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Striking the Right Balance: The Importance of Balance Screening in Persons with Diabetes

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In this edition of "Striking the Right Balance," Michael Vekasi, AuD, R.Aud, Aud(C), FAAA and Kathy Dowd, AuD discuss the importance of balance screening and the role of audiologists for patients with chronic diseases, particularly diabetes.

Michael Vekasi, AuD, R.Aud, Aud(C), FAAA and Erica Zaia, MSc, RAUD are coordinating the "Striking the Right Balance," feature which will cover the latest information on 'all things vestibular.'

If you would like to be more involved in all things vestibular, please check out and like our Facebook page by searching for "CAA National Vestibular Special Interest Group" within Facebook. You can also reach us by email at CAAvestibular@gmail.com.

An overview of diabetes in Canada

Diabetes is a chronic health condition where the human body fails to produce insulin (or fails to use the insulin it produces), which is a hormone produced by the pancreas (Diabetes Canada, 2021).[1] The major action of insulin is to regulate the uptake and metabolism of glucose (Elangovan & Spankovich, 2019).[2] In 2021, it is estimated that 10% of Canadians live with diabetes, while another 19% live with prediabetes (Diabetes Canada, 2021).[1] High levels of glucose in the blood can lead to complications, referred to as diabetes-related complications, and according to Diabetes Canada[1] (2021), include:

- kidney disease
- foot and leg problems
- eye disease (retinopathy)

- heart attack and stroke
- anxiety
- nerve damage
- amputation
- erectile dysfunction

One might notice that hearing loss and balance disorders are not included in the list above but might be indirectly included under ‘nerve damage’. There are groups of audiologists across North America (and even internationally) hoping to change that. Enter ... The Audiology Project (TAP).

An introduction and overview of The Audiology Project (TAP)

The Audiology Project (TAP) started as a non-profit in 2016, after 5 years of conversations between Dr. Kathy Dowd and Dr. Pamela Allweiss, director of Division of Translational Services at the Center for Disease Control (CDC) regarding research connecting hearing loss to diabetes. The CDC Division of Translational Services took a step in 2016 to recommend hearing evaluations by hearing specialists for persons with diabetes. In light of this move and Audiology’s hearing management focus, Salus University hosted a stakeholder meeting for the newly formed TAP and Audiology professional groups in the United States: Academy of Doctors of Audiology (ADA), American Academy of Audiology (AAA), and American Speech and Hearing Association (ASHA). In addition, representatives from the American Optometric Association (AOA), American Certified Diabetes Education Specialists (ADCES) and CDC were invited to attend. Speakers included audiologists Dr. Chris Spankovich, Dr. Robert DiSogra, Dr. Victor Bray and Dr. Richard Gans. Dr. Gans’ presentation on the vestibular effects of diabetes revealed a strong connection of diabetes to hearing effects, BPPV and neural degeneration of the VIII nerve for both sensory organs.

Following this initial meeting, The Audiology Project (TAP) organized a writing team of researchers and experts on hearing, balance, epidemiology, medications and audiology medical management in diabetes care. The expert team collaborations resulted in defining publications in the November 2019 edition of Seminars in Hearing.

In addition, TAP cohort groups were formed for audiologists in states and international countries to:

- Educate audiologists on this new emerging issue in Audiology
- Advocate and educate diabetes medical professionals on the important issue of hearing and balance in diabetes care
- Ensure persons with diabetes are screened and evaluated for the invisible handicaps of hearing and balance

In 2021, following 10 years of outreach to CDC by Dr. Dowd, Audiology is now recognized by both CDC and the American Diabetes Association. Materials now available to audiologists and diabetes professionals include:

- **What No One is Saying: The Impact of Diabetes on Hearing and Balance**
- Diabetes and Hearing Loss | Diabetes | CDC

- Take Charge of Your Diabetes: Healthy Ears | Diabetes | CDC
- Diabetes and Hearing Loss | ADA
- Online hearing screening

Did you know that Canada has its own TAP cohort? For more information about TAP Canada, click here. For more information about The Audiology Project (TAP) in general, including a wealth of resources about diabetes as it relates to hearing loss and balance disorders, click here.

The impact of diabetes on the vestibular and balance systems

The main impact of diabetes on the vestibular and balance systems results from the complications from diabetes affect the sensory systems that are needed for balance, including vision, proprioception, and vestibular (Piker & Romero, 2019).[3] Relating this back to our earlier list of diabetic-related complications, diabetic retinopathy can impact our vision and peripheral neuropathy (or nerve damage) can impact our proprioception. Piker and Romero (2019) indicate that large population-based studies show that diabetes is associated with a greater likelihood of vestibular loss, increased prevalence of benign paroxysmal positional vertigo (BPPV) and a greater risk of falling.[3] Older adults with diabetes have a significantly higher incidence of falls than those without diabetes (Hewston & Deshpande, 2015).[4]

With respect to vestibular anatomy, temporal bone studies of patients with diabetes have shown: (1) an increased presence of free-floating debris in the semicircular canals, indicating an increased probability of BPPV, and (2) significantly less type I vestibular hair cells in the saccule (Elangovan & Spankovich, 2019).[2]

In the audiology or vestibular clinic, statistically significant differences in vestibular function tests were found in patients with diabetes when compared to control subjects without diabetes (Ozel, Ozkiris, Gencer, & Saydam, 2014).[5] More specifically, Elangovan and Spankovich (2019) indicate that the literature suggests patients with diabetes may have prolonged latency and reduced amplitudes for vestibular evoked myogenic potentials.[2]

Role of audiologists in balance screening of persons with diabetes

Audiologists are uniquely positioned to ensure that patients who are diabetic (or have other chronic health conditions that impact the auditory or vestibular system) receive appropriate screening, evaluation, and monitoring of their hearing and balance function. We can educate our patients about the importance for hearing and balance screening (and appropriate follow-up) in this population. We can also educate other healthcare providers who work with this patient population to ensure they are also aware of the need for hearing and balance screening. These healthcare disciplines that come to mind include primary care physicians, diabetes educators, nursing, dietitians, and many other allied health professionals that work directly with persons with diabetes.

Case history questions to ask patients with diabetes

For the non-vestibular audiologist there are some questions that you can add to your case history

toolbelt that will help you determine if additional screening is required, or even if additional referrals are needed. The first and easiest question to ask your patient, which relates to their general health is, "*Have you been diagnosed with diabetes?*" At a minimum, a person with diabetes should be screened for their balance, which can be easily done by any audiologist, whether they work in a vestibular clinic or not.

A recent one-page document, developed by The Audiology Project (TAP) Canada (2021),[6] offers suggestions for additional case history questions for persons with diabetes, and include:

1. Do you suffer from dizziness or poor balance? (please describe without using 'dizzy')

This question helps the audiologist understand if there are concerns that may relate to the vestibular and/or balance system. It helps to identify the need for conducting a balance screening in the clinic, or if the patient should be referred for additional vestibular assessment.

2. Have you fallen? (if yes, how many times, were there any injuries)

This question helps the audiologist understand if the patient is at risk for falling, especially given that once the first fall occurs, the patient is at an increased risk of falling again. You may also want to document when those falls occurred to see if there are any patterns, or if they are recent falls or falls from the past.

3. Have you changed any movement patterns?

This question tells us if something has caused the patient to change the way they move – needing to walk closer to the wall, holding on to furniture as they move around the room, etc.

4. Are you fearful of falling? Do you have to think about your balance?

This question is aimed more at patients who do not have a history of falling, but gives us an idea if something has changed that has made them think they are going to fall, leading them to become afraid of falling.

5. Do you have any numbness, tingling, or loss of sensation in your feet?

This question is aimed specifically at patients with diabetes, as we know that nerve damage related to diabetes can cause peripheral neuropathy. This lack of sensation in their feet would reduce their proprioceptive input (or what the feet tell the brain) for their balance system, putting them at a greater risk for falling.

It should be noted that these five case history questions, with the exception of number 5., are not completely specific to persons with diabetes, but can be used for any patient where there is a want or need to know about their general balance.

Balance screening information for non-vestibular audiologists

If the answer to any of the above five questions (or if the patient indicates they have diabetes), a balance screening should be performed. Piker and Romero (2019) suggest that balance screening

and an evaluation for BPPV is recommended for patients with diabetes.[3] If you are not comfortable performing a balance screening, it is important for you to know who or where you can refer your patient to for a screening (or further assessment).

Balance screening is simple and there are many different tools that can be used for this. Information from The Audiology Project – Canada (2021) indicates that two simple balance screening tools that can be used,[6] include:

- The **Timed Up and Go (TUG)** test, which is an easy-to-use screening test for falls in the older adult population, and
- The **Modified Clinical Test of Sensory Interaction in Balance (mCTSIB)**, another easy-to-use screening tool that assesses balance in adults, but does require a piece of foam for the unstable surface conditions (a 'compliant surface')

Balance Screening Test	Instructional Video	Additional Resources
Timed Up and Go (TUG) test	Timed Up and Go (TUG) Test – Setup and Instruction (Mission Gait, 2020a)[7]	Timed Up and Go (TUG) Test – Toolkit (Mission Gait, 2020b)[8]
Modified Clinical Test of Sensory Interaction in Balance (mCTSIB)	Modified Clinical Test of Sensory Interaction in Balance or mCTSIB (Vestibular Examination) (Vestibular Today, 2020)[9]	Modified Clinical Test of Sensory Interaction in Balance or mCTSIB (Fall Proof Program) (sralab.org, 2013)[10]

Table 1. Balance screening resources

For more information about balance screening information for the non-vestibular audiologist, please see the following resource:

- Balance Screening for Patients with Diabetes: An audiologist's guide to helping patients with diabetes for the non-vestibular clinic (The Audiology Project – Canada, 2021)[6] – a special thanks and acknowledgement goes out to the following colleagues for their contributions to this resource: Nichole Sorensen, AuD; Diane Webber-Hamilton, AuD; Erica Zaia, MSc

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