (AAA)  
<http://webportal.audiology.org/Custom/FindAnAudiologist.aspx>

**For psychologists use:**  
<http://locator.apa.org/>  
And SW and psychologists:  
<http://www.helpgro.com/>

**Contact Us:**  
Kathryn B. Davis, Director of Healthcare | Hearing Solutions Center | One Broadway | Manhattan, NY 10038 | 212.850.0000 | [www.hearingaid.com](http://www.hearingaid.com)  
James Walker, MD, PhD, CEO, CEO | 100 Broadway, Suite 1000 | New York, NY 10038 | 212.850.0000 | [www.hearingaid.com](http://www.hearingaid.com)




SESSION R13



# AADE12



**The Stakeholders Meeting 9/28/16**



## Diabetes Educators

- Medicare coverage of education when diagnosed
- 2 hours education annually

## Endocrinologists

- Medical management of diabetes
- Diagnosis and treatment of hormonal effects

## Audiologists

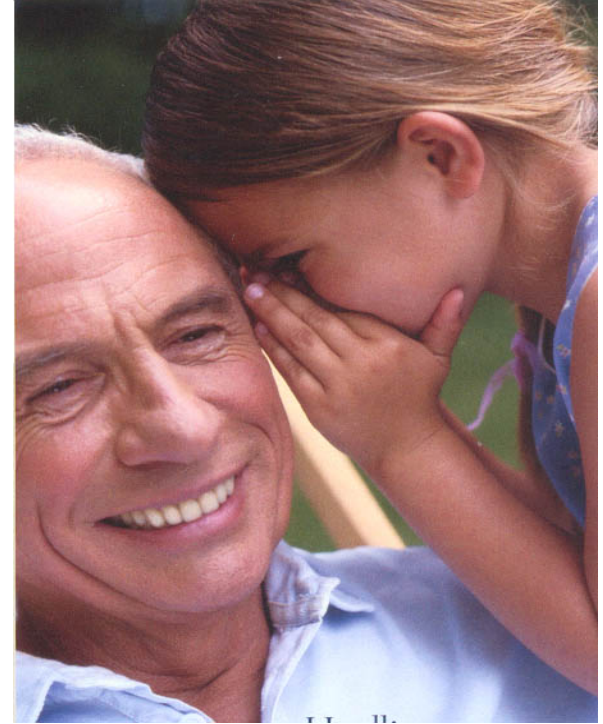
- Annual evaluation and management of hearing
- Vestibular screening and balance testing

Wow!! Thank you, doctor!  
I can hear better than  
I have for years!!



Next.





**Kathy Dowd, AuD, Executive Director  
The Audiology Project**

**[kdowd01@att.net](mailto:kdowd01@att.net)**

**704-502-5016**