

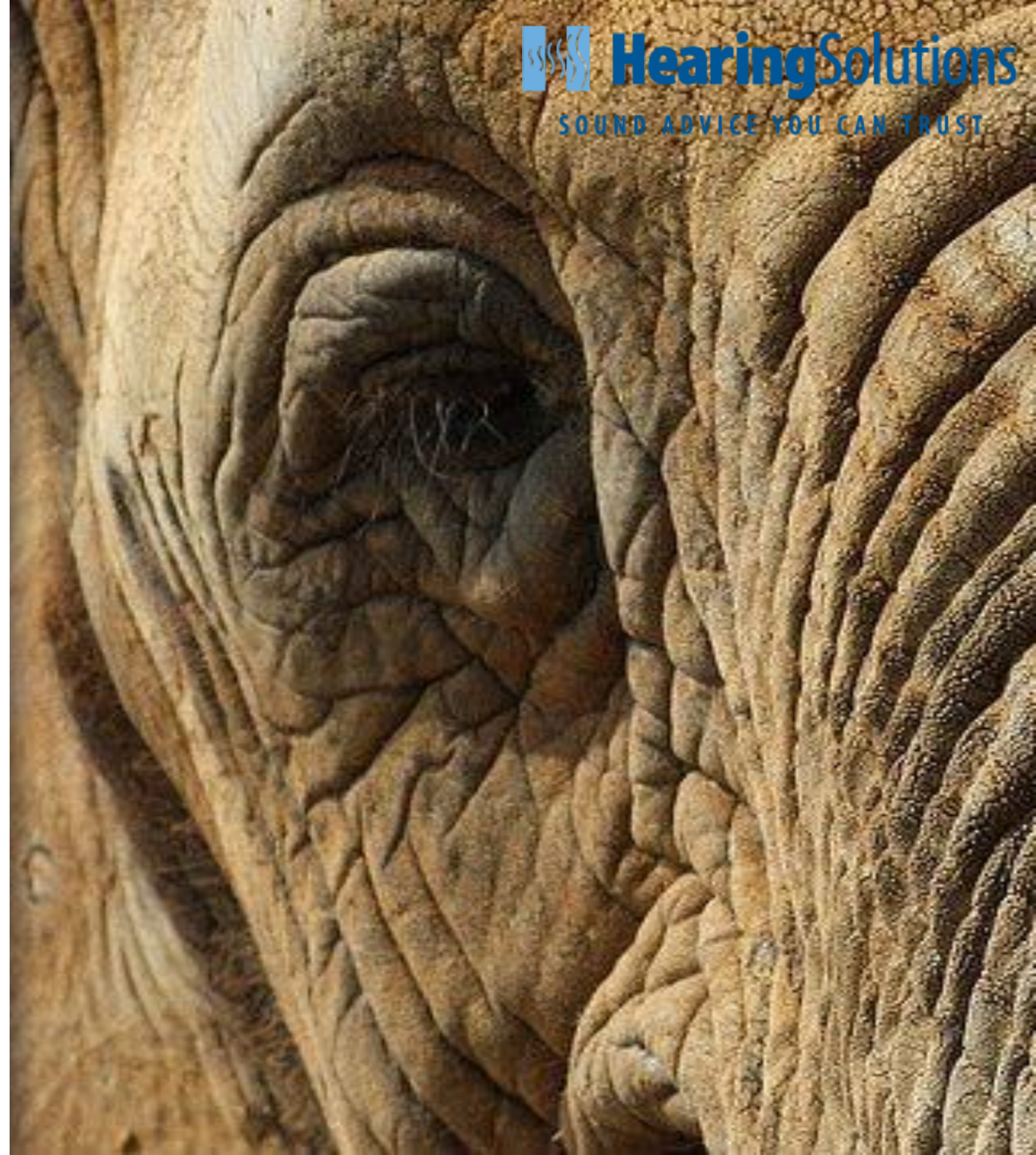


Emerging Audiology Management as a part of Diabetes Care

Andreas Seelisch, M.Sc., B.H.Sc. (Hons), Reg CASLPO
Director of Audiology, Hearing Solutions

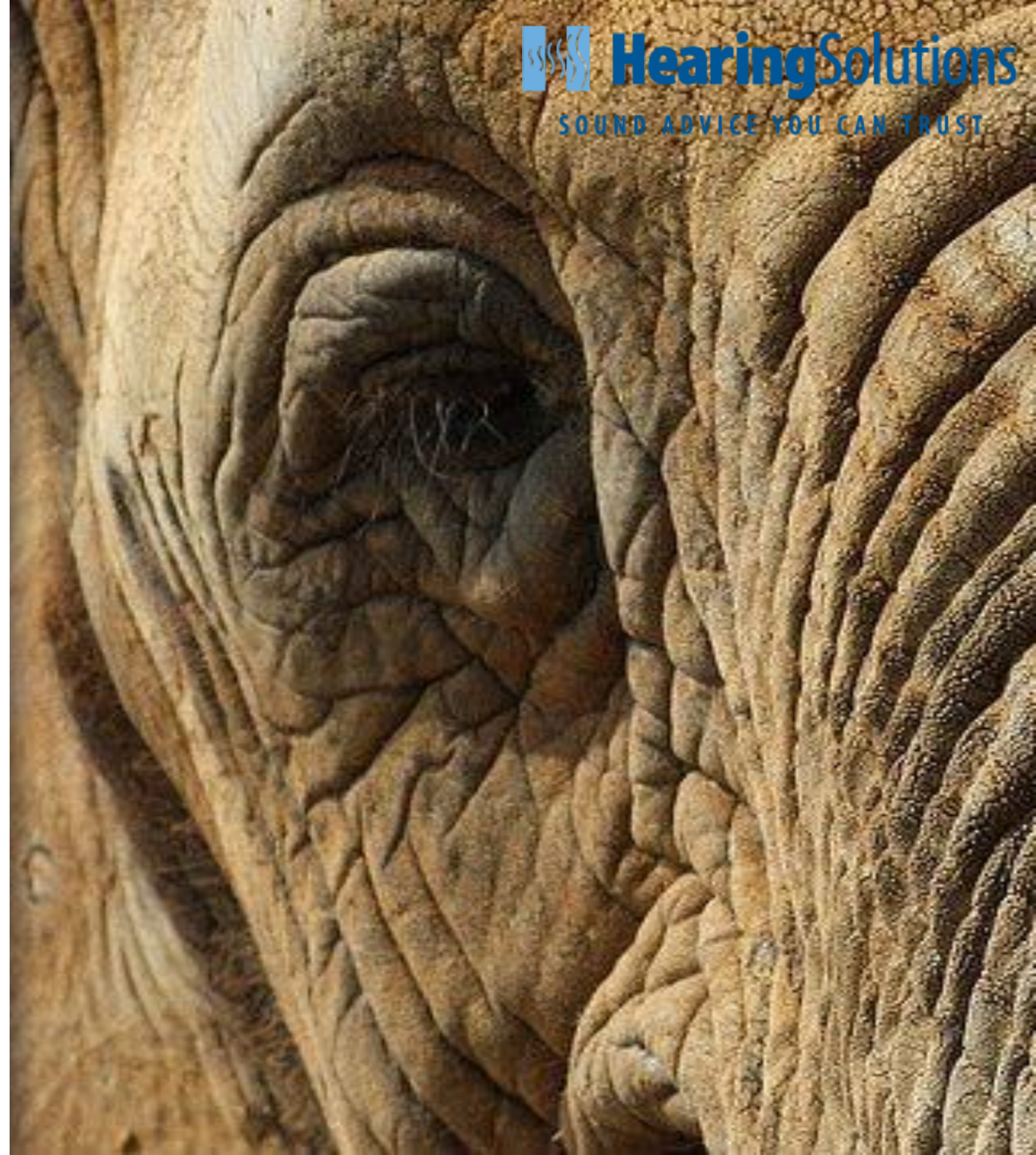
Disclosure:

- No financial disclosures.



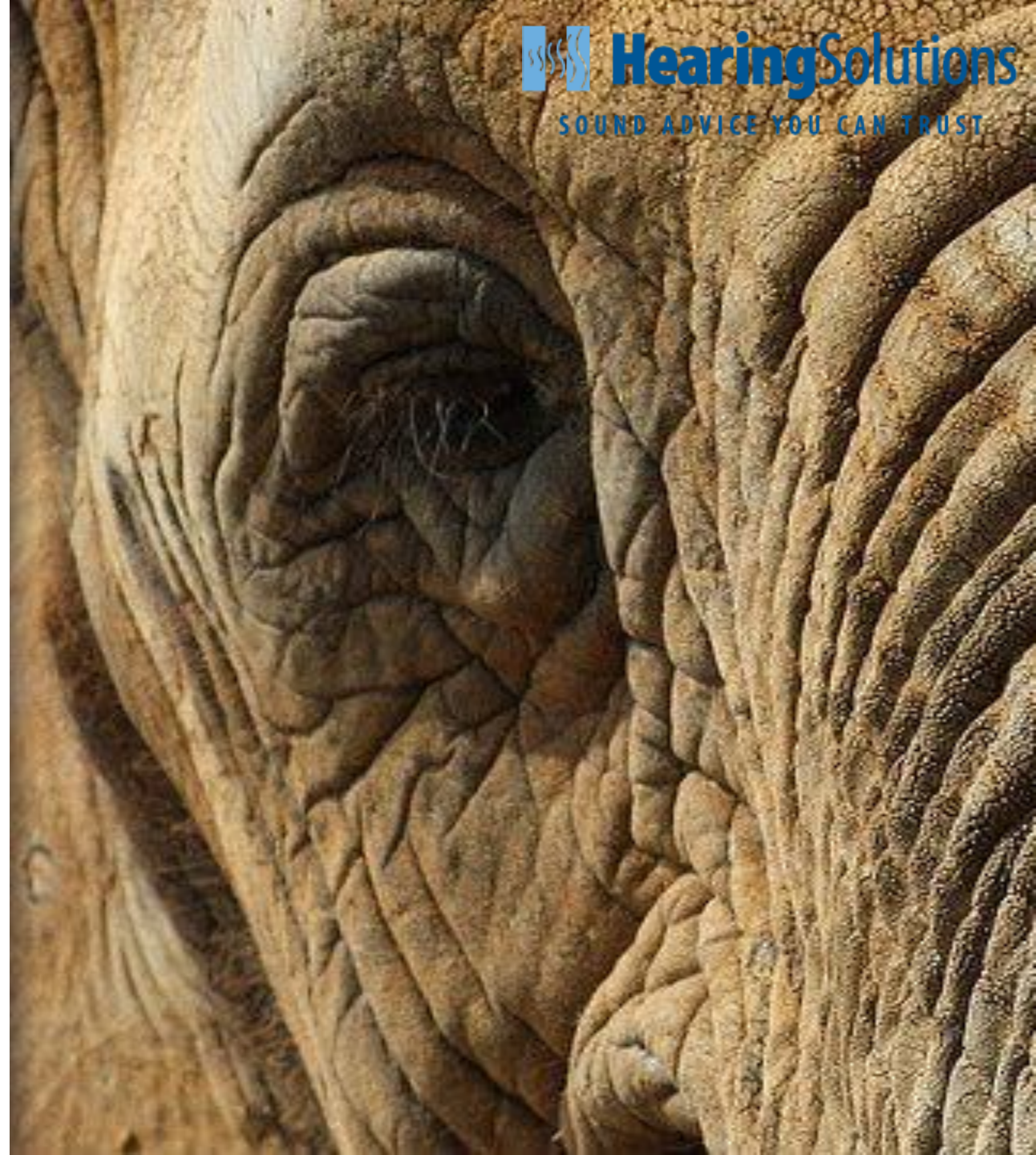
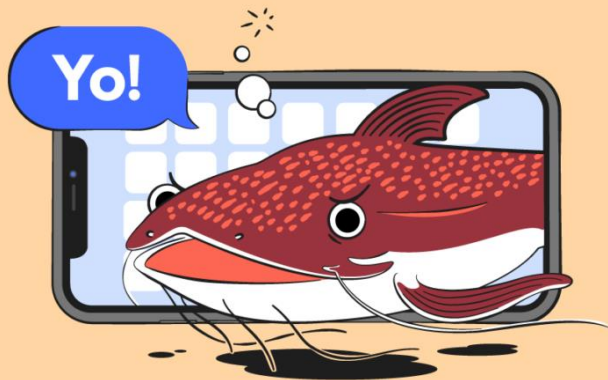
Disclosure:

- No financial disclosures.
 - I am not Kathy Dowd.
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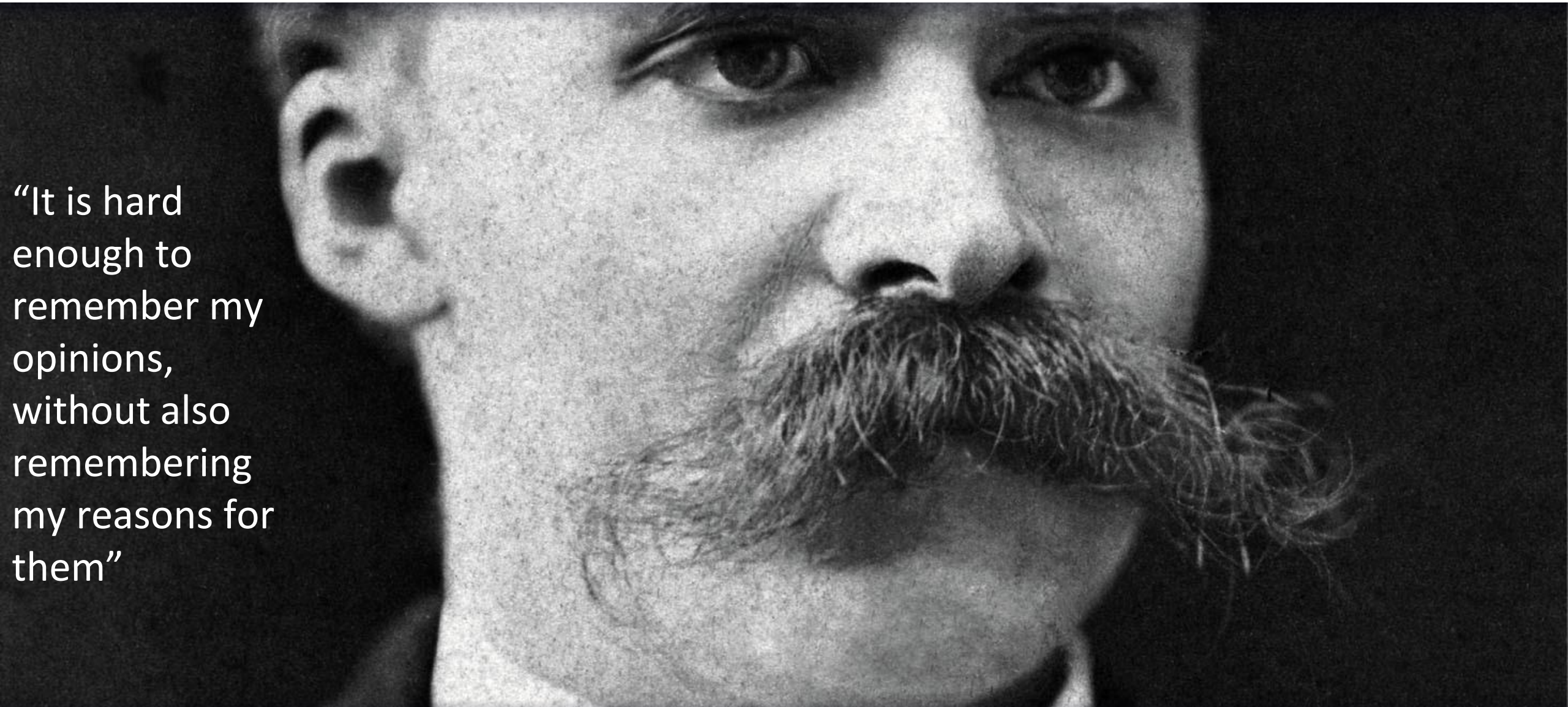
- No financial disclosures.
- I am not Kathy Dowd.
- Media outreach.





Agenda & Learning Objectives

- 1) Consider the professional journey of moving Audiology beyond its silo
- 2) Learn about the pathophysiology of diabetes and its impact on the cochlea and vestibular canals, neural systems and thereby hearing and balance /risk of falls
- 3) Learn how audiology medical management will ensure the best patient outcomes for diabetes care
- 4) Learn how can become advocates through interprofessional collaboration at the local, provincial and even federal level



“It is hard
enough to
remember my
opinions,
without also
remembering
my reasons for
them”

I know that hearing loss is highly prevalent:

- 5.3% of the population worldwide experience at least *moderate* hearing loss in the *better* ear (World Health Organization, 2012)
- 466 Million worldwide with *disabling* hearing loss expected to rise above 900 million by 2050 (World Health Organization, 2018)
- 10-12% Population (The Hearing Foundation of Canada, 2017, Lin et al., 2011)
- 20% When considering unilateral losses (Lin et al., 2011)
- 35% of Canadian adults 20-79; 54% of adults 40-79 (Ramage-Morin et al., 2019)
- Prevalence rises to:
 - 40% to 66% by age 75+
 - 80% by age 85+
 - (Yueh, Shapiro, MacLean & Shekelle, 2003)

I know that hearing loss is associated with a wide variety of negative outcomes:

Profound psychological consequences including: depression, isolation, anger, exhaustion, anxiety, insecurity, despair, negative self-image, inability to relax, loss of group affiliation, paranoia, and loss of intimacy (Trychin, 1993).

Impacts to quality of life as well as economic, behavioral, emotional and psychosocial domains (Dalton et al., 2003).

I know hearing aids can improve outcomes:

Systematic Reviews
have show that
hearing aids improve
health related quality
of life

Chisolm et al. (2007)

Hearing aid owners
report improved
relationships, work
performance,
communication
abilities and overall
quality of life

(Abrams & Kihm,
2015).

Hearing aids enjoy
high rates of
satisfaction (81%
rising to 91% with
technology purchased
in the last year)

(Abrams &
Kihm, 2015).

I know that hearing instrument uptake remains both low and delayed:

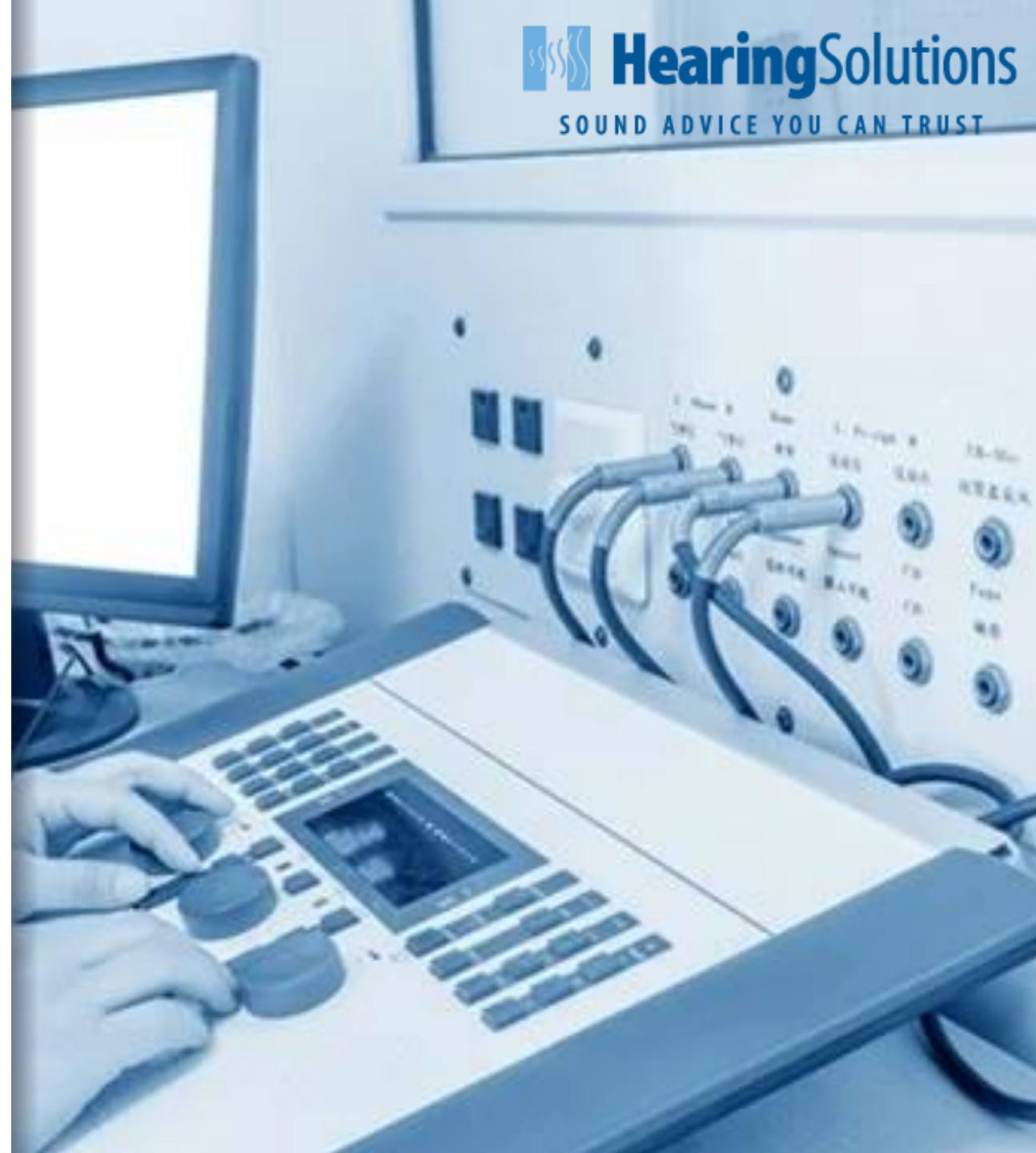
Hearing instrument penetration rates in the United States are estimated at between 25-33% (Amlani, 2010; Abrams & Kihm, 2015; Grundfast and Liu, 2017).

Delays in hearing instrument acceptance estimated between 9.5 and 12.4 years between identification of loss and device uptake (Abrams & Kihm, 2015, Kochkin, 2013)

Therefore, my vision is to promote increased hearing aid acceptance:

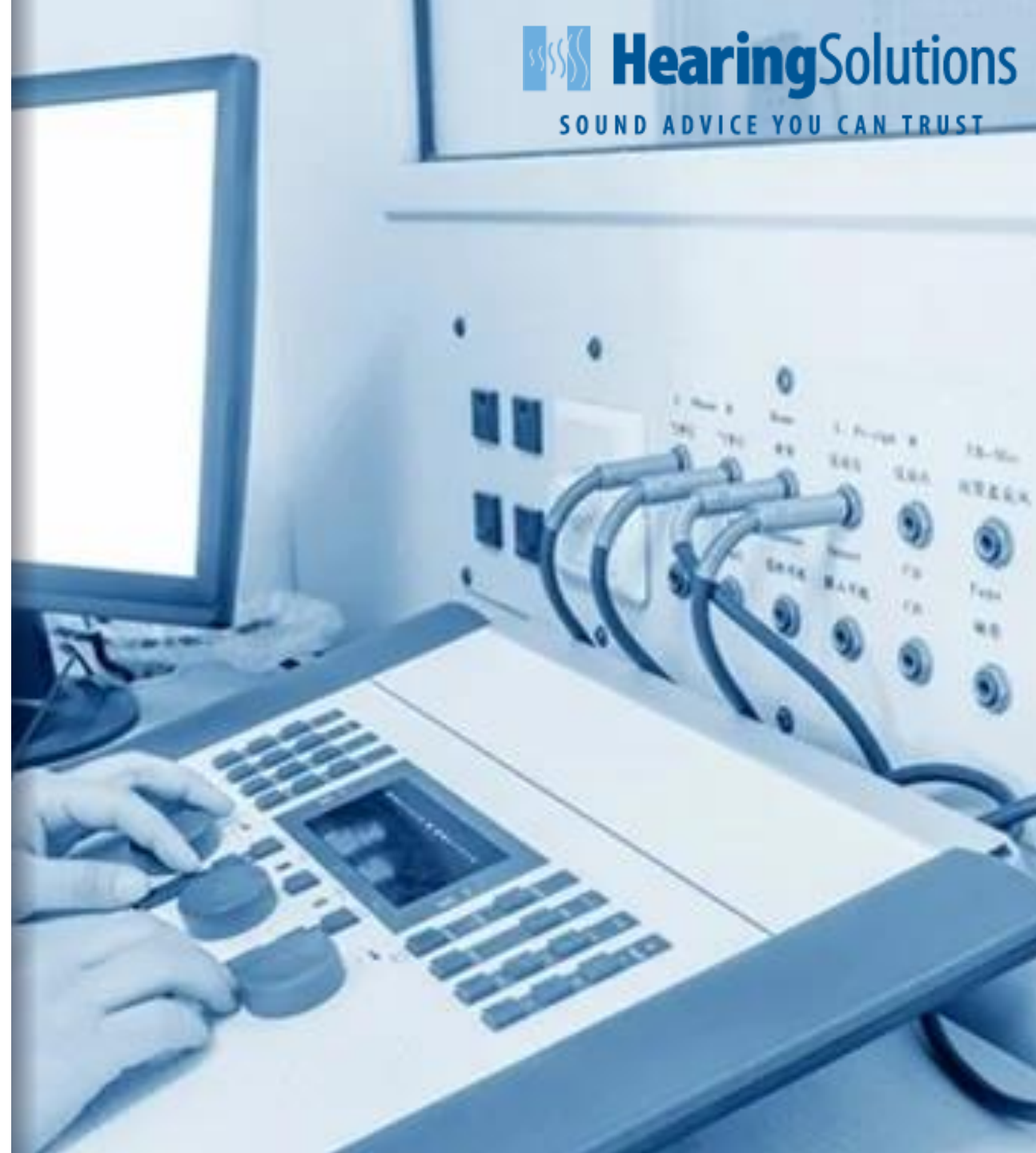


Audiology Traditionally Focused on:



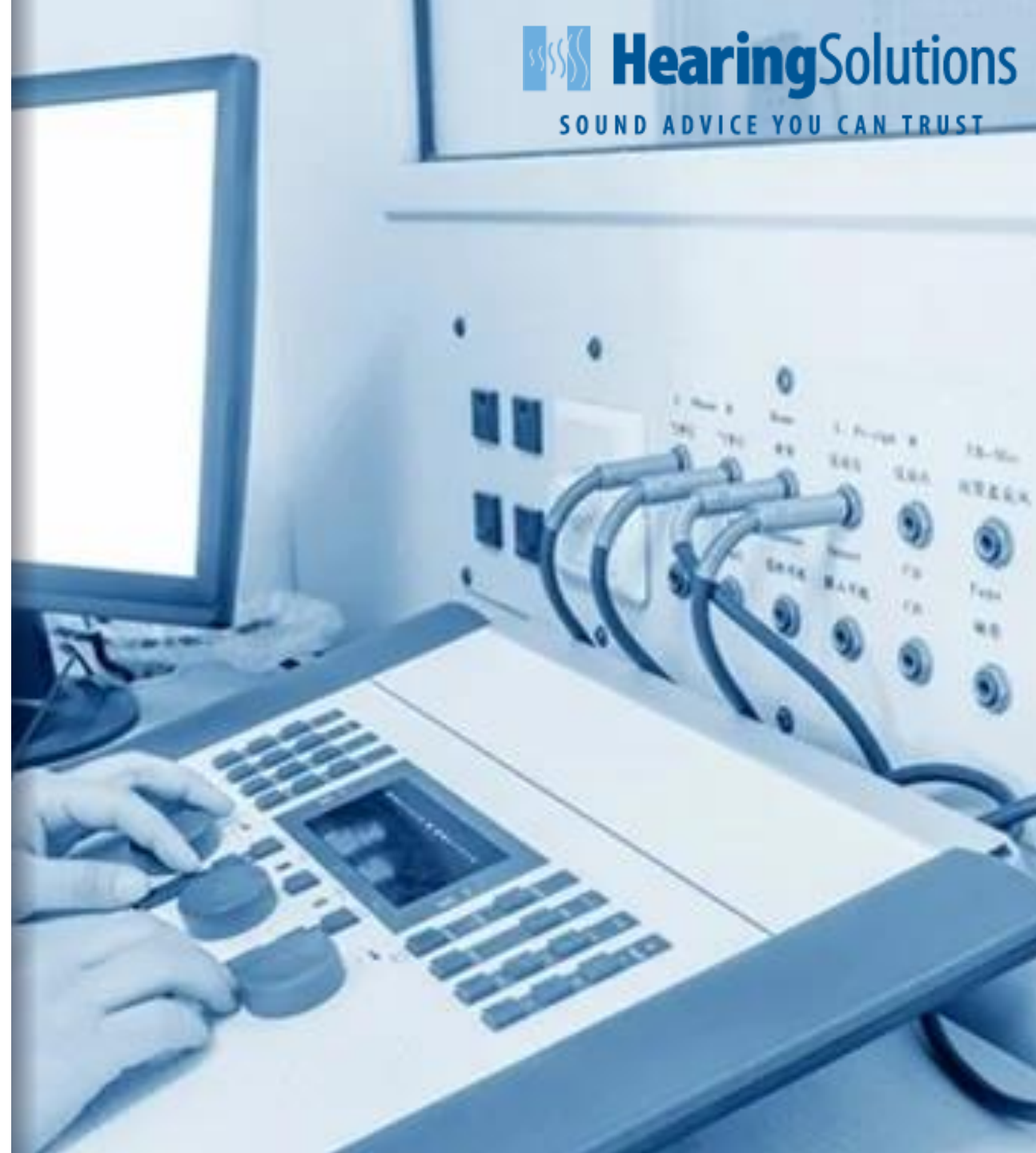
Audiology Traditionally Focused on:

- Diagnostics
-



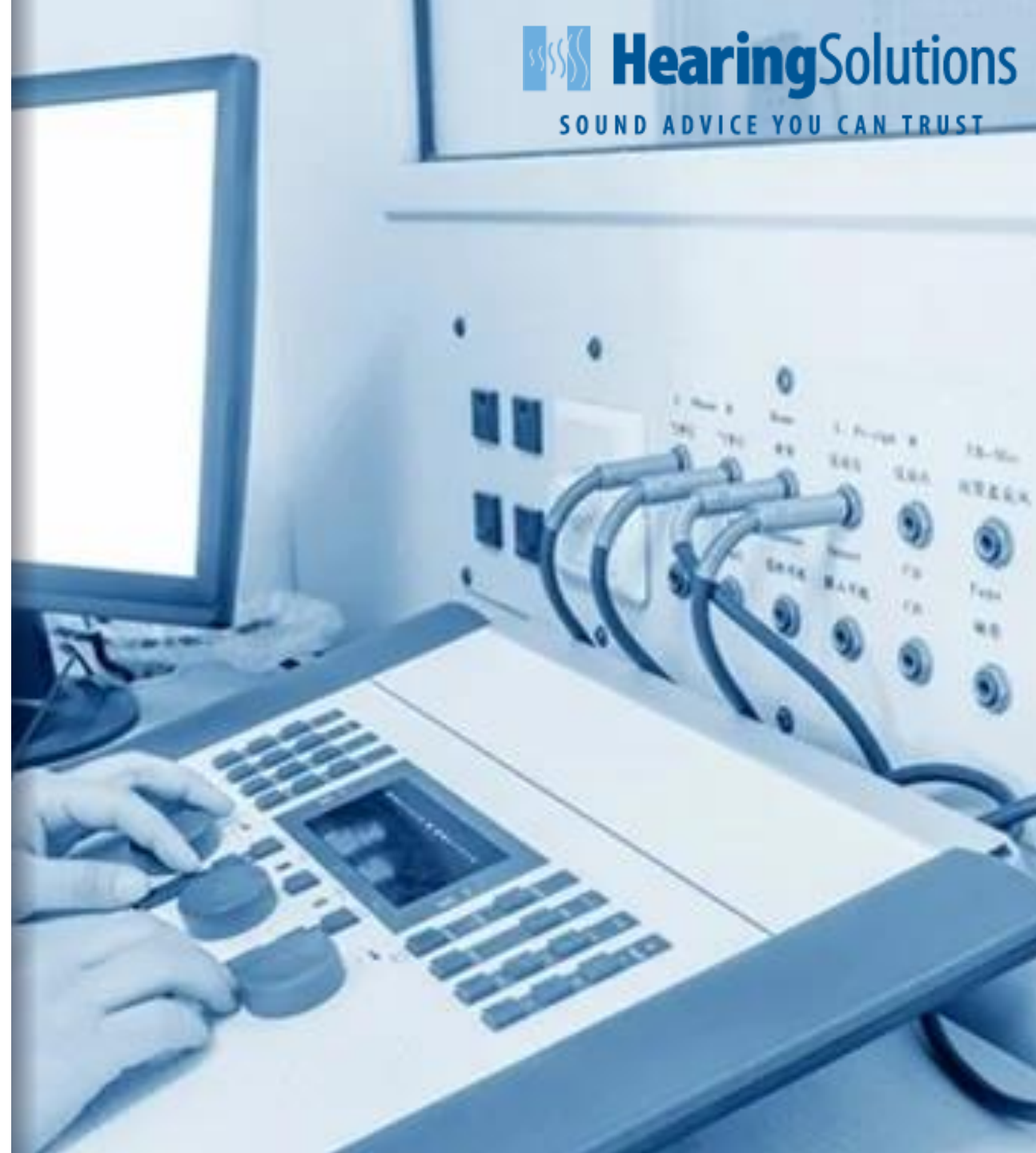
Audiology Traditionally Focused on:

- Diagnostics
 - Amplification
-



Audiology Traditionally Focused on:

- Diagnostics
- Amplification
- Counselling / Lifestyle

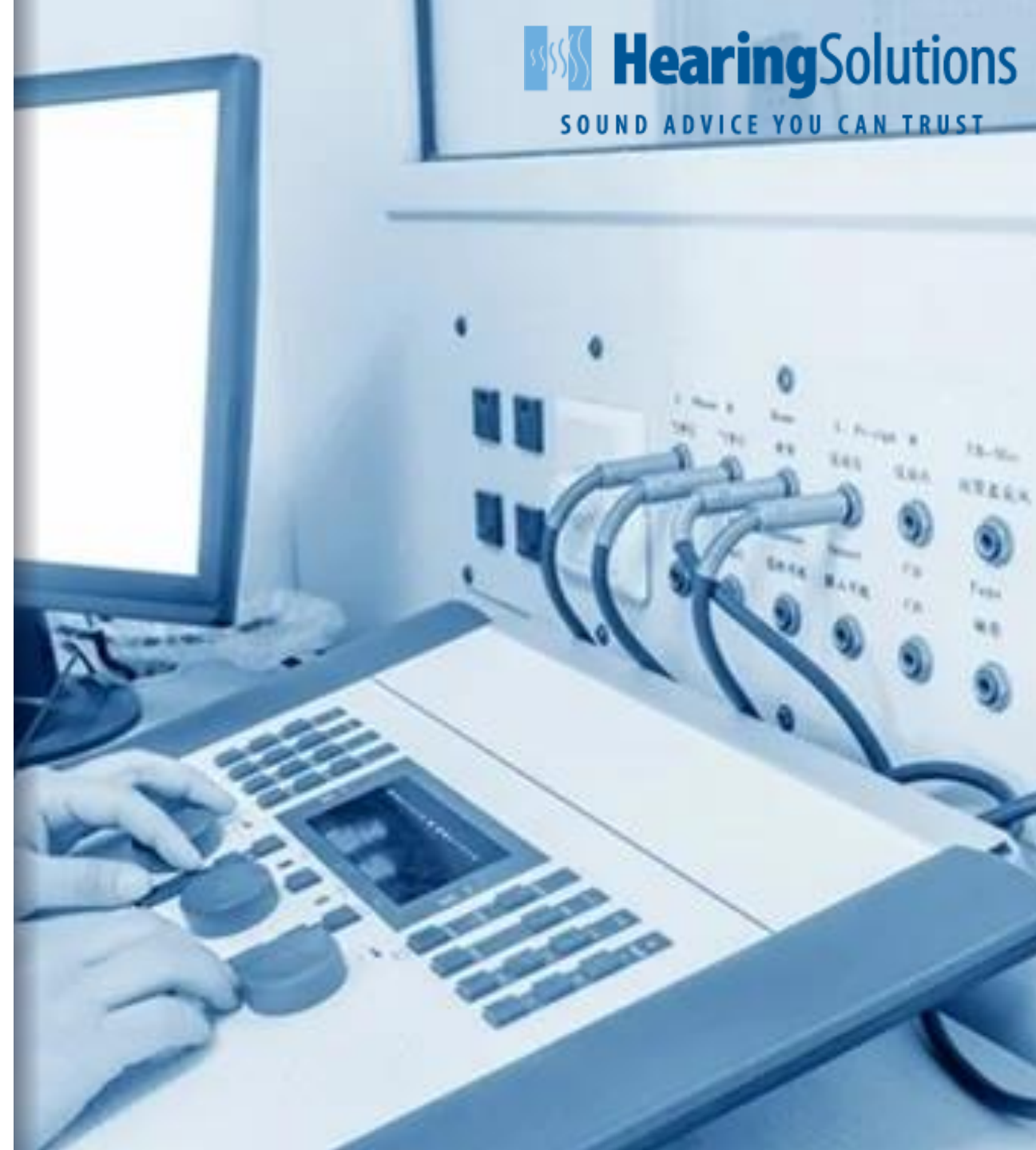


Audiology Traditionally Focused on:

- Diagnostics
- Amplification
- Counselling / Lifestyle

“they don't have much care...they test your hearing and what levels you've lost and then its straight away its on to hearing aids”

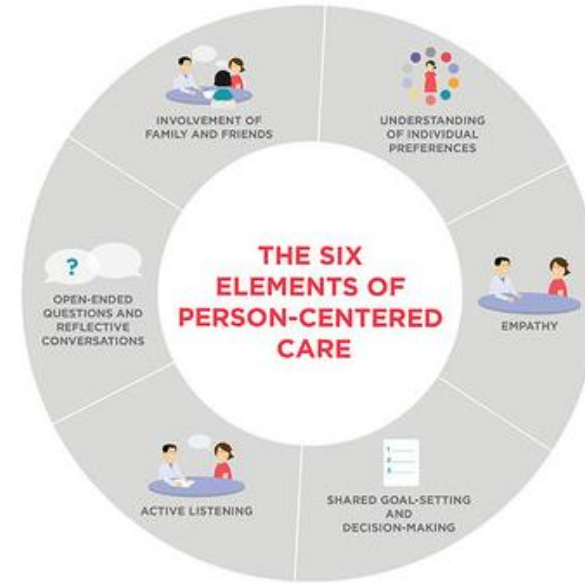
Greness et al (2014)



Audiology moves beyond the audiogram:

- Profession moves more away from paternalistic approach
- QoL impacts
- Patient/Person Centered Care
 - Family Centered Care
- COM-B
 - Capability, Opportunity, Motivation

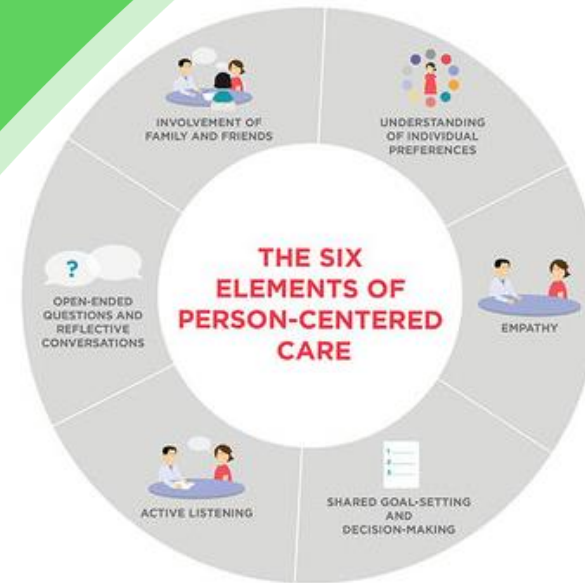
What is person-centered care?



Audiology moves beyond the program:

- Profession moves more away from paternalistic approach
- QoL impacts
- Patient/Person Centred Care
 - Family Centred Care
- COM-B
 - Capability

Person-centered care?



Still somewhat of a narrow focus:



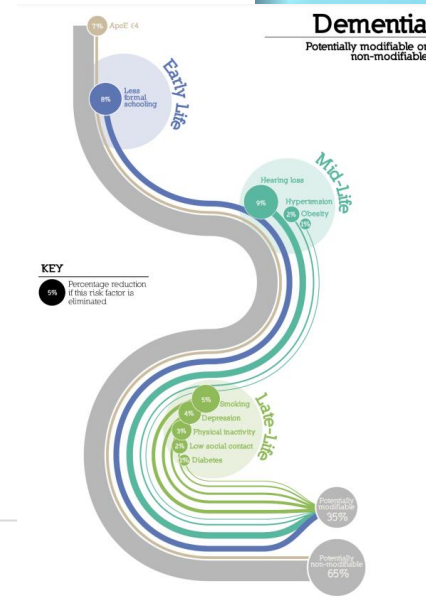
Audiology & Comorbidities:

- Frank Lin/ Johns Hopkins

Lin FR, Yaffe K, Xia J, Xue QL, Harris TB, Purchase-Helzner E, Satterfield S, Ayonayon HN, Ferrucci L, Simonsick EM; Health ABC Study Group. Hearing loss and cognitive decline in older adults. JAMA Intern Med. 2013 Feb 25;173(4):293-9.

- Lancet 2017

Livingston G, Sommerlad A, Orgeta V, Costafreda SG, Huntley J, Ames D, Ballard C, Banerjee S, Burns A, Cohen-Mansfield J, Cooper C, Fox N, Gitlin LN, Howard R, Kales HC, Larson EB, Ritchie K, Rockwood K, Sampson EL, Samus Q, Schneider LS, Selbæk G, Teri L, Mukadam N. Dementia prevention, intervention, and care. Lancet. 2017 Dec 16;390(10113):2673-2734.



Audiology embraces wellness:

LONG-TERM STUDY IS FIRST TO SHOW

Hearing Affects Everything Between Your Ears.

HEARING LOSS → SOCIAL ISOLATION → COGNITIVE DECLINE

• A WAKE-UP CALL TO ADDRESS HEARING LOSS NOW •

NO HEARING LOSS **TREATED HEARING LOSS** **UNTREATED HEARING LOSS**

HEARING AIDS REDUCE RISK OF COGNITIVE DECLINE*

It's Your BRAIN that hears.
NOT YOUR EARS.

Your ears and brain work together as a system. Your brain performs 4 key tasks when you listen...

Orient	The brain constantly uses both ears to orient itself and know what's happening in the environment.
Recognize	The brain depends on its ability to recognize a sound in order to make sense of it.
Focus	The brain uses both ears to focus on what's important, especially in noisy sound environments.
Separate	The brain separates relevant sounds from competing noise.

BrainHearing™ technology supports the work done by your own unique hearing brain.

Give Your Brain Exactly What it Needs to Hear...

BrainHearing™ technology:

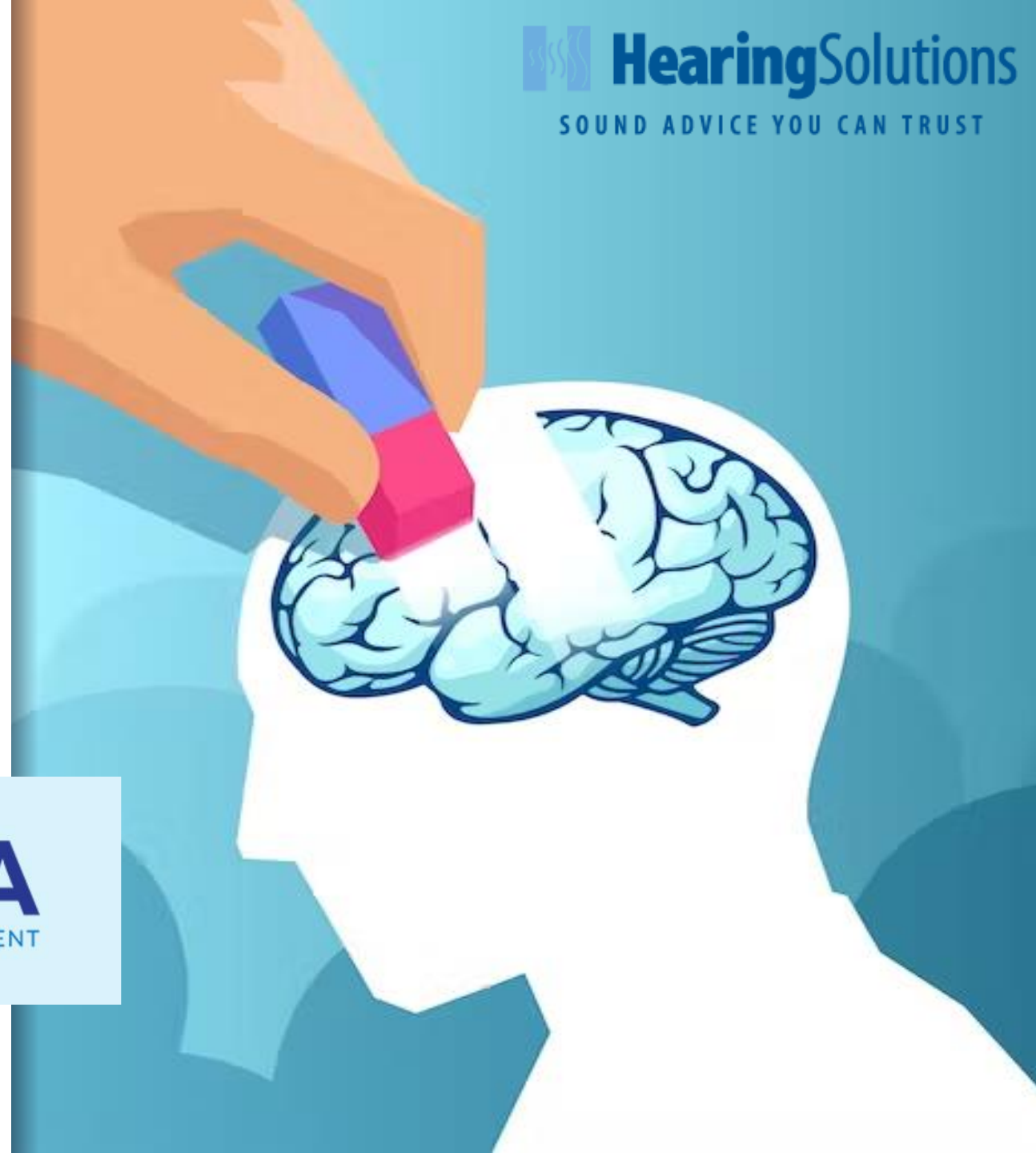
- Helps both ears work together
- Recognizes and preserves natural speech
- Separates speech from background noise
- Coordinates how sound is best understood by your brain

...Instruments with BrainHearing™ technology.

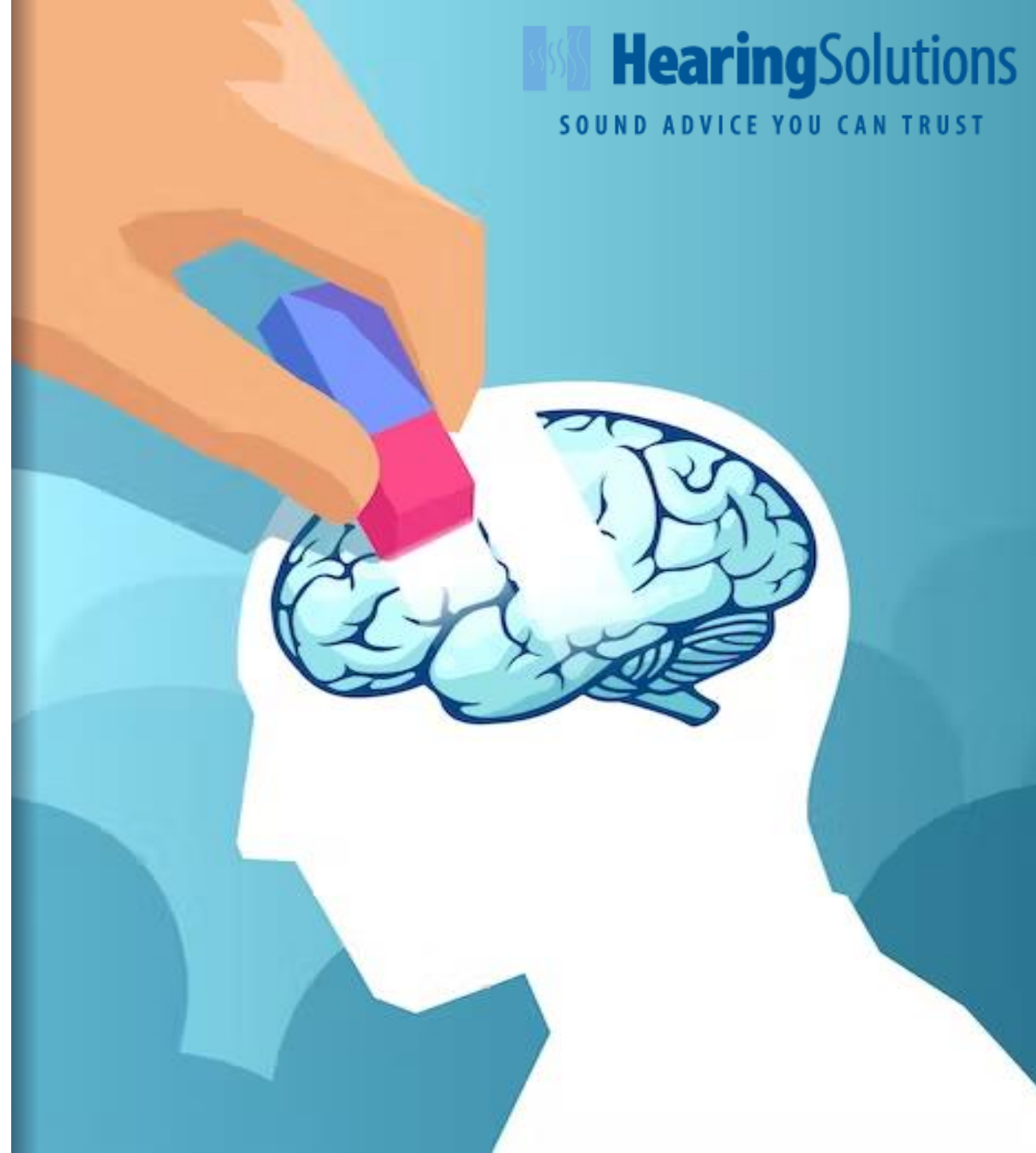
Work with your hearing care professional to see which Oticon hearing instrument is right for you. Visit [BrainHearing.com](https://www.brainhearing.com) for more information.

oticon
PEOPLE FIRST

MoCA
COGNITIVE ASSESSMENT



Audiology embraces wellness:



Audiology is embracing a broader view



Want to avoid the risk of operating in a silo:





New 2021-2022 advances in Audiology medical management of diabetes

- CDC designs new infographic for Take Charge of Your Diabetes: Healthy Ears
- The CDC and American Diabetes Association recommend baseline and annual hearing testing for persons with diabetes
- North Carolina Diabetes Advisory Council adds audiology baseline hearing tests and balance screening to the state's diabetes guidelines for 2021



Healthy Ears

Did you know that diabetes can harm your hearing and your balance? The good news is you can take steps to hear well and reduce your risk of falls. You've already taken an important step by finding this guide!

Tips to Keep Your Ears Healthy

- **Make an appointment with a health care provider called an audiologist (aw-dee-OL-uh-jist) to check your hearing and balance as soon as you are diagnosed with diabetes.**
 - Bring a list of your medicines and any illnesses and hospitalizations.
 - Your audiologist will look at your history and test results to help you prevent or deal with ear problems.
 - Your audiologist can tell you ways to protect your hearing and balance. For example, you can:
 - Wear ear protection around loud noises like lawn mowers, leaf blowers, and chain saws.
 - Not clean your ears with objects like cotton swabs, pencils, or paper clips.
 - Eat a healthy diet. You can work with a dietitian or diabetes educator to create a healthy eating plan.
- Ask your doctor or pharmacist if any of your medicines could harm your hearing. Share this information with your audiologist.



- **Visit your audiologist right away if you:**
 - Hear ringing or other noise in your ears or head.
 - Have problems hearing or maintaining your balance.
 - Become dizzy, fall, or feel worried you could fall.
 - Have a sudden change in how clearly you can understand what people are saying.
 - Have trouble understanding what people are saying because of background noise.
 - Feel like people are mumbling when they talk to you.

Regular exams help your audiologist find and treat ear problems early to protect your hearing and balance. Find a provider in your area at the [American Academy of Audiology website](http://AmericanAcademyofAudiology.org).



Centers for Disease Control and Prevention
National Center for Chronic Disease Prevention and Health Promotion

How Can Diabetes Harm Your Ears?

- Diabetes damages small blood vessels in your inner ear and your vestibular (ve-STIB-yuh-ler) system, which is the part of your inner ear that helps with balance.
- Diabetes can make it harder for signals related to hearing and balance to get to your brain.
- Hearing loss is more common in people with diabetes.
- You are more likely to fall if you have diabetes because of damage to your vestibular system.

What Are the Signs of Balance Problems?

- Feeling dizzy or lightheaded.
- Feeling like your head is spinning.
- Falling or feeling like you may fall.



What You Should Know About Hearing Loss

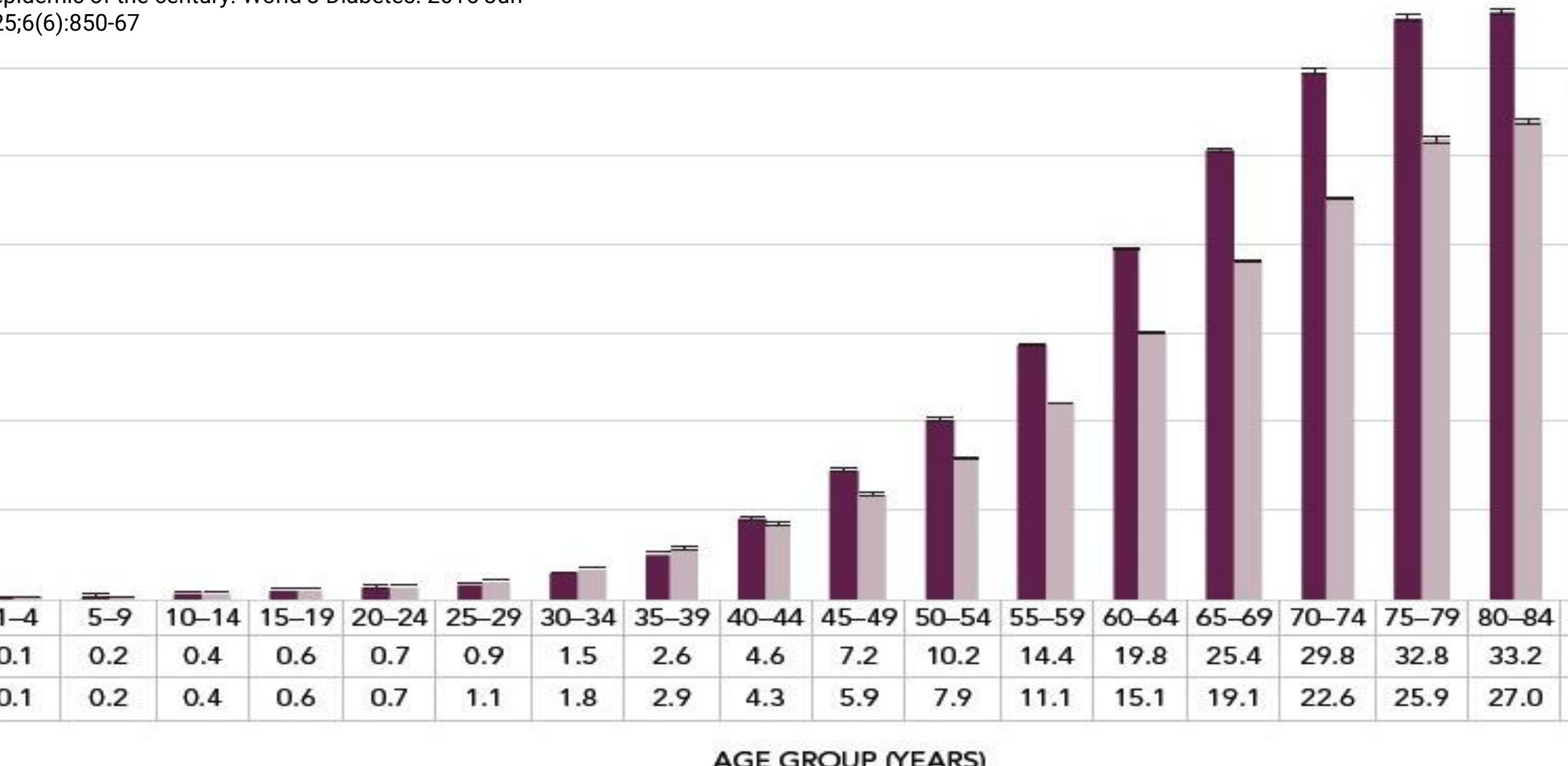
- Hearing loss can make you appear confused or as if you are not paying attention.
- Uncorrected hearing loss can make you feel depressed or anxious.
- Family and friends may be aware of your hearing loss before you are.
- Hearing loss affects how you communicate at work, with family, and with your health care team.

Consider some of the similarities between Hearing Loss and Diabetes in that context

- Highly Prevalent
- Negative Outcomes
- Known Treatment
- Mixed Compliance

9.6% of Adult population

Kharroubi AT, Darwish HM. Diabetes mellitus: The epidemic of the century. World J Diabetes. 2015 Jun 25;6(6):850-67



Hearing loss is higher among those with diabetic retinopathy

Comprehensive Eye Exam

Retinal plaque signals obstructive vascular disease of the heart or carotid artery. ²⁴

Diabetic retinopathy is associated with early kidney disease-Albuminuria. ²³

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

Vision loss due to diabetes is associated with major depression. ¹⁷

Diabetic retinopathy is associated with periodontal disease. ¹⁸

Worsening diabetic retinopathy is associated with elevated diastolic blood pressure. ¹⁹

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

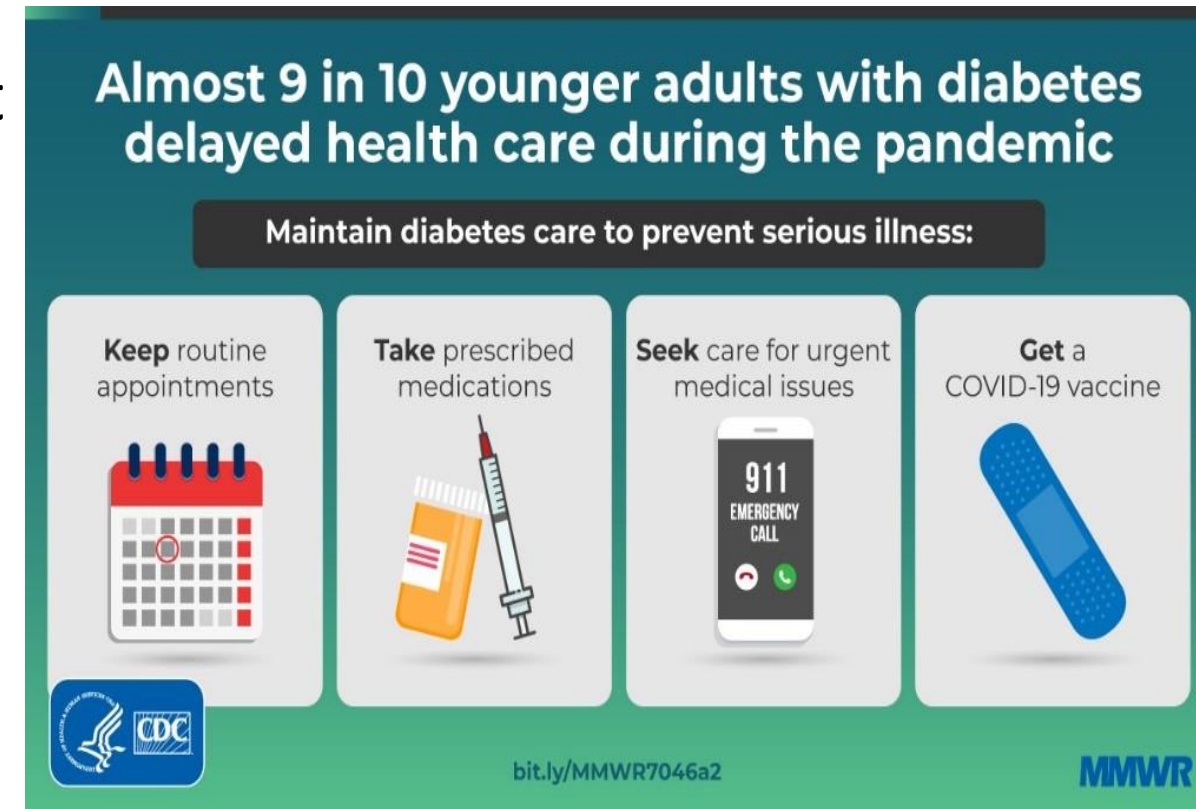
Reduced corneal sensitivity, dry eye, and ocular muscle palsies are early indicators of diabetes and associated neuropathies. ²¹



References available by request:
Michael R. Dueñas OD, FNAP,
AOA Chief Public Health
Officer, mduenas@aoa.org

Diabetes Education Specialists Focus

- **Blood sugar numbers:** equipment selection, timing and frequency of testing, target values, and interpretation and use of test results.
- **Food:** how food affects blood sugar and how to make food choices.
- **Physical activity:** developing a plan that balances food and medication with their level of activity.
- **Medicines:** how to inject insulin, how diabetes pills work and when to take them.
- **Dealing with stress**



Compliance

- 60-80% Insulin
- 65-85% Oral Medications

Alqarni AM, Alrahbeni T, Qarni AA, Qarni HMA. Adherence to diabetes medication among diabetic patients in the Bisha governorate of Saudi Arabia - a cross-sectional survey. Patient Prefer Adherence. 2018 Dec 24;13:63-71.



Diabetes

- Hearing loss twice as common in those with diabetes
- Chronic condition with gradual onset (similar to hearing loss)

Besser et al (2018); NIH (2004)

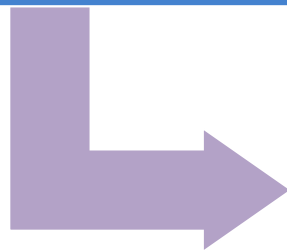


Weakened immunity with advancing age...

Increased prevalence of
chronic disease



Ototoxic medications
more common



Increased prevalence
of hearing loss?

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

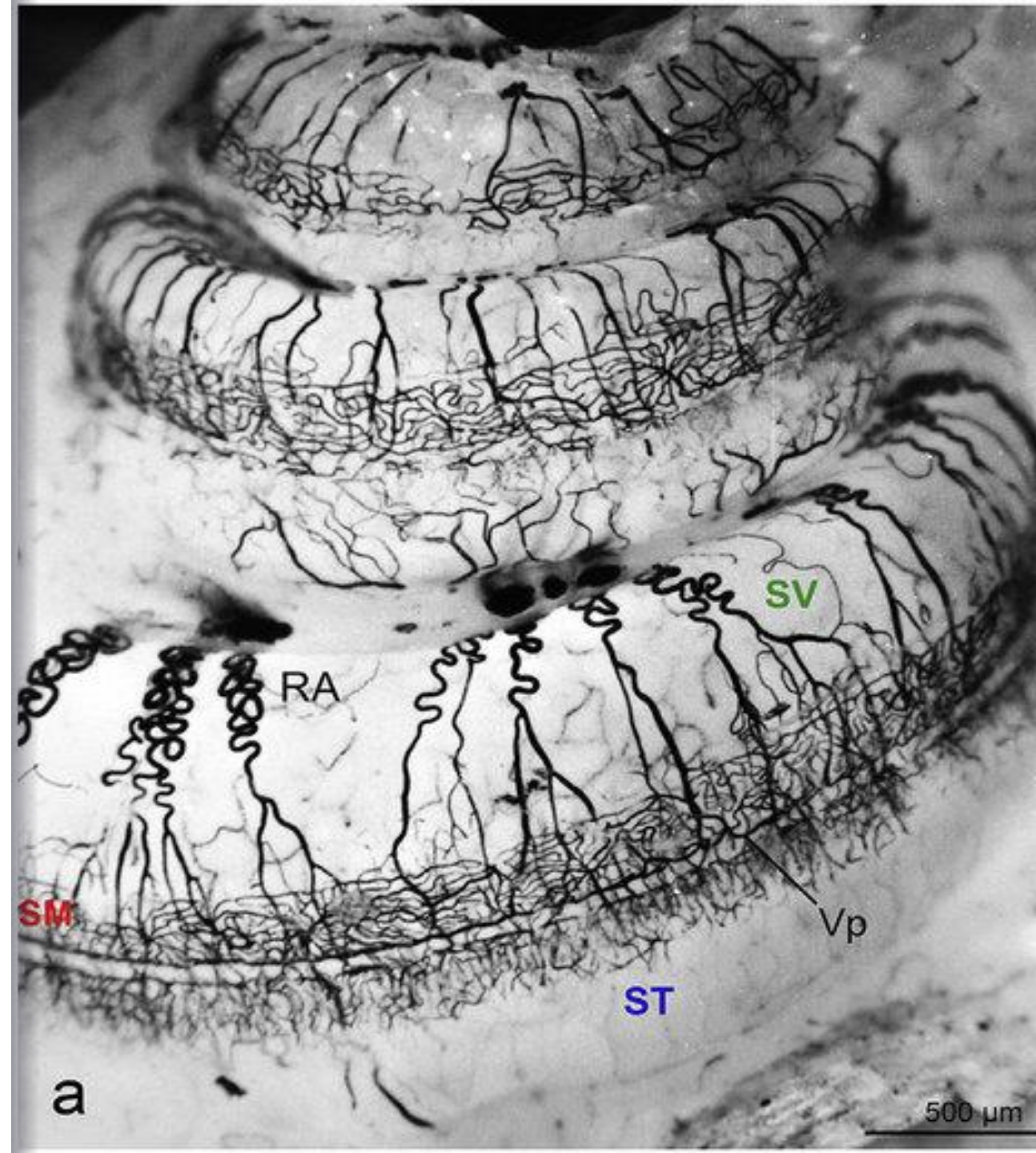
A Confounding Factor

- Anosognosia: inability to know you are sick or have a sensory impairment
- Patient “denies” illness
- Lack of self-awareness
 - Spouse and family notice first
- Not denial but true neurological deficit



Primary Mechanisms

- Microangiopathy -small blood vessel changes secondary to elevated blood sugars
- Same mechanisms responsible for diabetes role on eye, kidney and foot





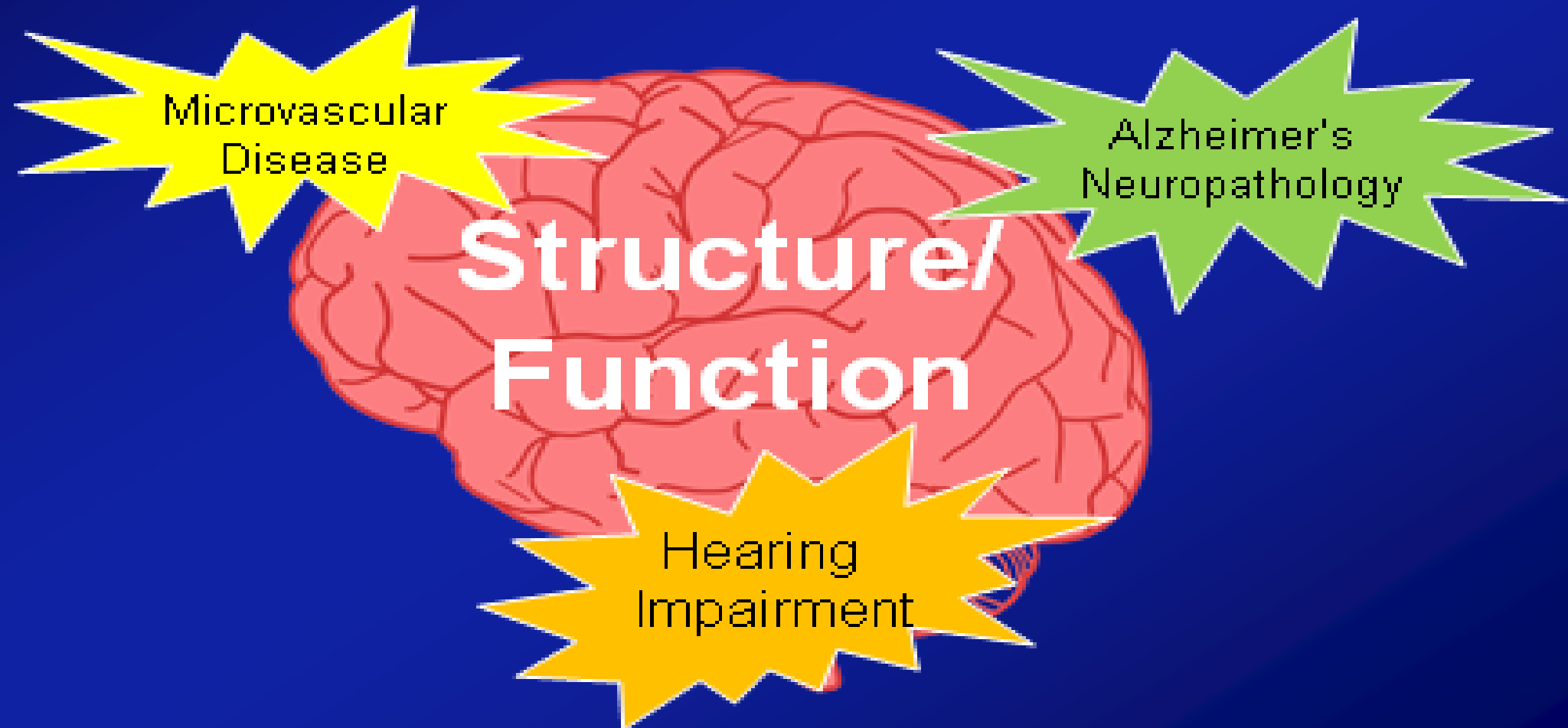
Retina

A diagram of a human eye in cross-section. A beam of light enters from the right, passes through the cornea and lens, and is focused onto the retina at the back of the eye. A label 'Retina' with a pointer indicates the location of the retina on the back wall of the eye.

The retina is the light-sensitive tissue at the back of the eye.
A healthy retina is necessary for good vision.

Double Hit Theoretical Model

Hearing Loss & Brain Structure/Function



Consequences of Hearing Loss

Symptoms

- 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

Falls

- 28-35% of people 65+ fall each year
- 32-42% of people 70+ fall each year

WHO(2007)

- Increased incidence of falls for every 10dB of hearing loss
- 25dB = 3x risk

US Centers for Disease Control & Prevention, Lin & Ferrucci (2012), NIH (2004)

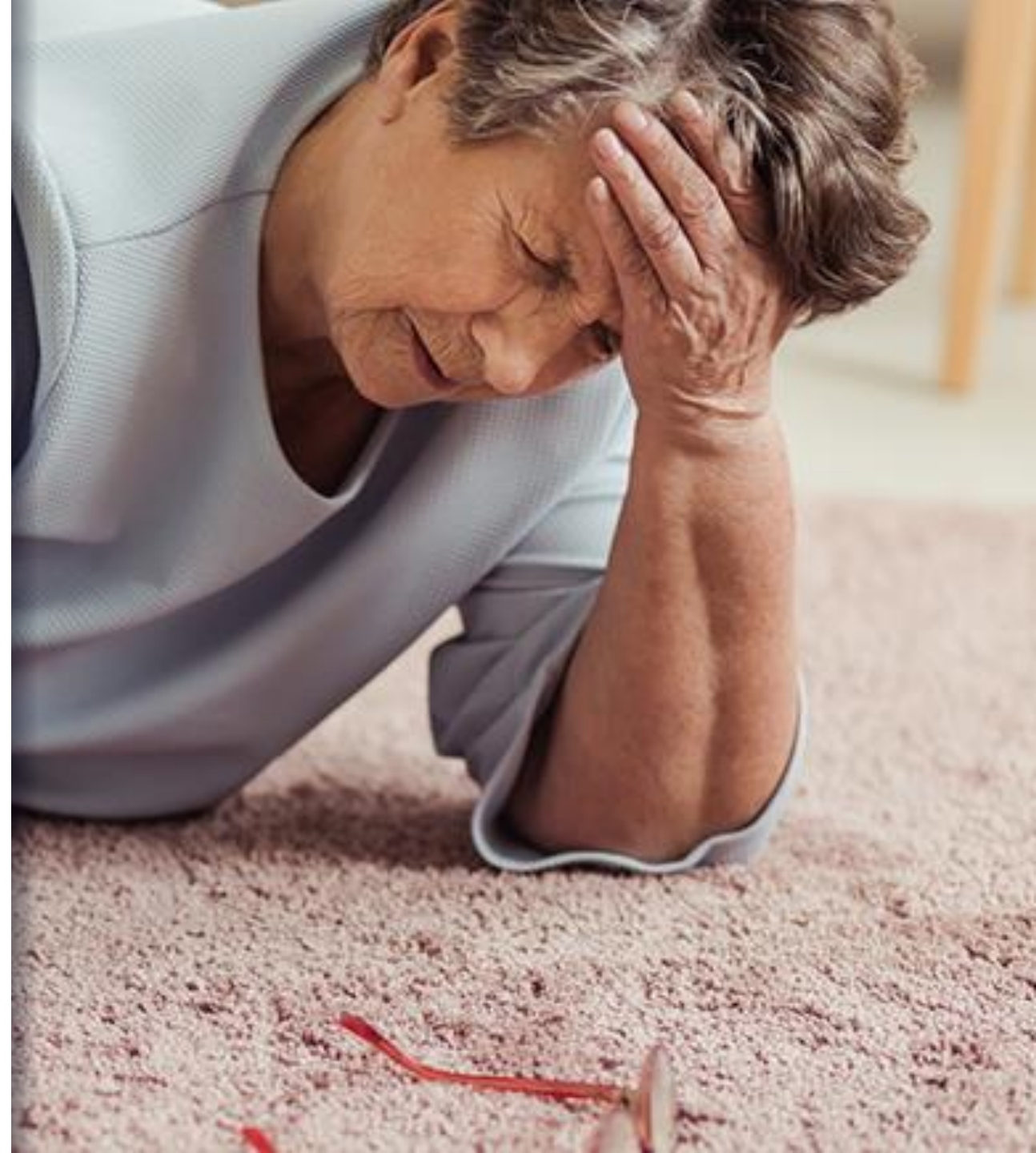


Falls

- Decreased special awareness
- Increased cognitive load

WHO(2007); Abrams (2015)

- *Factors are complex and interrelated!*

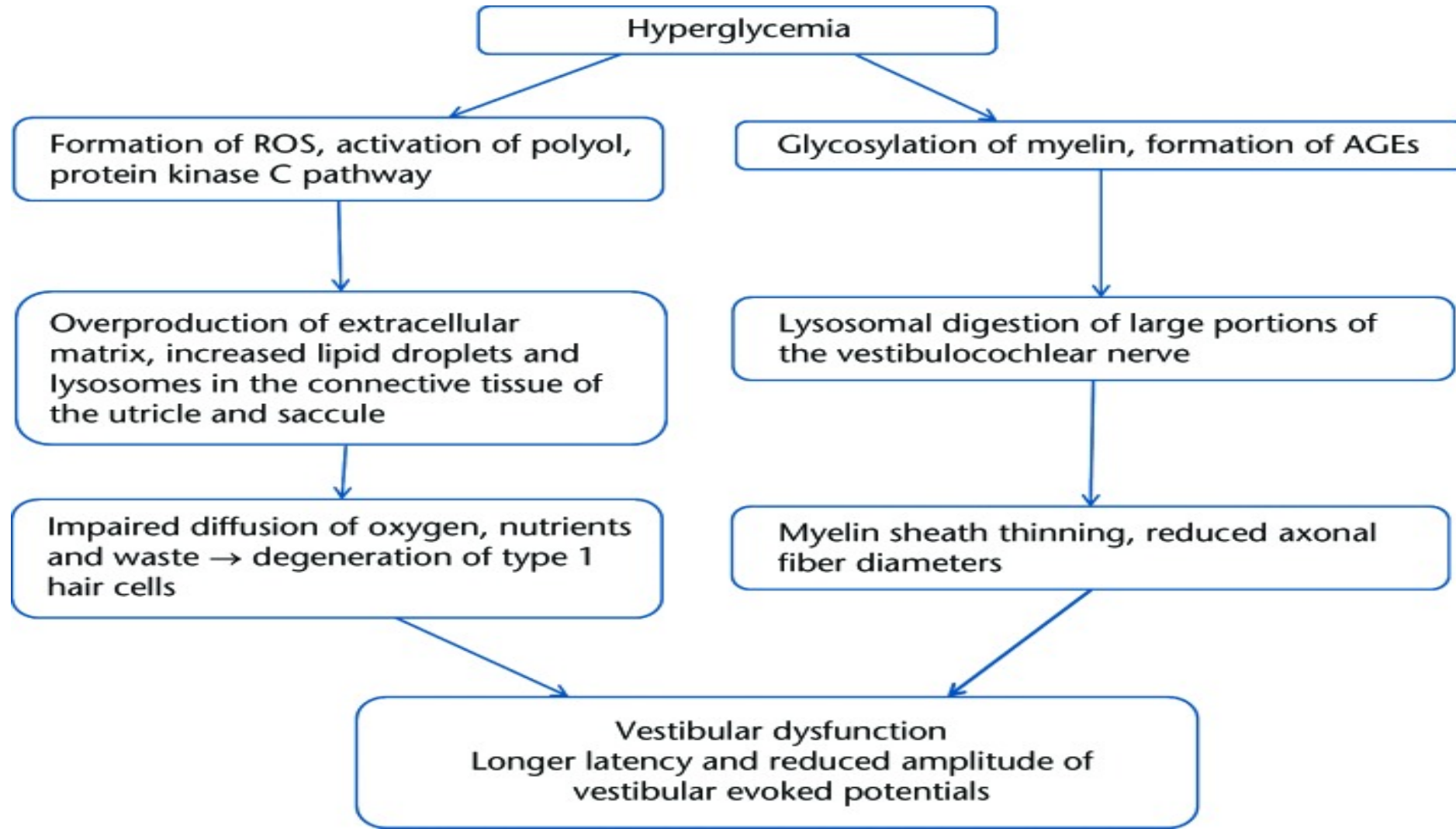




Fall risk: where does vestibular impact occur

44

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



Risk Factors for Falls

EXTRINSIC | Factors

- Lack of stair handrails
- Poor stair design
- Lack of bathroom grab bars
- Dim lighting or glare
- Obstacles & tripping hazards
- Slippery or uneven surfaces
- Psychoactive medications
- Improper use of assistive device

INTRINSIC | Factors

- Advanced age
- Previous falls
- Muscle weakness
- Gait & balance problems
- Poor vision
- Postural hypotension
- Chronic conditions including arthritis, stroke, incontinence, diabetes, Parkinson's, dementia
- Fear of falling

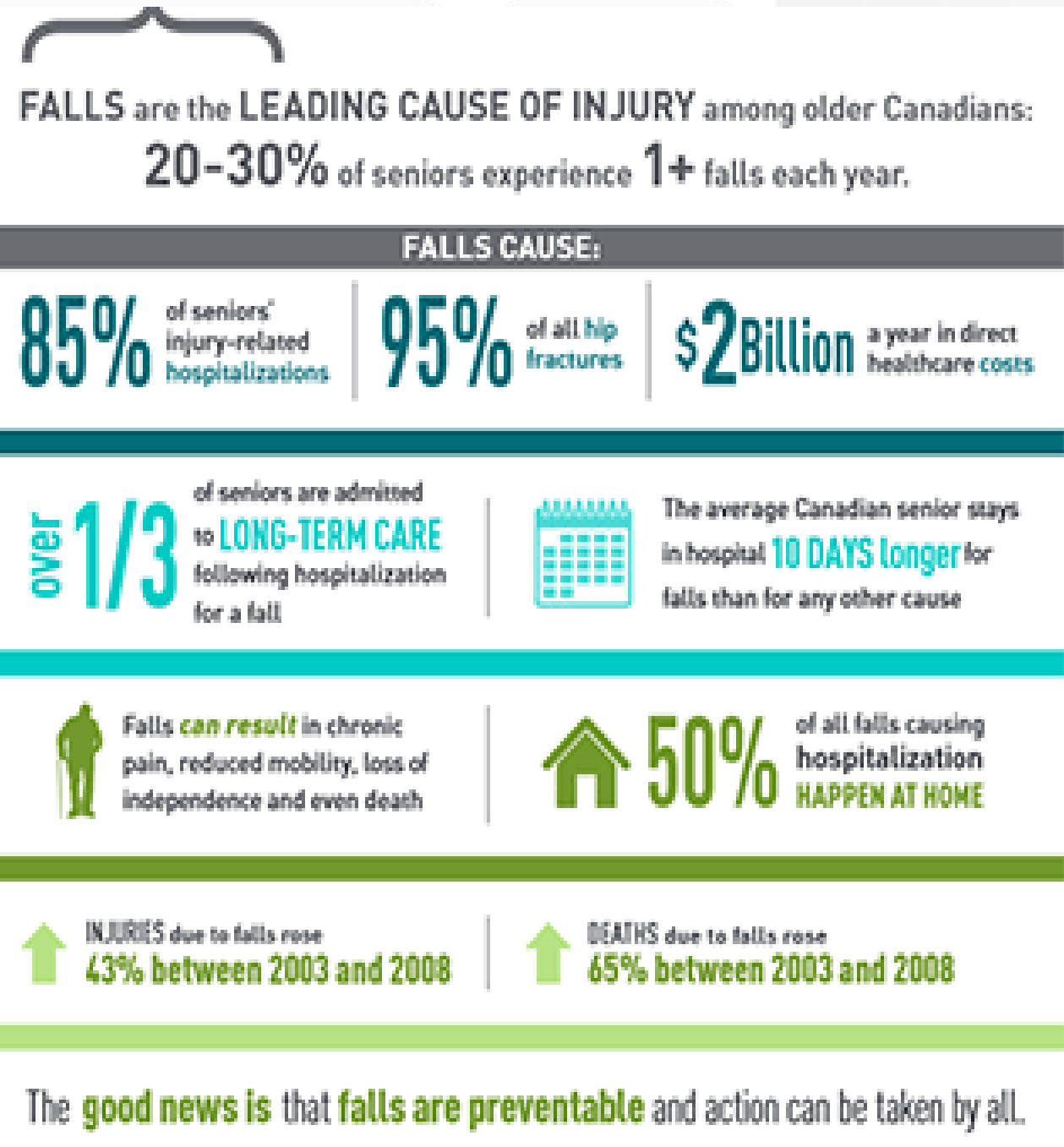
Risk Factors for Falls with Diabetes

Effective clinical and community interventions exist for the following fall risk factors:

- Vestibular disorder/poor balance
- Vitamin D insufficiency
- Medications linked to falls
- Postural hypotension
- Vision impairment
- Foot or ankle disorder
- Home hazards

CA Fall risk

- Is there awareness of diabetes falls risk?
- Are audiology clinics screening for risk of falls? Download CA fall risk questionnaire from TAP
- Do vestibular audiologist check for foot neuropathy, vision loss during assessment of balance?
- Recommendations for PWD and balance:



Audiology Management and Monitoring



A diagram consisting of a large, light gray arrow pointing to the right. Inside the arrow's tail on the left is a dark gray circle containing the text 'Case History'. To the right of the circle, within the arrow's body, is a bulleted list of factors.

Case History

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

Ototoxic and Vestibulotoxic Drugs

Loop Inhibiting Diuretics

- **Furosemide, ethacrynic acid, and bumetanide** (bumes) Ototoxic effects more acute when medications are intravenous.
- Damages to Stria vascularis. Synergistic effect when administer with other ototoxic medications.

Infection Control

- Aminoglycoside antibiotics are cleared more slowly from the fluids of the inner ear than from blood serum. Therefore, the concentration in perilymph will remain high after the concentration in the blood has fallen off.
- Aminoglycosides have been detected in the cochlea months after final dose administration. The retention of aminoglycosides may account for delayed onset of hearing loss and prolonged susceptibility to noise-induced hearing loss.
- Since aminoglycosides are cleared through the kidneys,

their concentration may stay higher if the patient has renal dysfunction.

Cancer Chemotherapeutics

- **Cisplatin** is a Chemotherapy drug used to treat cancer patients. The hearing loss is bilateral and symmetrical, involving the high frequencies first and the low frequencies.
- Severity of hearing loss depends on the type of tumor, pre-chemotherapy loss, mode of drug administration, renal function, and age.
- Hearing loss is cumulative.

Pain Management

- **Quinine**, with it's increasing popularity for the treatment of nocturnal leg cramps makes quinine ototoxicity a relevant clinical problem. The hearing loss is typically mild to moderate and bilaterally symmetric. Low serum quinine concentrations, which occur

among tonic drinkers, may lead to clinically significant vestibular changes.

- Salicylates and many non-steroidal anti-inflammatory drugs (NSAID's) is ototoxicity manifesting as mild to moderate reversible hearing loss and tinnitus.
- In one study, five patients suffered hearing loss while receiving naproxen, and only two recovered their hearing after discontinuing.
- Tinnitus is an early symptom.
- Congenital permanent hearing loss has been linked to the use of these drugs during pregnancy.

High Risk Factors:

- Impaired renal function
- Prolonged treatment course
- Advanced age (over 65)
- Previous aminoglycoside therapy
- Sensorineural hearing loss
- Occupational noise exposure while taking these medications

Audiology Management and Monitoring

Case History

- Tinnitus/Vertigo – positional-random – how long?
- Falls, Migraines / Autoimmune Disease
- Medications:
ototoxic/vestibulotoxic
www.rxlist.com TAP diabetes Rx list
- Chronic diseases: CKD, CVD, IDDM/NIDDM
- Hospitalizations: infections, trauma/ accidents
- Noise exposure: Home or work
- Hearing Loss / Balance- light-headedness and/or dizzy issues.

Audiology Management and Monitoring



The diagram features a large, light gray arrow pointing to the right. Inside the arrow, on the left side, is a dark gray circle. To the right of the circle, within the arrow's body, is a bulleted list of five items. The circle and the list are the primary visual elements of the diagram.

Hearing Evaluation

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

Audiology Management and Monitoring



Balance Testing

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

Audiology Management and Monitoring

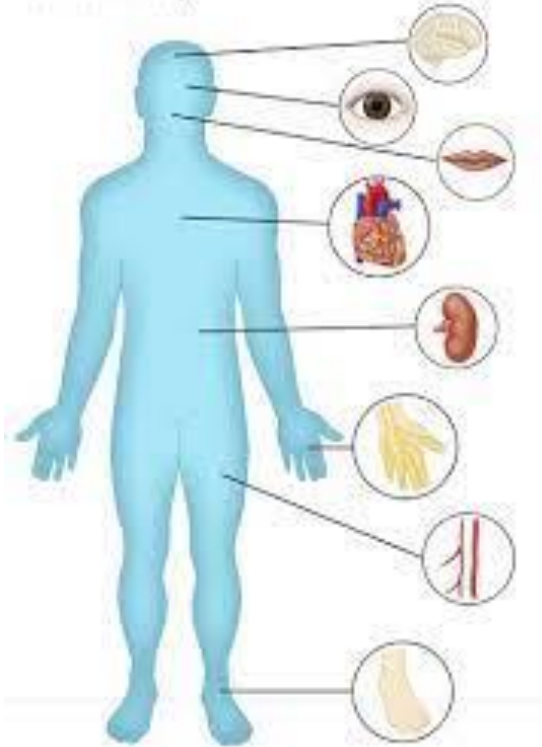


Recommend

- Retest hearing in ____ years due to _____
- Refer for diabetes education
- Amplification
- Refer to Fall Prevention clinic

Advocacy Needed!

Diabetes Can Affect Various Parts of Your Body



Advocacy Needed!



- 130pg document released in 2022
- No mention of hearing or falls



Advocacy Needed!

Search Results

Search For Resource Type

Enter Keyword(s)
hearing



Filter By

Resource Type

☐ Article

Browse 7 Item(s)



Diabetes and **hearing** loss: could your **hearing** be at risk?

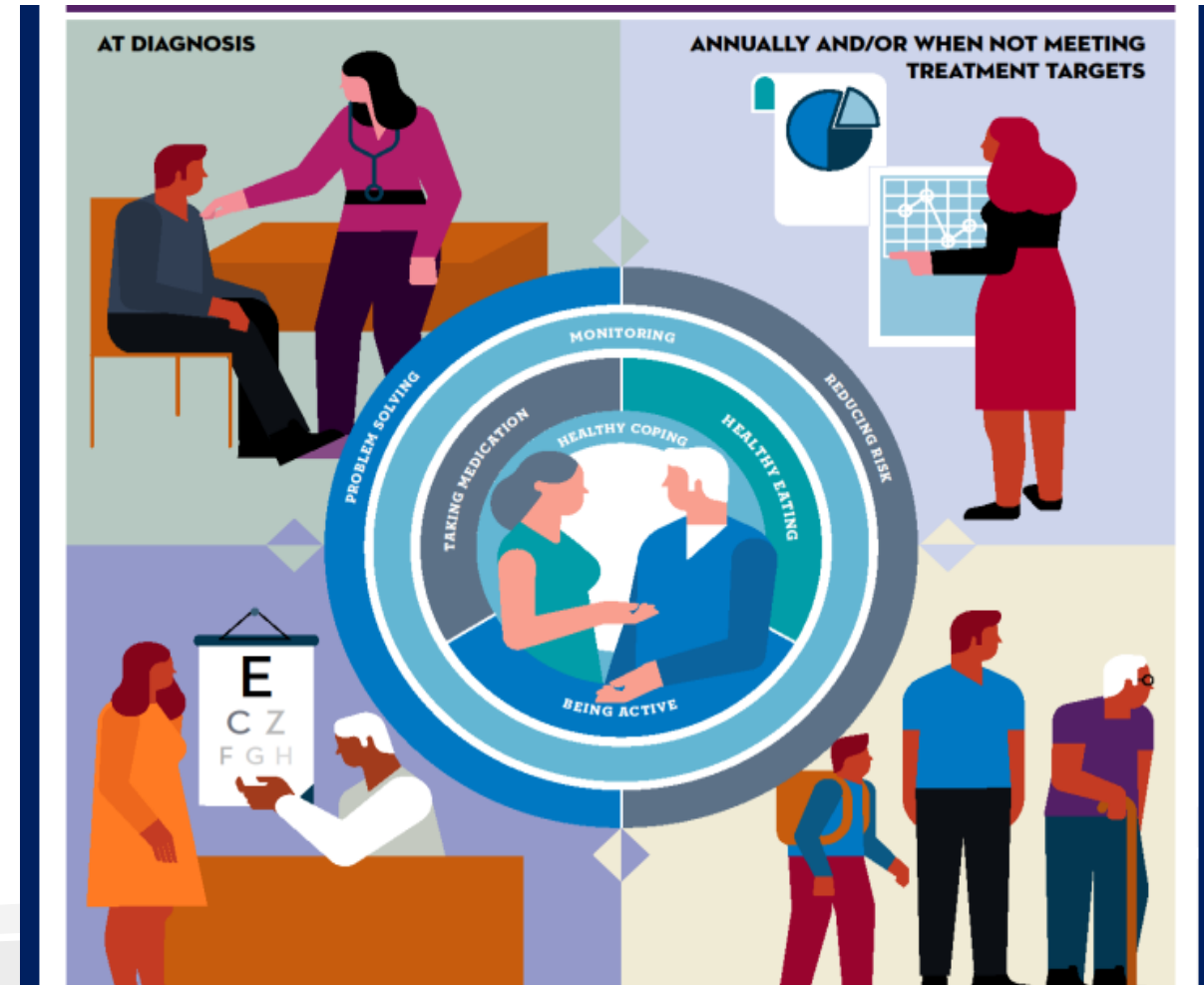
Many people don't know that diabetes is linked to an increased risk of **hearing** loss. This...

Article

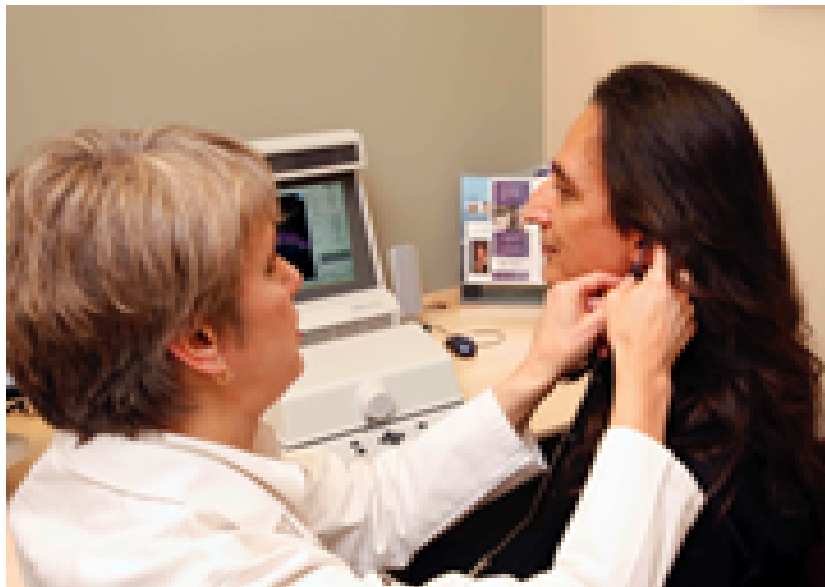
- Diabetes Canada no links

Your Local Medical Providers

- Pharmacy
- Podiatry
- Optometry
- Dental
- Diabetes Educators (graphic)
- Endocrinologists/ENT/Family MD/Internal Medicine



Audiology and PPOD



Align with Pharmacy for oto-vestibulotoxic monitoring

Collaborate with Podiatry for better balance and foot care

Ensure Optometry evaluation to help lower risk of falls

Counsel patients to see the dentist several times a year

Ongoing IPE and IPC with other professions

You need to be an advocate :



Take Aways

Audiology has evolved to encompass a much broader view

- It will continue to do so
- Diabetes is an emerging direction

1



Take Aways

Do not need to be an expert on Diabetes to incorporate it into your practice

- Do need to be conscious to ensure it's a part of the dialogue



Take Aways

Need advocates!

- For patients
- Public
- Stakeholders





Thanks!

Any questions?

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www.theaudiologyproject.com

