Audiology: Diabetes in Hearing & Balance Care

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- [Christy] At this time, it is my pleasure to introduce Dr. Kathy Dowd, who will discuss the audiology in diabetes, hearing and balance care. Dr. Dowd has worked to raise the awareness of chronic disease and ototoxic medications that cause hearing loss by instructing diabetes educators, optometrists, and audiologists nationally about this silent and unmet medical need. Her background in audiology for 40 years has varied, with educational audiology at local and state levels as well as private practice in ENT and proprietary clinics. Welcome, and at this time, I'll hand the mic over to you.

- [Kathy] Thank you so much, Christy. And welcome to everyone who's joining us this afternoon. And hopefully this will walk you into a great weekend. I became involved with audiology and diabetes care back in 2011. So I have learned a lot. And if you're just now learning about this comorbid condition, it's something that you really have to education yourself on. I assumed some things in the very beginning which I found out to be false. So you have many professionals around you that can help you learn about diabetes and that you can teach about hearing and balance care. So as far as disclosures, we've checked all the copyrights and permissions. And I have no financial restrictions to disclose. What we're gonna talk about today is the pathophysiology of diabetes on the cochlea and the vestibular canals, as well as the neural system, which causes disruption in the perception of hearing and in your balance, or risk of falls. We'll also explain how audiology medical management will ensure the best patient outcomes for diabetes care. And we'll explain how to work towards interprofessional education and collaboration in your state and in your local venue for the inclusion of audiology in diabetes care. So to start with, what is happening in the body with diabetes? Well, the same thing that's happening in the cochlea and the vestibular system is happening throughout the body. It's a term called microangiopathy, which is small blood vessel disease, or SMD. So when you look at the cochlea, there's a disruption in the microvascular system there, as far as neural degeneration. The eighth nerve comes off both the cochlea and the vestibular system going up to the brain. And diabetes is affecting the neural system, not just for the ear and balance system but throughout the body. The other thing that happens is that a person's gonna be more susceptible to

infections when they have diabetes. So you have to be aware of this and look out for this in your patients who may have diabetes. In addition, there's a domino effect with other chronic diseases. It's not unusual for somebody who had cardiovascular disease, and then very late in life to get diagnosed with diabetes. Or vice versa, they have diabetes, and then they get a diagnosis of cardiovascular disease. Chronic kidney disease is another aspect that comes with diabetes, not to everyone, but you have to be on the lookout for it, Alzheimer's and other chronic diseases. So just be aware with your patients to look out for all these chronic diseases that may be linked in some way to diabetes. In addition, it takes nine to 12 years to identify diabetes or prediabetes. So there's a long lag where a person has no idea that they have diabetes or prediabetes, and it's causing disruption in their body or damage to their body. So for example, the dental profession is actually looking at including identifying diabetes with their patients as part of their scope of practice. And I think this is an excellent thing for them to do. When you look at this image here, it shows you for diabetes how every part of your body is affected.

So you see on the left-hand side, there's brain, there's your ears. There's your eyes, your heart, your kidneys, your feet, your tendons, your bones, your blood pressure, your teeth, and again, your brain. Your brain is the receptor for all the neural transmission in your body. That's what tells you what to do. Whether you're standing upright, you're laying down, whether you're hearing correctly, your brain has to be functioning. And this microangiopathy, this disruption in small blood vessels and neural degeneration is happening throughout the body. One interesting fact in the standards of diabetes care is that there's a paragraph about broken bones, how it becomes more, people get more broken boes when they have diabetes, not from osteoporosis or osteopenia, but there is no comment about risk of falls. So that's a question I have. Are the broken bones coming about because the person is at a higher risk for falls? There's been a of discussion over the last five years about hearing loss being associated with advancing age. We had the NASEM report, the National Academy of Science, Engineering, and Medicine, came out with a 400-page report in 2016 stating

that hearing loss was due to advancing age. And there was another task force that also talked about age-related hearing loss. So my sense of what's happening with these chronic diseases is, yes, with advancing age, you get an increased prevalence of chronic diseases because you have a weakened immunity with advancing age. In addition, you are getting more potentially ototoxic medications to deal with pain and infection. The risk of falls is due to losing your vision with diabetic retinopathy, foot neuropathy, where you can't even feel your feet, and then also the vestibular issues that come with diabetes. In addition, there's a increased prevalence of hearing loss, with cardiovascular, with chronic kidney disease, with Alzheimer's, with diabetes. So is it age only that's causing hearing loss and risk of falls? Or is it because you have a weakened immunity, there's an increased prevalence of chronic diseases, and then there's a cascade effect? Why is hearing loss not easily detected? It's impossible to do a observational hearing screening.

You cannot just observe somebody and say, "I think you have a hearing problem." Maybe you could is it was severe. But it's not easily detected. And one confounding factor is called anosognosia, which is the inability for the person to know that they have a sensory impairment. The patient has a lack of awareness, doesn't recognize the signs or the symptoms of the illness. And it's not merely a denial. It's an actual neurological deficit of self-awareness. There's a really good book where I learned about this. It's called "I'm Not Sick, I Don't Need Help!" by Dr. Xavier Amador, who's a psychologist. And he wrote, when he was in his residency, he talked about going into a patient's room who had had a stroke. And he said, "Well, I understand that you don't have any use "of the right side of your body." And she said, "No, no, I'm fine. "I'm ready to go. "I wanna get out of here." He said, "No, you're not able to walk. "You had a stroke. "You can't move the right side of your body." And she said, "No, I'm fine." He said, "Okay, well, just raise your hand up off the bed." And he waited a minute, and nothing happened. And he said again, "Raise your arm up off the bed." And she said, "I did." He said, "No, look at your arm, "and raise it up off the bed." And she looked at her arm, and it didn't raise up. And she looked back at him and she said, "You're

holding it down." He said, "No, I'm not. "I'm on the other side of the bed." He said, "That's due to a stroke." But in her mind, she still had the capacity to physically move her body. She was totally unaware of the stroke effects. So this is what happens with hearing loss. A person with a hearing loss says, "No, my hearing is fine." And it could be because they hear certain aspects of speech. Perhaps they hear all the vowels. They just don't hear the high-frequency consonant sounds, and they hear them at a loudness level that seems normal. So it's not their problem. It's because these young people just don't know how to speak clearly anymore. They mumble. So this is a CDC series of slides on Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults. And in 1994, just to give you some reference, depending on your age, that was when Madonna was invited on "The Late Show" by David Letterman. It was also when the movie "Forrest Gump" was released. It was the founding year for both Yahoo and Amazon.

So this is our reference point. And it shows you on the left-hand side that they started measuring the incidence of diabetes in 1990. They began a Translation Advisory Committee in 1993. And that was to try to control the effects of diabetes. And in 1995, the ADA clinical practice recommendations included a referral of persons with diabetes to doctors of optometry for an annual vision evaluation. So this is your reference point for 1994. Now, wherever you're located, look at your state. And let's just go through the different states and the different years. So 1995, there may still be some states that are missing data, or they have a low incidence. I'm in North Carolina. We're in the Southeastern United States. You see that there is more yellow in the lower part of the United States. '96, it looks like perhaps they didn't collect as much data, or else everything improved. '97, so you see Mississippi and Alabama and Texas as well as Illinois are getting darker orange. Now you have orange coming in. So again, in Mississippi, and I don't know if that's Arkansas or Oklahoma. So the prevalence of diabetes, 6.5% with an increase of, it's an increase of 33% from 1990. '99. So pretty much, by the year 2000, the whole United States, it's starting to be an epidemic with diabetes. So. Just a second here. 2001, oof. Well, there you go, Mississippi and

Alabama. But then also coming into the fray is Louisiana, Tennessee, South Carolina, West Virginia, and now up in Michigan. 2003. 2004. So remember when we started back in 1994, '95, there were still white sections of the United States. And now you're seeing more and more dark orange or dark red. Southeastern United States seems to have the biggest incidence. And North Carolina seems to be going in and out of having the highest incidence. 2008, 2007 and 2008, this is when we're going into the recession. So it's a very stressful time for people around these years. 2009. '10. '11. '12. '13. '14. '15. So now it looks like the majority of the United States is at a high incidence. And remember, too, that it takes nine to 12 years to identify diabetes and prediabetes. So these are the diagnosed incidence of diabetes, or patients with diabetes. It does not include those that are walking around who have not yet been diagnosed. So let me just go into what's happening with diabetes and hearing loss. So with diabetes, you have high blood glucose. And it damages the inner ear. It's called microangiopathy, or small vessel disease, similar to the way that diabetes can damage the eyes and damage the kidneys. And when you look at the small blood vessels, they are throughout the ear. Throughout the inner ear, the vestibular system, you have blood vessels feeding all aspects for the ear. Even on the eardrum, you have a network of small blood vessels. So I'm gonna show you a video in the next slide. And this is gonna explain, now, we don't have these educational teaching materials that they have for vision. But I want you to look at what's happening with vision, just knowing that it's also happening in the cochlea. And the other issue is the cochlea is a little black box. So you could look into the cochlea like you can look into the back of the eye for diabetic retinopathy.

- [Narrator] 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 cause severe vision loss, or even blindness. Diabetic retinopathy is the most common diabetic eye disease and is a leading cause of blindness in persons with diabetes. It is caused by changes in the blood vessels of the retina. The retina is the light-sensitive tissue at the back of the eye. A healthy retina is necessary for good vision. In some

people with diabetic retinopathy, blood vessels of the retina may swell and leak fluid or blood. In other people with diabetes, abnormal new blood vessels grow on the surface of the retina. At first, diabetic retinopathy may not cause any changes in vision. But over time, diabetic retinopathy can get worse. At first, a person might see spots floating in their vision or may notice a general blurring of vision. Eventually, diabetic retinopathy may cause vision loss and even blindness.

- [Kathy] So what is happening in the ears, when you have the small blood vessels growing new tendrils in the ear and in the vestibular system, or leaking blood into the endolymph and the perilymph of the cochlea? Endolymph and perilymph have chemical compositions that actually help aid the synapses of sound sending the signal up to the brain, up the neural pathway. So if you're mixing blood in there, what's happening to the person's hearing? Is it going off and on with this occurrence? And this is what happens with uncontrolled diabetes, when you don't have it under control. So it's very significant. And there is a lot of research on this issue for hearing and balance. The other issue with diabetes is balance. So poor balance contributes to fall risk or the fear of falling. If you have a risk of falls, it contributes to a lack of exercise. And falling leads to potential bone fractures. And it also impedes diabetes care. Because if you're set up to get diabetes education, you're not gonna feel comfortable getting out of your house and walking, or even going to the doctor for follow-ups. Because you're fearful of falling and perhaps breaking a bone. Falls are a very costly medical expense in the United States. So this is why it's very important to know what's causing the risk of falls in diabetes. Now, this is a slide, and it comes from, hold on a second, "Physical Therapy" magazine in 2016, March of 2016. It's talking about, where does the vestibular impact occur? So when you look at hyperglycemia, too much blood in the sugar, what's happening is there's a formation along the protein pathway. There's an overproduction of extracellular matrix and increased lipid droplets and lysosomes in the connective tissues of the utricle and saccule of the vestibular system. There is impaired diffusion of oxygen and nutrients and waste, and degeneration of type 1 hair cells in the vestibular system. And on the right-hand side, you see

hyperglycemia causes glycosylation of the myelin. The myelin is the coverage of the nerve, the myelin sheath of the nerve. So the lysosomal digestion of large portions of the vestibulocochlear nerve, which is the eighth nerve, the myelin sheath thinning, reduced axonal fiber diameters, all of this is causing vestibular dysfunction. There's a longer latency and reduced amplitude of vestibular evoked potentials. And again, when you look at the American diabetes standards of care, it does list bone fractures as a comorbid condition of diabetes, but it does not mention the risk of falls. And I think that's where we need to educate more people on this issue. Chronically high blood sugar levels damage the nerves not only in your extremities but also in other parts of your bodies.

So the damaged nerves won't effectively carry the message between the brain and other parts of your body. When you look at maintaining balance, you have to look at, can the person see in front of them and know where to step and what's on the floor in front of them? Do they have a loss of sensation in their feet? So if they can't feel their feet, they may be stepping on a surface that isn't level, and it will cause them to fall, as well as the vestibular disruption. So it's not just one thing with diabetes. It's your whole body. And when we talk about from an acoustical or a balance system pathophysiology, this signal comes into the ear, or your vestibular system tells you your orientation in space. Are you standing up? Are you laying down? Are you starting to fall? And when you look at the nerve from the cochlea, let me see here. Okay. So, there. Okay. So the nerve comes off the inner hair cells, the outer hair cells, and delivers a synapse, which is picked up by the cochlear nerve. And then it travels. So it travels from the cochlea to the pons, the medulla oblongata. 85% of what you hear in one ear travels to the other side of your body and is perceived on the other side of your head, of your brain. So if you're hearing on the right ear, 85% of the signal goes to the left side of your brain and vice versa. Any impact on the sound synapse occurring in the cochlea or the vestibular system is going to impair the signal that's gonna travel along the nerve. And if the nerve is losing its ability to transmit the signal, then the brain is not gonna get a clear signal. And therefore, it's not gonna tell your body what it

needs to do, if you need to move. So your inner ear can have effects from microvascular damage from diabetes or macrovascular damage from cardiovascular. The auditory pathways, for both auditory and vestibular, is the eighth nerve. And the eighth nerve sends the signal to the brain, to the temporal lobe, the auditory cortex, for your brain to interpret what's going on. In addition, with diabetes, what we have to look at are medications for pain, infections, other diseases, and what is the toxicity for the ear and the vestibular system. When you have neuropathy, although you can't feel your feet, your feet may be burning. They may be hurting. And so you're gonna ask for pain medications. Whether it's aspirin, salicylates, NSAIDs, ibuprofen, these have a potential damaging effect on your ear. Infection-control medications, now, persons with diabetes have a higher risk of infection. And the infection-control medications, which are usually aminoglycoside antibiotics, will have a devastating effect on your hearing and potentially on your vestibular system.

So anyone who is getting a mycin drug, gentamicin, vancomycin, erythromycin, any of those medications that are used to prevent or get rid of infection have a potential to damage your hearing, and not just for the time that you're taking them, but for the notice six months when you stop them. And effects don't go away. It continues to erode your hearing and your balance. When you look at loop-inhibiting diuretics, and usually these are for persons with cardiovascular disease, LASIX and furosemide get rid of the fluid around your heart or the fluid in your extremities. The damaging part of loop-inhibiting diuretics is when you combine them with aminoglycoside antibiotics. When you have both of those in the body at the same time, there's a synergistic damage on hearing and balance. So the physicians need to know about this. The nurse practitioners need to know about this. The audiologists need to monitor this and manage this. In addition, when you look at chemo, cisplatnum, carboplatnum have a deleterious effect on hearing, so again, there are clinical guidelines for ototoxicity noise for monitoring and managing this. And we need to educate physicians about this. So for audiological management of hearing loss, what you wanna do is have a baseline hearing test at the time of diagnosis. Because that's gonna tell you, okay, this is your

starting point. We're at home base. You were just diagnosed. This is where your hearing is right now. And your hearing may be fine. Or maybe you've been working in a very noisy occupation and you already have some damage from noise. But at least we have a picture, a photo of your hearing from a hearing test at the time of diagnosis. If there is no hearing loss on a pure-tone audiogram, it may indicate a need for additional tests, like otoacoustic emissions or speech in noise. The pure-tone audiogram is kind of our standard for diagnosing a hearing problem. However, there could be a hidden hearing loss. And damage is gonna show up on an otoacoustic emission test or a speech-in-noise test. Again, if you're gonna do a baseline, try to include these in that. The case history will tell you all the factors that are influencing potential hearing loss. What has this person been exposed to over the last 15 or 20 years? and then you will have recommendations to the doctor or to the medical professionals that set a rationale for future monitoring and management for this patient. But I wanna make a really clear note here. Always refer for diabetes education. This is something that's covered by Medicare.

So a person who's just diagnosed with diabetes can get up to 10 hours of diabetes education when they're first diagnosed, and it's covered. And so a diabetes educator or educational specialist will teach them how to eat right, how to exercise, how to check their blood glucose levels. All of this is very, very important for the person with diabetes. So when you're taking a case history, and there's a really good article that I just saw today that Dr. Victor Bray did, wrote. It's a holistic approach to managing hearing loss and comorbidities. So although we're talking more about diabetes, all chronic diseases need to be managed. You need to take a really good case history. Because this tells you where did this hearing loss come from or what are all the things that this patient is facing that they're gonna need to manage. What medications are they on or have they been on? If they went in for a hip replacement or a knee replacement, a lot of those artificial joints have gentamicin in them. So is that affecting hearing in any way? What chronic diseases does this person have? Hypertension, high blood pressure, is cardiovascular disease. So something as simple as hypertension, or

high blood pressure, is important to note. And when you take a list of their medications, hopefully they have it written down, they may forget to tell you about a disease, but then you can say, "Well, what are you taking this medication for?" And it may help you to learn that there are additional diseases that are being treated. What hospitalizations have they had in the last 10 to 20 years? Were they in a terrible car accident 15 years ago and they ended up in the ICU for two weeks, comatose? All of this has relevance when we're tryin' to find out what's happened to this person on this initial evaluation, trauma, accidents, fell off the horse, had a sledding accident, ski accident, noise exposure. And some people have occupational noise exposure. But those who don't, then the list is always guns, chainsaws, and leaf blowers. People don't consider that these can damage they hearing. But I had one woman who had a significant loss, and it looked very much like noise exposure. She was a nurse. And she said, "No, I haven't been around any noise." And so I said, "Lawnmowers, leaf blowers, chainsaws?" She said, "Oh, I use a leaf blower every day." I said, "Why?" She said, "Oh, I blow the leaves off my deck." But without hearing protection, this was causing a very significant hearing loss. And then any complaints of hearing or balance issues, now, the person themselves may not perceive a hearing issue.

But do they have complaints? You need to record this. The next aspect in audiological management is to do the hearing evaluation. Do a pure-tone audiogram, air-bone speech. They may have a moderate hearing loss but really good speech discrimination. They may have a moderate hearing loss but very poor speech discrimination. All this has importance when you're gonna make recommendations for them. Do a speech-in-noise test, a quick SIN test, an OAE. And then also do a balance screening. It's not recommended that we do a balance assessment for every person who's diagnosed with diabetes, but it is important to ask some questions. So your balance screening can be very, very simple. Have you fallen in the last few months? Or do you have a fear of falling? In addition, you wanna know, is there a vision problem? Or do they have neuropathy in their feet? So if you're an audiologist and you're doing a vestibular workup, make sure you check for neuropathy. They may be cleared on the vestibular

evaluation. But you wanna know if the other sensory issues are impacting balance and risk of falls. So when you're doing a balance evaluation, the most common is VNG. So it includes ocular motility, positional testing, BPPV, which is benign positional proximal vertigo, and caloric testing. Now, there are some more advanced testing, cVEMP, oVEMP, rotary chair. But again, I add foot neuropathy. Because I've heard of people getting cleared by the audiologist, and everybody's still scratching their head, but why are they falling? And it's this foot neuropathy. It's a very simple screening tool that can be done. And then finally, you're gonna make a recommendation. So what are you gonna recommend? Retest hearing in a year, six months, three months, due to diabetes, ototoxic medication? It was recommended to me back in the '90s to write this recommendation that says, "Retest hearing for medical management purposes due to," and then refer back to your case history. What is it that you're needing to monitor and manage?

Also make a recommendation on your report to refer for diabetes education. Perhaps the primary physician has not done that. It's just, they stay so busy. It just was an oversight. You can remind them of that. It may be that your test results require amplification for the person with diabetes. So that may be one of your recommendations. And if the person is at risk for falls, then there are many fall prevention clinics that are popping up around the United States. And these are state agencies that are supporting fall prevention. So look around in your state and contact your fall prevention coordinator to find out what resources are available in your state. Also, one other point on making a recommendation, if the person is not taking their medications, make sure you make a note in this recommendation to speak with the patient about not taking their blood pressure medicine. Maybe they said, "Well, I don't feel anything when I take it." They're not necessarily gonna feel anything, but they need to take all prescribed medications. So this is very important. So we have to work together with all of the different professions to manage diabetes. We wanna give consistent diabetes messages to the person with diabetes. They need to recognize danger signs. If they're losing their vision more, maybe that means their diabetes is

more out of control. And they need to be checking their blood glucose. Promote a team approach to care. Integrated, comprehensive care benefits everybody. So in working with the CDC, they have kind of put together these allied health professions of pharmacy, podiatry, optometry, dental, and audiology. Remember diabetes educators, also. When you look at pharmacy, are your patients taking their meds? In the United States, 15% of prescriptions are never filled. And 50% of patients stop their prescription regimen within six months. It may be due to not having the money for the prescription. But discuss this with your patients. Why have you stopped taking this medicine? Every single pharmaceutical company, if you search it on the internet, has a way for people to get free prescriptions. There is an application on their website. So it's a very simple process. Link up with a pharmacist so you can relay to the pharmacist, this person may need some help in getting coverage for their medications. But we know pharmacists play, people see their pharmacist seven times more frequently than any other medical professional.

So make sure you know the pharmacists around your clinic. When you look at podiatry and foot care, more than 60% of nontraumatic lower limb amputations occur in people with diabetes. Patients with diabetes are 15 to 26 times more likely to have an amputation than patients without diabetes. Up to 20% of diabetes patients who participate in routine foot care will have a treatable foot care problem. So I listened to a talk in Michigan by an infection control clinic. And they said anybody that came in to be treated for infections, what they did is they always X-rayed their feet. And they discovered, with one lady, she had a sewing needle stuck up her foot. So they pulled it out, and they showed it to her. And she said, "Oh, my heavens, that's where that went. "I've been looking all over for it." But she had no sense that it was in her foot. Other people walking around the house barefooted had LEGO blocks embedded in the bottom of their feet. So it's important to talk with your patients that they always walk around the house with shoes or slippers or something with a sole so they don't pick up things, because they can't feel it. And then it'll cause an infection, a break in the skin. And it could lead to amputations. 15% of people with diabetes get an amputation, a

lower limb amputation. Vision health, now, vision is far ahead of audiology, and even dental care. Because they've had guidelines since 1995. But you wanna make sure that your patients are getting their eyes checked on a regular basis. So ask these questions. And if there's a no, or they're not sure, that's when you wanna make a referral to an optometrist. Did you get a full eye exam with dilated pupils at least once a year? Do you know how diabetes can affect your eyes? Do you know what to do if you have vision changes? There's one person in my area who was in her eighth month of pregnancy, and she developed gestational diabetes, in her eighth month with her first child, and she suddenly went blind, totally blind. She had been working up to this point. It was devastating. Now, her vision, her daughter's probably 10 years old now, but her vision has resolved somewhat. But she says she has to be very cautious about, she still has diabetes, but very cautious about her diabetes and eating right and exercising. Dentistry and oral health, dentistry has just come on the landscape of diabetes care. Going to an annual conference in 2012, this was kind of the topic of the day for diabetes educators is inclusion of dentistry. 85% of patients with type 2 diabetes report they have received no information on the association between diabetes and oral health.

And after I went to that conference in 2012, I asked my own dentist, do you know about any links between dentistry and diabetes? He said, "No, I've never heard of that." But now I asked him a couple years ago. He said, "Oh, my god, yes. "We have standards of care. "We're very watchful "for any symptoms of problems." Because if you have periodontal disease associated with poor glycemic control, you can get infections in your body from this. And tobacco use, poor nutrition are also risk factors for compromised oral health. So if you're missing teeth, and you're not having good nutrition because you can't chew, that's gonna have an effect on your total health, total health, heart health, diabetes health. So for audiology, these are the things that we need to do to align with pharmacy, podiatry, optometry, and dental. Pharmacy, obviously, for the ototoxic and vestibulotoxic monitoring, if we somehow could get the clinical guidelines to pharmacy so that they knew when they had to give a prescription

for gentamicin or vancomycin, that we can start to do the baseline and monitor that person. For podiatry, we have to collaborate for better foot care and balance care. Talk with your patients. Make sure they wear shoes. Make sure that they have somebody looking at the bottom of their feet. Make sure that optometry evaluations occur. Because we want to lower the risk of falls. We want people to be able to see. Counsel your patients with diabetes to see the dentist several times a year. So there needs to be ongoing interprofessional education and interprofessional collaboration among audiology and all of these other allied health professional groups in your state and local settings. Family and internal medicine, and again, this is another concern of CDC's is that family physicians and internal medicine are not checking for diabetes as often as they should. And we know, from an audiological standpoint, too, that there's also consequences of having a hearing loss when you go to the doctor. The doctor may recognize the symptoms if the person asks for repetition, or they bring a third-party interpreter or a spouse. Or they may recognize that there seems to be some confusion, cognitive decline, depression. They're not getting out. They seem to be isolating themselves.

So the family doctor and the internal medicine doctor need to know that these are symptoms of, potentially, a hearing loss in addition to the chronic diseases and the medications. What the doctor needs to know is that if the person has an invisible handicap of hearing loss, they are going to miss the verbal instructions that the doctor wants them to follow. And therefore, they didn't understand. And so they are gonna be noncompliant with the medical directions, what the doctor is telling them to do. And therefore, the doctor is gonna be hit with worse patient outcomes. So it is of value for the doctor to know if there's a hearing problem. It's not unusual. It's an invisible handicap. But I'll show you a little bit later what you can do to help them to recognize if there's someone in their office that has a problem. And here it is. Hearing screening starts the process. So this is on our website. hearScreen USA is an online screening. It takes three minutes. You do have to plug in headphones. You can run it off of a laptop or an iPad, or even your telephone. But make sure you use headphones, and make

sure you're in a quiet place. So when you hit the start button, and it is a three-minute test. So you're gonna hit start button, and it's a digits-in-noise test. So there's some instructions, and then you start hearing nine, five, three. And then on the computer, you just hit nine, five, three. I mean, it'll show up those numbers on your phone. Or then the background noise is going to increase and decrease at times. There's like 22 sessions of three numbers. And so after three minutes, it gives you a pass-fail. If you're audiologist, this is something that you can put on your own site, website. And it costs about $300 a year, but then you can share it with area physicians. And you can have a place at the bottom where, when somebody fails, the nurse just goes ahead and makes the referral on this site to you, and you get the patient's name. And then you know where to start from. But this is a very important screening tool, and I hope that you will use it. You also have to educate people about audiology. In 2011, CDC had never heard about the effects of diabetes on hearing and balance. We were totally unknown to them.

So we need to explain to all people, all medical professionals, what we do. We do audiology evaluation and management of hearing. We do balance screening and evaluations. We do treatment of hearing loss and balance problems, but sometimes we refer to physical therapy for the treatment, depending on your clinic setting. We counsel the person for social, job, and personal communication. So are they having any difficulties on the job? What can you do to make, if they work on the phone, what can you do to help them if they have a hearing problem? We also have some specialties in tinnitus management, cochlea implants, and pediatric specialties. So all of this is very, very important for other professionals to understand what audiology does. Another thing that I'm sure, okay, this is how you can advocate for audiology with this emerging issue of diabetes. You can join a state cohort. Or we also have country cohorts around the world. So if you wanna start to advocate and educate people about the effects of diabetes and chronic diseases, go to our website, fill out the Contact Us form. Tell us where you are. Give us some information about who you are. And then we'll get you linked in. Reach out to your national, state, and local-level

agencies and groups to educate them about what audiologists do. Offer to present to their group counsels. And we will give you PowerPoints. Or we have webinars on our website that you can show for free when you have to go and speak at a medical society at a hospital that meets once a month. We have the resources we can give you. Align with PPOD, with pharmacy, podiatry, optometry, and dentistry in your area, in your state and also in your local area. How can you have synergy to make sure that people get the best diabetes care? And then also make sure that you are referring for diabetes education. They are the linchpin of diabetes care. And I must tell you that diabetes educators just in the last few months have changed. They are no longer called certified diabetes educators. Now their title is DCES, which means diabetes care and education specialist.

So all of this is brand new. But I just want you to know they're not called just certified diabetes educators. They are diabetes care and education specialist. They are wonderful. They will help tie up all the loose ends for your patient with diabetes. One other resource, which I don't have listed here but I will tell you, you can Google YouTube, Flintstones video, hearing loss. It is a wonderful educational tool. It's only a minute long, and we can't show it here because we don't have the copyright for it. But it lets you see a minute of Flintstones cartoon. And you hear Fred and Barney and Wilma all talking, except it's filtering it based on a mild high-frequency loss, a mild to moderate hearing loss, a moderate to severe hearing loss. So this is a very good educational tool that will help people to understand, ah, that's what they're hearing. I had no idea. I knew they were missing some things, but this is terrible. I wish I had known this. So anything like that that you can show people, I think, will be very educational for them. And educate yourself about diabetes. Know the ABCs of diabetes. Know what A1C is. Know how it's important to control blood pressure, control cholesterol, and to stop smoking. So all of those things you can learn about yourself. And I was ignorant, I will voluntarily say that, in the very beginning. And an audiologist with diabetes educated me on some of these things. So make sure you're educated when you're trying to talk with your patients. Here are some references,

which I think you'll have access to. We just finished a two-year project to write a whole publication in "Seminars in Hearing." And on our website, you can actually download one of those segments of the publication on epidemiology of diabetes with hearing loss and balance. There's also research articles that you can find on our website, and then, again, the hearing screening app, which I encourage you to use. If you don't have the ability to get your own, go to our site and use it. We do have links at the bottom for the Academy of Doctors of Audiology, Find an Audiologist, or the American Association of Audiology at the bottom of that. So I think we've come to the end of the presentation, if anyone has any questions.

- [Christy] Thank you, Dr. Dowd. We're gonna go ahead and open up the floor. Just a reminder, of you had any comments or questions for her, you can type them in via that Q & A box just below the PowerPoint slides. Ah, we have one here from Victoria. Dr. Dowd, can you please give us the name of the Flintstones site again, or the clip for that Flintstone.

- [Kathy] It's on YouTube. So if you Google YouTube, Flintstones, hearing loss, then it'll show up on YouTube. And it's a minute long. One of them is 40 seconds, and one is 55 seconds.

- [Christy] We have a comment here from Pamela. She says, "Thank you "for your advocacy of diabetes education. "As a long-time CDE/DCES, I believe we are "on the most underused healthcare professionals, "and we can impact patient outcomes significantly. "Thank you, Dr. Dowd, for your great presentation." I agree, Pamela.

- [Kathy] Well, thank you, Pamela. I think diabetes educators are so important. And as audiologists, we need to always ensure that our patients are being seen by a diabetes education specialist.

- [Christy] So we'll leave the floor open here just for a another moment or two. Dr. Dowd, if you had any last comments or takeaways for the members, feel free at this time. Otherwise, we can close up and wish everybody a great weekend.

- [Kathy] Certainly. I have nothing else. I think, if you go to the website, you'll have plenty for resources there.

- [Christy] Perfect, thank you, Dr. Dowd. We're gonna go ahead and, oh, we have a couple of questions, actually. And we still have a few minutes. Carolyn asks, "What is the main test for balance?"

- [Kathy] VNG, videonystagmography. And so what we do is we actually stimulate the vestibular system with calorics, with water in the ear, and it causes the vestibular system to get activated. And then we monitor the eye movement, and it shows us if one or the other side of the head, if that vestibular system is weak or if both of them are not functioning. And it helps us give recommendations for decreasing risk of falls.

- [Christy] We have one last question here from Mary. Mary asks, "Was the information presented today relevant "to children and pediatrics as well, Dr. Dowd?"

- [Kathy] I don't see as much research on children. And I think, probably, with uncontrolled diabetes, you're gonna see some of the same things. That's an excellent question, excellent question. And I would not want to dismiss that children are not having those same effects. And I don't know. I don't know that they're getting referred to diabetes educators or to audiologists. But we certainly need to ask the question of whether diabetes has been diagnosed for those children if they're having hearing problems or problems maintaining balance. Very good question.

- [Christy] Thank you, everyone, for your questions. And thank you, Dr. Dowd, for your time and your expertise. We appreciate you coming on to AudiologyOnline and

presenting your wealth of knowledge with us. I hope everyone took away some great points today, and have a great day.