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Grand Rounds: Tinnitus

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- [Carolyn] At this time, it's my pleasure to introduce our presenters. Dr. David Jedlicka is a staff audiologist at the Pittsburgh VA and part-time instructor at the University of Pittsburgh. Currently, he is the president-elect of the association of VA audiologists. In addition to his work in telehealth, he is a clinical researcher in the areas of functional balance assessments, hidden hearing loss, amplification, and other audiology specialties. He's also our guests author this month at 20Q with Gus Mueller, which is a text course feature on AudiologyOnline. You can find his great article on our homepage. Dr. Lori Zitelli, joined the University of Pittsburgh Medical Center as an audiologist in 2012. She's part-time lab-instructor at the University of Pittsburgh and teaches a clinical procedures lab for first year AuD students. Her interests include amplification, tinnitus, decreased sound tolerance, clinical education, clinical research, and interventional audiology. She's an active fellow of the American Academy of Audiology. She also has a lot of great courses on AudiologyOnline. We invite you to check them out in our course library. Dr. Tia Oliverio is currently a staff audiologist and clinical preceptor at the Pittsburgh VA Medical Center, specializing in electrophysiology and vestibular evaluations. She's also responsible for clinical education for second, third, and fourth year students, from the University of Pittsburgh and other AuD programs. We are honored to have these presenters with us today and Dr. Jedlicka, I'll turn

- [David] Thank you for the wonderful introduction, Carolyn. We are all excited to be here. We feel like we have some great things to discuss with you today. It is involving tinnitus, but to continue with some housekeeping notes here. We just wanna give the VA disclosure for Dr. Oliverio and myself, that we are employees of the VA Medical Center in Pittsburgh, and the views and opinions expressed in the presentation, are those of ours and ours alone, and do not necessarily reflect the views and opinions of the Pittsburgh VA Healthcare System. So just some other disclosures to put in here that I am a Staff Audiologist here at the Pittsburgh VA and worked for Pitt. I'm a member of several organizations. And I'm very happy to say that now, instead of being president-elect of AVAA, as of just one month ago, I'm now president. So that's is one

non-financial disclosure, I probably should disclose. As we know, Dr. Zitelli is employed by the University of Pittsburgh. She's a lab-instructor. She works for the University of Pittsburgh Medical Center, and she received an honorarium for presenting this course. And Dr. Zitelli is also a volunteer at the American Academy of Audiology, she's highly involved, runs a lot of great projects over there. And lastly, Dr. Oliverio like me is an audiologist at the Pittsburgh VA with no relevant non-financial or other financial disclosures. So what do we want you to learn today? We really want you by the end of this course, to be able to talk about some different tinnitus treatment methods. We want you to be able to identify the benefits of combination devices, and by combination devices, we mean hearing aids plus sound generators in the use of tinnitus treatment. And lastly, talk about and describe the utility of tinnitus questionnaires. There are many great questionnaires available, and we're gonna highlight some of them today and how they can be used in your clinic.

I am a big fan of AudiologyOnline. I spend a lot of time on here just based on curiosity of other things in audiology. And I was really excited to see that Chris and some others will actually be presenting in Tinnitus Grand Rounds in a couple of weeks. So that will be the Tinnitus Evaluation and Management in partnership with the University of Mississippi Medical center. If you are wanting to find that, that is course number three, 35348. So if you haven't yet, you should probably sign up for that. And if you're listening to this pre-recorded, give that a quick search in the catalog and definitely add that to your continuing education list, that's going to be a very, very good one. Now, before we get into this, this is an idea that I kinda stole from Dr. Zitelli, is to talk about the purpose of grand rounds. So originally grand rounds were designed to increase knowledge and improve patient care. And in fact, in many cases, patients were involved in the grand rounds process when it first started. The reason why this really applies for clinicians is because it will allow people to stay up to date in their involving care, especially outside of their core practice. So as you saw from my bio, I kind of dabbled in a lot of things. And most of my tinnitus practice is associated with hearing loss. So by being able to participate in grand rounds, I and others are able to get a

better understanding of the best treatments for tinnitus, and to think of certain things outside the box. This can also really be helpful for students as far as clinical education goes, because as we know so many students want cut and dry, black and white, and a grand rounds case can really show how that's not always going to be the case for the patient that they're seeing. And lastly, here it's to help facilitate discussion. So in the cases that we're talking about today, these are going to be non-straight forward cases. There are many different avenues that we could have taken as far as treatment goes. And just because we chose something that may have been different than what you and the audience may have chosen, doesn't mean it was right or wrong, but hopefully this will get you to be able to think about these cases in a different way, and to think about how you can treat your patients, learning something from what we have to present.

And when we discuss these cases amongst ourselves, you know, as far as presenting this, we can really bounce ideas off one another. So even as a presenter, by talking to the other experts on these panels, we're able to learn about different ways that we can approach similar cases moving forward, which will hopefully lead to the best outcomes for our patients, which is ultimately what this is all about. So my first case I'm going to present to you today, I'm going to give a little spoiler right off the bat. We're going to call him Mr. NC, for non-compliance. This was a veteran that we first saw in 2011, that came to our clinic to file a claim for compensation and pension, regarding hearing loss and tinnitus. Now, for those who don't know among the veteran population, the veterans can put in a claim for different disabilities that they report were due from their time in the service. If they find that to be the case, they can receive what's called a service connection. And essentially that means the VA, will handle the treatment related to those specific disabilities. Sometimes they're compensated with money, other times the VA will say, "Okay, we will claim responsibility, "but it won't have any type of financial reward "to go with that." So tinnitus is actually number one, as far as the rankings go with service connected disabilities and hearing losses too. So this is things that we are very familiar with here in the VA. At this time, Mr. NC was 39 years old. He reported he was having difficulty hearing in background noise, that he had

periodic, non-bothersome, bilateral tinnitus, but didn't have any other complaints otologically or audiologically. This was what we found from his audiogram at the time. As you can see the left ear within normal limits, right ear, pretty good with a little bit of a dip at 4,000 Hertz, but looking at his speech understanding scores, those were great and the temps were normal. So the results from the claim both were denied. For hearing loss, it was denied because of the audiometric findings, plus what is called as MOS or Military Occupational Specialty, what he did in the military stated that it did not place him at risk for hearing loss for what he did. His claim for tinnitus was denied also due to his MOS. And one of the reasons cited was it was infrequent tinnitus, there was less likely than not due to military service. There are certain buzzwords that people can often use when they're trying to claim for tinnitus, which will make it a little bit more likely that they'll receive a service connection. And he apparently did not use those buzzwords.

Now, if you're wondering why, I didn't see him at that time, somebody else did. I worked a little bit more closely with this, because there's actually two different branches to VA. There's the Veterans Healthcare Administration, which is where Dr. Oliverio and I work, where we take a look at veterans coming in with hearing loss of hearing complaints, and we try to treat that. Then there's also the Veterans Benefits Administration that will take a look at the claims that people were putting in for disabilities, but not necessarily putting for the treatment at the same time. We will certainly work with those folks in the VBA. In fact, our clinic share space with them, so we'll often see patients on the same day to treat them, but that's kinda like the two separate parts, under the umbrella where if you're not a VA audiologist, you may not have known that until now. So hopefully that's one new thing for you to learn. I started seeing this veteran in 2017 and the patient came in, still reporting difficulty hearing bilaterally. He's mainly complaining about difficulty in background noise. This time however, he came in reporting bilateral, constant, bothersome, high-frequency tinnitus. He did report some periodic aural fullness bilaterally, but he said it was not very common, it wasn't repeatable as far as when it would show up that he just noticed it

within the last year. He reported some longstanding lightheadedness that was consistent if he would stand up too quickly. And he did report sudden onset vertigo. He reported it over the last few months. He said, "It would occur when he was laying in bed, "mostly at night, "and it would last until he vomited." He went to the ER for this issue and reported that, "He was given meclizine for it." And he said he would take it basically either daily or as needed to treat the symptoms. This was the hearing test that I completed in 2017. As you can see, the left ear remained pretty much stable, the right ear especially, 4,000 Hertz did drop a bit. The word understanding was still good at that point. So we decided to take a big all encompassing approach with this veteran. We wanted to make sure that we did a vestibular evaluation because of his complaints, plus we involved our Ear, Nose and Throat and Physical Therapy partners. We have a great working relationship with those departments.

And when we do a lot of our vestibular testing, we'd like to make sure that we're in sync with the other two groups, so that way the patient is getting the best care possible. We also reported, we wanted to do some APD testing because of the patient's reports of difficulty hearing noise. The patient's HHIA score was actually 40 out of 40, which is something that we would not have expected, given the audiometric thresholds, plus his speech intelligibility in quiet, but he was reporting it was the noise, that was giving him the trouble, so we decided let's run APD testing. We also want us to do a hearing aid evaluation because that would allow us to bring in some tinnitus management strategies, plus having that high frequency dip at 4,000 Hertz in the right ear, hearing aid could certainly help with that. So when we did the vestibular testing, we found basically everything was normal. And when the patient went to see ENT, it was found that he was basically suffering from orthostatic hypertension, which was causing him to become lightheaded from standing up too quickly. The other thing that was found during this appointment too, was the patient had some alcohol dependence at this time as well. So a lot of times when he was reporting the dizziness at night and not feeling better until after vomiting, these were associated with episodes of binge drinking as well. So that was most likely the cause for the spinning at night and not

feeling better until he vomited. When we did the APD test findings, this was probably the biggest sign that we had for what was going to come, working with him in the future. We have a full battery of tests that we do for patients that we suspect may have auditory processing disorders. We started with the scan because it's a nice all encompassing test. It starts off with three tests, which are part of a screening battery, and that is gap detection, auditory figure ground zero, and the competing words free recall tests. Gap detection is a quick little test where a patient will hear two beeps with a very small pause in-between. Patient then has to report whether they heard one or two beeps. Now these tests are all run at the same intensity, it's well within the patient's realm of hearing, so you should be able to hear it. The patients always have to just report one or two. However, the patient did not respond to most of the presentations. Now, typically when we see this, we know it's either an issue with the patient, either not being attentive to the test, or if it's the patient showing signs of non-organic hearing loss. We then moved on to the auditory figure ground tests, which is a speech and noise test, signal-to-noise ratio of zero dB, and the patient scored two out of 40.

Just like we saw the gap detection, the patient didn't respond to basically anything, after the first five or six presentations. Competing words free recall, same exact thing. For this test, the patient hears two words, one on each ear and they have to repeat them back, doesn't matter if it's right to left or left to right. The patient did pretty well at the start, but then just stopped responding. I was working with a student that day and really wanted the student to get some experience in working with this test, which is why we decided to run all the other subtests of the scan. And I was hoping too that with further instruction for the patient. We can get some more responses, but unfortunately that was not the case. The patient just was not responding to most items in the test and he actually failed every single subtest that we administered. So that really kind of tipped me off that the patient, wasn't necessarily putting forth his best effort. So the focus then became, all right, we know we're gonna give him hearing aids, maybe that will help with some of the hearing and noise complaints. We also wanted to

address tinnitus he reported, that was a big issue for him. So two of the tinnitus evaluations that we run commonly at the Pittsburgh VA or the tinnitus handicap inventory, that is tinnitus functional index. So when we first were talking to the patient about the tinnitus he was experiencing, he was really reporting difficulty with concentration because of the tinnitus difficulty understanding speech for the same reason and difficulty falling asleep, as well as maintaining asleep. Now on the THI, the score is out of 100. There's 25 items and he scored similar to as you would to the hearing handicap inventory.

So when you break it down into the three categories, the patient was near a max score on all of these. And typically when you see a patient with a score that's high in this severe range, this typically means that the patient really can't function because of their tinnitus. However, the patient didn't report any other symptoms of not being able to go to work, come to appointments or things like that because of the tinnitus. The tinnitus functional index is another 25 scale item where 23 of the questions the patient has to answer on a scale of zero to 10, and the other two, they have to put it on percentage between zero and 100. So on this scale, he reported, he was aware and bothered by his tinnitus 100% of the time and put every other subscale problem as a 10 out of 10. Now Dr. Zitelli will actually have a picture of the TFI in her part of the presentation. So if you're interested to see what it looks like, she'll show you that in just a moment. But these scores that he was reporting, typically you only see this in the most severe cases, which just from talking to him, I would not have guessed that it would have been this high. So when we decided to do the hearing aid evaluation, we really wanted to concentrate on making sure we are getting that right ear hearing loss addressed. We wanted to improve his speech understanding, but we also felt that this would be a good way to help reduce the tinnitus. We've known for a long time now, that hearing aids are a great way to help with the reduction of tinnitus. And we've decided to explore some other options as well. So we ordered a tinnitus sound generator for the patient to use at night. So that way it could help him fall asleep and stay asleep. We also offered him Progressive Tinnitus Management, which is the VA specific tinnitus

training, so think of it like TRT, but specifically for the VA, but the patient was not interested in at this time. So with this veteran's options for treatment, we really could've gone in any direction we wanted, we could've just tried hearing aids at first, we could've went with hearing aids that have the sound generator built in. We could've went with hearing aids plus that external sound generator, which is what we ended up doing, as well as maybe just going with the tinnitus sound generator, it feels only affording him at night. So right off the bat, you know, any one of these paths could have started off in the right manner. It just really depends on what the patient needs from your interview with them. We decided to go with Starkey Muse IQ Micro RICs, and we did this because it was appropriate for the patient's audiometric configuration.

The patient wanted something small and discreet, so that worked, and this would give us the opportunity to use the hearing aids as a combination device. So initially we were going to use this just for amplification, but we knew if the amplification alone didn't work, that there was a sound generator option available, and it could be set one of two different ways. At the hearing aid fitting, we fit him about one month after the hearing aid evaluation, which was pre-COVID about when we would see these patients back. And as soon as we fit the patient using comprehensive measures, he said, "Wow, I can hear speech so much better." And again, I was working with the same student this time and she had a higher pitch voice compared to mine. And you know, one of the things that you reported difficulty was with women's voices. So that was encouraging to see off the bat. And he also reported an immediate reduction in the tinnitus, which was huge, that was great to see two benefits right off the bat. Because he was a younger veteran compared to what we typically see, he had no problem with insertion and removal, but the faces, changing the batteries, changing the volume, everything was set for him to be a successful user right off the bat. So after hearing aid fitting, we typically bring patients back about three to four weeks, just to do some follow up measures. When he came back this time, the patient came to the clinic, he brought the hearing aids, but he wasn't wearing them, he had them in his case. He reported that, "He still could not understand "in background noise, "he didn't notice any true

improvement with this tinnitus, "and he didn't like how the domes felt in his ear." We also asked him about how the sound generator was working for him, and he stated that, "He hadn't taken it out of the box since he received it." And all of our follow up visits, we do many different outcome measures, but we also like to check datalogging as well. So when we found that he only had one hour of use of the devices. So we asked him a little bit about that, and he was basically saying, "He wore them in the car, ride home, "took them out and never put them back in." So really, we don't know if it didn't understand or improve his understanding in noise, it didn't give us any idea if it really improved the tinnitus because he didn't wear it.

So when we were asking about this, he really just kept going back to, "He didn't like how the domes felt in his ears." We decided to take molds of his ears, wear custom earmolds, attach them to the hearing aids, redo all of our relearn measures and then bring them back for follow up visit. Number two, whenever we were seeing him, prior to that follow up visit, we really wanted to make sure that he had every opportunity to succeed with helping him sleep at night because he did report that was such a big problem. So we decided to show him how to use the sound generator that we have. And it's nice because it's 20 different tracks built in and the patient can set it to whichever one they like, or they find to be the most neutral. And we always teach them too, to set this at a level where it blends not to overmask their tinnitus. We also decided to add sound generator program for the patient and the hearing aids thinking, okay, if he had a little bit more control, maybe this will allow him to use the hearing aids more. So when we saw him back for the fitting with the earmolds and everything, he reported immediate benefit, and that he would feel like, he would use this tinnitus program, a little bit more than just the hearing aids by themselves. Comes back for follow up visit number two, and what do we see? Well, hearing aids is still in the case and he reported it that, "He wasn't wearing them this time "because he had standard complaints of occlusion "with the molds." Now we had a pretty big vent in them, so we were surprise to hear the difficulty with occlusion, but a lot of what he was reporting were things that we had warned him about at that refitting appointment. He said that,

"He wasn't using the sound generator program "and the hearing aids "'cause he didn't feel like it was beneficial." He still hasn't taken the sound generator, out of his box. And datalogging after we reset it previously, still showed one hour of use and got the patient to confirm same thing. Still wasn't wearing them, didn't wear them, after his last visit. We decided to try to take away as many problem sources as possible. So we modified the vents on the earmolds to make them as big as possible. He reported, "Hey, this is much better. "I don't feel like I'm hearing myself as much, excellent." We spent the rest of the time, which was significant portion of our time, trying to counsel the patient on the use of full times, or even just to really increase the use of what he was doing to slowly ramp it up. And we told him, "You know, you have to acclimate to the sounds "that you're hearing." The other thing we decided to do, and one of the reasons why we chose to Starkey devices was because of their SoundPoint feature. This allows the patient to set their own tinnitus sound generator level. But one of the big drawbacks to it is, you're asking your patient to think about their tinnitus while they're setting it.

So it kinda goes against all the tinnitus treatment, you've ever learned, where you tell the patient to not focus on it. Well, for this brief moment, you do want them to focus on it. So if you're not familiar with it, these are what the screens will look like. So on the left, you can pull up this screen either in the software or you can use a tablet that has a software installed to do it this way as long as it's connected to the hearing aids. Once the patient clicks starts, they can go anywhere into the four quadrants with either their finger or the mouse. And as they move around, it's all randomized. So just going to different side, wouldn't necessarily change the intensity or change the frequency, it's going to be different for every point. So we typically tell the patient, "Okay, find four spots that you feel like blend in the best "with your tinnitus and set it." And once they set their four points, they click on it again, that little point will turn into a star, and that's where the setting for the tinnitus sound generator will be for the patient. The reason why we try to cap them at four is because if you have a patient with severely debilitating tinnitus, they might end up putting 10, 15, 20 different points on this graph

and not be able to select it. So my personal recommendation is, try to cap it at about four or five. So that way the person is not going and selecting too many points. After we did this, we didn't know what we were gonna find for follow up number three. We did find that when he came back, hearing aids were getting in the case, datalogging showed one hour of use, he took them out when he got home. And we decided at this point to return the hearing aids to the manufacturer for credit. And when we were talking to him, he just didn't feel like they were going to be beneficial, but we still wanted to give him some options for treatment. And the progressive tinnitus management course that we offer involves our psychology department, working with us to provide these treatments. And we brought this up to him and he was not a big fan of when we brought this up. He said that, "He had been given a previous diagnosis, "from a mental health provider, which he disagreed with." He also said that, "He was not going to do any type "of treatment that they wanted him to do "in order to, you know, whether it's tinnitus "or the other issues going on."

Now, this was whenever I decided to look further into it because one of my roles here at the VA is also working with patients with auditory processing disorders. And one of the studies we're working on right now is finding that certain comorbidities are likely to predict if a patient is likely to have self perceived hearing handicap with normal audiometric thresholds. And he actually had eight out of the nine in comorbidities. The only one that was not listed on our list that is here is chronic kidney disease. But the big one we were worried about here today is, the borderline personality disorder. So luckily we do work with the psychology department and I decided to talk to the psychologist that we work with. And what was interesting was when I was talking with her about this, she said that, "Patients with borderline personality disorder "or other personality disorders are often non-compliant "with most medical type recommendations or treatment." And so it was something that really should not have been unexpected at that point. So when we saw the patient last, we did recommend to come in every two years or so for repeat audiometric evaluations. And he did, he came back in 2019, no change in symptoms had the same complaints. And we talked about

the options again, and he just denied, denied, denied. He said that he would contact the clinic if he changed his mind. We haven't heard from him yet, but maybe he'll be back in 2021. We hope he does for that updated audiometric evaluation. So what have we learned from this? Well, going back to starting this case, from the very beginning, I really feel like now I'm paying much more attention to the comorbidities of the patient and try to have a better understanding of how that would affect the outcomes here. And it's really important for us to have realistic expectations and that type of information being conveyed to the patient. So I don't know if he was expecting just to hear needed to immediately solve all his problems, noise, or to immediately get rid of all the tinnitus and never have it pop up again. But that's something that I kind of almost undersell things to a point to a patient in order to say, "Hey, it's gonna take a lot of time and work," whereas, it could be probably a little bit quicker than what's actually happening for the patient as far as benefit goes. Continue to use interdisciplinary approaches when possible.

So as you can see what this patient, we worked with so many other providers, and it really allowed us to provide the best care possible, even though in my opinion, we didn't meet his needs. But we, in my opinion, looked at many different options that were available. I don't think that we really left too much on the table. And this is really the point where the patient just didn't want to put in the effort that he would have needed to become a very successful user to treat the issues he was having. And then lastly, don't let this example bring you down, there's going to be great success stories, and you're gonna have ones that don't work out well. So, you know, we've seen patients with similar backgrounds and complaints that we've been able to treat successfully, but this was a good one for us to see that, okay, even when you do everything by the book, it might not work out properly. Now the second case I have for everybody here today is with Mr. B and I will just preface this by saying that Mr. B was one of my favorite patients, I was able to work with. We started seeing him back in 2001 when he was 65 and he just came in standard veteran, 65, noise-related hearing loss, age-related hearing loss. And throughout his entire time with us, he only use

Phonak BTE hearing aids because he loved their accessories, namely the remote controls. So we were able to provide him with five hearing aids approximately every four years or so. And around 2007, and as we talked about the last case, it's important to know your comorbidities, the patient started to see a therapist, due to anxiety and paranoia. This was done with the encouragement of his wife and his daughter. So here's a progression of the hearing loss starting from 2005, that was the earliest audiogram I had on our file, all the way through 2019. So as you can see, BTE hearing aids will easily meet the needs for this. So during my externship year in 2009, I was able to meet Mr. B and work with him. And when we were doing the case history, he reported a history of otologic surgery, which wasn't in any of his previous notes.

So I was a little bit surprised to see that, so I was asking him a little more about it. He didn't know what year it was, he just said, "He had an implant." He didn't have any conductive component to his hearing loss that day or prior, and there were no other notes in his chart indicating that he had any type of otologic surgery. We were lucky to have a video otoscope and the ENT has one as well, and they knew about this issue too. So we decided to show him when we were doing video otoscopy, that there was nothing in the ear, no implant, because he was saying this implant was put in by somebody, so they could listen to his conversations. That lines up with that paranoia that was starting around 2007. So he was thinking what was happening was that his neighbors in his apartment building were able to hack into his hearing aids, and they were able to adjust his hearing aids, because at this time, I told him at the hearing evaluation that he was getting new hearing aids that were Bluetooth compatible because the patient did use a cell phone, but he didn't want the Bluetooth accessory that went with the hearing aids. Now he reported that he knew his neighbors were hacking his hearing aids because he would hear a high pitch radio signal, and the hearing aids would become intermittent, but he was only experiencing this in the right ear. So I did otoscopy and found that the right hearing aid or the right ear did have cerumen, and the right aid was also included with cerumen as well. I fixed the hearing aid, ENT was able to see him to remove this cerumen in the ear, all of a sudden the

hearing aids were working and no radio signals were present, everything was working well. The patient then returns about six months later and reports that the hearings were hacked again. Now this time he starts to suspect that his neighbors are gaining access to his hearing aids through his remote control, he was focused on the Bluetooth at that point. When we took a look at the hearing aids, there was occluding cerumen bilaterally, the ears looked okay, no cerumen blockage or anything, but when we fixed the hearing aids, radio signal was eliminated and the patient was concerned about the future hacking. So I told him that the way that the remote control was set up, that it was not possible. So that seemed to work counseling-wise for the patient. Eventually, what we decided to do, was have the patient seen quarterly by ENT for cerumen management. And we would see the patient on the same day for hearing aid check and tubing change. Now I know that might seem a bit excessive, but I would rather tackle the problem before it becomes one, rather than letting it break down and then have him live with some extra anxiety or fear, thinking his devices were being hacked. So every appointment we would say, there's no way for the neighbors to hack your hearing aids remote, but he was still calling once a month worried that the hearing aids were hacking into his hearing aids.

Around this same time, the veterans started to have some cognitive decline as well. So he started contacting law enforcement, quite often saying that, "People were breaking into his home, "especially whenever he wasn't home "or when he was sleeping." But he said, "They weren't stealing anything, "they were just moving things around, "which would cause them stress and annoyance." But speaking with the veteran's daughter and his wife, what would happen was when they would clean the house and move things around and he would wake up, he'd be disoriented, and that's what would cause him to feel this way. They decided to change things where they would only clean things or move things around when he was awake. So that way he was aware of it, and that seemed to really help, but he just really thought that the neighbors were spying on him and doing this to mess with them. So eventually we had an appointment where the patient wasn't able to come in, due to a severe snowstorm in Pittsburgh. And that led

to occlusion in both ears and hearing aids. He also started to get the tinnitus again. Well, he thought this was the hackers. Luckily snow, all melted, the patient was able to come back in, I was able to get this cerumen out and fix the hearing aids. But at this point, the patient felt like his hearing aids, were no longer unhackable. So we decided to think outside the box of how we can make things better for him. So with his 2009 Exelia Art hearing aids, he had the KeyPilot remote and his 2013 and 2017 hearing aids used to PilotOne remote. I instructed the patient only uses new hearing aids, and when he felt that this old hearing aids were hacked, that he could switch to an older set. I said, "Now make sure you don't leave any batteries "in them," one because I wanted to make sure that the batteries didn't lead to any corrosion, but mainly to tell him, "Okay, if there's no power to the hearing aids, "people won't be able to hack in there." Plus that gave him a little bit more confidence that if something happened to the new set, he could go back to an old set, which we knew were working just fine.

So that actually worked out really well. So most of the time, what was happening was, the hearing aids were getting plugged up with cerumen, before the ears have become fully occluded. He would mail his hearing aids in, I would clean the hearing aids and I would basically update the serial number of the remote control and the Phonak Target Software to make sure that nobody could hack into his hearing aids. This was something that I showed him in the clinic that I was linking your remote control to his hearing aids, because he was starting to believe the serial numbers on the remote controls were the passwords to the devices. So we happen to have some extra KeyPilot remotes and PilotOne remotes in the clinic. So when he would come in, I would show him that I was changing him out. He would see it had a different serial number, and when he saw me connect it all in the software that gave him some peace of mind for a while. So that worked out really, really well for a long time. So what are your take home messages here? Sometimes there's just no amount of counseling that will be effective. For this patient, he was completely convinced that something else was happening to his hearing aids that was out of his control. But at the same time, I didn't want to belittle the patient, I didn't want to take away, from the things he really

felt were distressing. So I listened to the patient, I tried to make sure that there were creative ways for him to address the problems at home, which we did. But I also wanted to make sure that we were staying within the boundaries of ethical practices and not disrespecting the patient because there are so many times along this journey, whereas we know what's actually happening, then we can say, there's no way for this to occur. The big thing was, I just wanted the patient to feel like we always had his best interest at heart, which we truly did. But the biggest thing was Mr. B recently passed away. And like I said, he was one of my favorite patients and I do miss our quarterly appointments. And you know, actually he was supposed to be here in June. So realizing he was on the schedule, on in his day, you know, it's kinda makes me sad, but having this opportunity to work with him, really allowed me to learn different ways to work with patients in non-traditional ways. And there are many different ways that we can go about it, but, you know, just by being able to confirm his concerns and to trust them to give him a little bit of peace of mind, I think was well worth every effort along the way. So I hope you enjoyed the story of Mr. B as much as I was able to enjoy working with him. But now onto some other topics, we are going to take it over here to Dr. Lori Zitelli, who has some really interesting cases for you.

- [Lori] Thank you, Dave. I'm really glad to be here talking with everyone today. And I'm about to tell you two stories that are unrelated to each other. And I'm gonna borrow a line from Dragnet and just tell you that the stories you're about to hear are true and only the names have been changed to protect the innocent. So the patients that we're first gonna talk about, I'm gonna call her Mae. She's a 45 year old woman who was first presenting to the emergency department in our medical system after a motor vehicle accident. So she had reported that, "She was driving "through an intersection and another vehicle was speeding "through and ran the stop sign, "causing her to T-bone them with her front end." Fortunately, she was wearing a seatbelt, so she was restrained. And at that time she was reporting primarily some pain in her left wrist and some pain to her neck. She was alert and oriented and did not lose consciousness. And fortunately is right hand dominant, so that's fortunate for her. So at the time of the

emergency department visit, she was given a splint for her left hand and some pain medication for that soreness in her neck. And she was instructed to follow up with her primary care physician. So one week later, she was reporting a newer onset of headache and nausea and given all of the complaints that she was reporting together, she was referred to the concussion clinic, which I think was appropriate. And that ended up, I guess spoiler alert, being a good referral for her. She at that time was also reporting a new onset of tinnitus, which had not been present prior to the accident. The tinnitus was bilateral and louder in the left ear. She was reporting some imbalance and maybe not sure, but possibly some hearing difficulty, maybe not, and was instructed to follow up with ENT for all of these reasons. So on the day of the ENT assessment, they reviewed her case history just to make sure that, to see if anything had changed since her last appointment. And on that day, she was again reporting bilateral tinnitus, since her motor vehicle accident louder in the left ear. She had been diagnosed with a concussion at that point and was reporting that the tinnitus in the left ear was constant and loud and the right ear was intermittent.

On that day, otoscopy was unremarkable, and this is the audiogram that was obtained during the ENT appointment. So she, you can see, she has a very mild, notched, sensory neural hearing loss bilaterally with a very slight, asymmetry in the high frequencies with the left ear being slightly worse than the right ear. 100% speech understanding bilaterally at conversational levels and pure tone average and SRT in good agreement. So the plan from that appointment was to set her up with an MRI. And I think the reason for that, is because she's having this tinnitus, that's more prominent on the left side, even though it is bilateral, and the various slight asymmetry in the high frequencies on the audiogram. I think maybe if either of these things had been true independently, they might not have taken this route, but with both of those things together, this is what they decided to do. So on the day that she was supposed to have her MRI, she called the ENT office to say that she was not able to complete it even after her doses of valium. So this is the first time that comes up and in all of this. So that tells us something that we're gonna need to focus on a little bit later. And at

that time, she was offered a sedated MRI, but she chose to defer at that time. So I think the plan was we would check her hearing after a certain period of time. And if it was continuing to be stable, maybe she wouldn't need to go through with that. But if there was a change, they might think about offering sedated ABR. So what now, right? There are many treatment options for tinnitus, and fortunately the ENT physician referred her to us for evaluation and discussion of some management options. So when the patient was seen in our clinic, some of the ways that we try to determine candidacy for treatment are by, evaluating the self perceived tinnitus-related handicap. And we do this by taking a pretty thorough case history and by using some validated questionnaires.

So I'm gonna start with the questionnaire scores. Just like Dr. Jedlicka, we like the tinnitus handicap inventory and the tinnitus functional index. And I do really feel like they both give us valuable and kind of different information. So I like the tinnitus handicap inventory because it gives us a good overall picture of their kind of global self perceived handicap. And you can see there are many "Yes" responses here. And if you tally everything up, her overall tinnitus handicap inventory score, was an 84 out of 100, which would put her in the category of a catastrophic self-perceived handicap that's related to tinnitus. So someone who falls into this category typically, has tinnitus that's always heard, they have disturbed sleep patterns and difficulty with many many activities. We also like the tinnitus functional index. And these are the screenshots that Dr. Jedlicka had referenced. And these in circled in red are her answers to these questionnaires. So you can see many nines and tens indicating big problems in these areas. I like this questionnaire because you can calculate an overall score just like you can for the tinnitus handicap inventory, but it also gives you eight subscales that you can look at. So the subscale is indicated by the letter in the top left hand corner of the bar above each of these sections. So "I" for intrusiveness is the first one, sense of control, cognition, sleep, auditory, relaxation, quality of life and emotions are the eight categories. And I do like doing both of these questionnaires because if someone has a fairly low overall tinnitus functional index score, but one of the subcategories is very

high, that's really helpful because it tells me that they might not need tinnitus retraining therapy, or some very structured involved treatment program. They might just need help with that specific problem. But unfortunately, that was not the case for me, many, many, nine and 10 answers here indicating that the tinnitus is pervasive and impacting many areas of her life. So to calculate the overall score, we would sum all of the valid answers from both pages, divide by the number of valid answers multiply by 10. So scoring this questionnaire will allow us to again, get an overall score that will put her into a category. And her overall score was a 77.2, indicating that for her, tinnitus is a very big problem. So that lines up with the tinnitus handicap inventory. And you'll see in a minute, it also lines up with what she had reported to me, which is nice. So if you're gonna do a subscale score, you would follow the same procedure for each of the eight subscales.

So what I'm showing you on this chart here, are the scores for the individual subscales. And many of them indicating that that particular area is a very big problem for her, sleep is a big problem, quality of life is a big problem and auditory activities fortunately for her, are a small problem. So this form is what we use to take our case history for patients who are reporting tinnitus. And it just helps us to make sure that we're touching on all of the relevant points that we wanna get at. And then there are a couple of other things that we typically ask about as well, that you won't see on this sheet. But the highlights here are that again, she's reporting tinnitus in both ears, left louder than right, left ear constant sudden onset, after a medical via motor vehicle accident. It sounds to her like a high pitched ringing and the activities that are either prevented or affected include concentration, sleep, quiet resting activities, work and sports. So quiet resting activities would be like reading a book, doing a crossword puzzle, knitting, crocheting, something where you're kind of, sitting quietly doing something. And sports in this case is related to not her performing or participating in sports herself, but her ability to attend a sporting event, which she had previously liked to do. So she was saying at this point, she would not attend a Pittsburgh Penguins game, which was something that she had liked to do before. For her ear overprotection was fortunately

not a problem, so we're always asking about whether people are wearing earplugs more than they should, that would be overprotecting their ears, and if they're wearing earplugs in quiet, unfortunately she was not doing either of those things. If we find out that people are doing those things, we want them to stop, 'cause that can cause a lot of different problems in addition to exacerbating the tinnitus. You'll see under severity, annoyance and effect on life. She's ranking all of these things as either a nine or 10 out of 10 problem, 10 being the worst, the loudest tinnitus could be, the most annoyed you can be. And it impacts every aspect of your life basically. And she reported that, "Tinnitus was a problem for her "because she can't escape that." Fortunately, sound intolerance did not appear to be a problem for her. She answered no to pretty much all of these questions and ranked the severity of the problem, her annoyance level and the effect on her life to be zero out of 10, which is no problem at all. And we always ask, because we know approximately 60% of people with tinnitus also have sound intolerance issues. But fortunately for her, this was not something that was a problem. She was not wearing hearing aids and had never had hearing aids recommended to her. So that's the little section related to hearing loss, and then lastly down on the bottom, the ranking questions.

So we like these questions because it helps us to get an idea of where the primary problem lies. If tinnitus sound intolerance or hearing loss are all of three potential problems, which one is the worst problem, and in what order do they fall? So for her tinnitus was an eight out of 10 problem, and would be the primary problem. Hearing was one out of 10, almost not a problem at all, and sound intolerance was no problem. So additionally, when I probed a little bit more related to asking about sleep, she reported that, "She had some trouble with sleep, "but when she had her TV on, it really helped her, "so she felt like that was a good solution for her." She had also indicated that work was affected, so I asked her what she did and she said, "I'm a cognitive behavioral therapist." And that's just one of those moments where I don't know if anybody else has ever experienced this, but your brain kinda comes to a halt. And you're like, "Wait a second, what?" And I had that reaction because we know cognitive

behavioral therapy, can be something that's helpful for people who have tinnitus, just in terms of teaching some problem-solving strategies, and coping skills and kinda adding to your toolbox, just to give you the tools you need to get through those really difficult parts in your day. And this was obviously something that she was intimately familiar with, but didn't appear to be helping her in this way, so I just thought that was really interesting. I mentioned previously the concussion clinic, she reported that, "She had gone for an evaluation "and they had referred her for vestibular therapy "and it had really been helping her imbalance." So that was great. And we always ask about suicide because we know that even patients with mild tinnitus disturbance, can sometimes report suicidal thoughts.

So we just make it kind of part of our evaluation, and she had replied that, "She sometimes had fleeting thoughts, "but she had no plan to die by suicide "and no intention to die by suicide." And if this is an area that interests you, there is a course on AudiologyOnline that you can take to learn more about this area and how to ask these questions and what to do, if someone indicates that this would be an option for them. Okay, so moving on to the audiologic assessment, I feel like we have a pretty good idea of how the tinnitus is impacting her and it seems to be significant. The audiogram was very recent from the ENT appointment, so we didn't need to repeat that. She underwent some otoacoustic emission testing for this appointment. And for someone who is being seen for a tinnitus evaluation, I think this test can be really helpful for counseling, especially if they have fairly good to normal hearing. Seeing some objective evidence of peripheral hearing damage or end organ damage, can be really helpful just to help them reconcile that because a lot of people say that, "They don't understand if they have normal hearing, "how can they possibly have tinnitus "if it's caused by hearing loss, "it just doesn't make sense to them." So this test, it can be really helpful for some people, if we can show them, look, "You do actually have this little bit of damage "and we can measure it in these frequencies." And it very frequently makes sense, given their audiogram and their reports and what they're describing with the tinnitus. So she did find that really helpful in this case as well. The next part of the

audiologic assessment is the loudness discomfort level or uncomfortable on this level testing. We like the procedure from the Memphis Hearing Aid Research Lab, Robin Cox's group. And if you're interested in how to do this procedure, there's information on the slides here. And there are also instructions on the website, which are really nice because we know that the instructions that you give someone can affect how the responses they give you. So the uncomfortable loudness levels that I measured for this patient were largely between 90 and a 100 dB HL, and those are considered to be slightly reduced. Typically we'd wanna see them like a 100 dB HL or louder. So this is slightly reduced, but remember that she reported sound intolerance, was not a problem and really didn't limit her at all. So even though these results technically, are slightly reduced, functionally, it's not impact impacting her or limiting her participation or ability to do anything she wants to do. So it's not something that we really focused on.

And then lastly, the tinnitus evaluation. So to bill this code, the 92625 code, pitch matching, loudness matching and minimum masking level are all part of this. So she matched her tinnitus to 8,000 Hertz bilaterally and matched to a loudness level of 20 dB HL in the right ear and 35 dB HL on the left ear. And that would be reported in terms of sensation level 10 dB in each ear. And her minimum masking levels were measured at 50 in the right ear, 68 in the left ear and 50 bilaterally. TWN is threshold of white noise, so that would be the level where she'd just barely started to notice the white noise sound. So that tells us for her, the tinnitus is not really very easily masked. Okay, so really anyone who has tinnitus has several options available to them. And one of the options is always to do nothing, and that certainly was an option for her. Sound therapy is always an option, and I have it in quotes because sound therapy really can mean, a lot of different things to a lot of different people. So we can, we'll talk briefly about that. Counseling is an option, and then there are a lot of other things that people do to try to address tinnitus that are not all based in a good amount of evidence. And more briefly, we'll look at that as well. So it is certainly possible for people who have tinnitus to do nothing and still improve at least a little bit over time. So this study that

I've referenced from 2018 here looked at a bunch of different studies that had a no intervention or waiting list control arm of clinical trials. And they found that there was a small but significant improvement in tinnitus severity over time, even though they didn't receive any treatment. And there's another study from 2011, that found a similar findings. So it is possible that people can improve over time. It's not typical that the improvement will be significant, but it's certainly possible. Okay, sound therapy. Anytime I hear this term, I'm always like a little bit cautious about it because I think there are a lot of different ways that you can provide sound therapy. And there's an article from Henry et al, in 2008, describing many of the different ways that you can use sound. And I really liked this article because I thought it did a great job of describing each of those things.

So masking is something that people frequently do, which is just covering the tinnitus with another sound. Soothing can be a way that people use sound. And the goal of that is to just feel better or less stressed when you listen to a sound that you like. Contrast reduction is a good way to use sound, basically just by reducing the contrast, between the noise they hear in their ears or their head, or the noise they hear environmentally, just making the tinnitus, not as noticeable, or it doesn't stick out as much. Distraction is another way that you could do this by shifting away from the tinnitus to you moving your attention onto something that's interesting. Just a little relaxation. Neuromodulation is another way that people can do this. So I like this article because it does a good job of describing all of these things. And as Dr. Jedlicka mentioned, many of these things are what hearing aids do, and this is why many people find hearing needs to be an effective treatment for tinnitus. And I think most of us probably know that, but it's nice to be able to describe each of these things in these terms and think about all the ways that hearing aids are helping for people. And then there's counseling, which I should have also included in, "On my initial slide of all of the options." There are really many ways that someone could provide counseling for someone who has tinnitus. I think a lot of us provide educational counseling. And generally, the goal of that type of counseling, is to demystify the tinnitus and help

people to maybe get a little bit of ownership and understanding of what they're experiencing. Maybe make it a little bit less frightening for people or less concerning. Give them some more information about how their hearing system works and how actually many people have tinnitus, when there's peripheral damage. And just try to describe some of the ways that we can try to help people with tinnitus without necessarily curing it. So I think that's a big part for many of us. And then there are also many different ways to provide counseling and kind of a structured way or specific types of behavioral therapy. So that could include any of the things that you see on this list here. And I mentioned other, so there are a lot of other things that people do to try to address their tinnitus that are not really rooted in great evidence, but we all know that when people are desperate, they may try many things. So all that information is in the PowerPoint, if you wanna review that. So going back to Mae, this is a chart of what happened at all of her different appointments, including her THI and TFI overall scores on that third column there.

So on the day of her initial evaluation, she had a THI score of 84 and a TFI of 77. She decided to pursue tinnitus retraining therapy. So one month later she came back for her counseling appointment, which is that big educational counseling and informational session. And we ordered some devices for her. She came back to get her devices about a month later after that, and we programmed them with just the tinnitus sound generator. And at that point you'll notice her THI score, had already decreased significantly. So a change of 20 points on the THI is considered significant and she achieved that. And also on the TFI, change of 13 points is what you're shooting for. So already even a month after the counseling, she was really at a point where we were hoping to see her go. And then her continued follow ups after that, after she was using the devices, according to the training protocol, she had continued to see some movement in her questionnaire scores ending at a 46 on the THI and then 57 on the TFI. So I wanted to talk briefly about cognitive behavioral therapy, just because I thought it was so interesting that she does this for a living, but didn't appear to be able to apply all of those same concepts to her own problems or treatment. So there's

evidence to say that cognitive behavioral therapy can be helpful for people who have tinnitus, although it doesn't make your tinnitus go away or necessarily change your perception of the tinnitus, it can really help to reduce tinnitus related distress and handicap. So the goal is to help people to identify and evaluate any negative thoughts that they have related to tinnitus and kind of change them and make them more realistic. So the idea being they're initially, gonna experience something and have an interpretation or thought which will lead to a belief and then lead to a reaction. So if you can kinda help them to get at the root of that, by changing some of these things, it can really change how they view all of this. And then I just thought it was interesting just in terms of self-treatment. And I was curious to see what the American Medical Association has to say about that. And there were several opinions on their website that pretty much stated that this is self-treatment, is a thing that poses a lot of different challenges. And it's probably not something that's the best thing for the patient in many instances. Especially in the field of mental health, they had indicated that someone who's treating themselves as really depriving themselves of the benefit of that outside consultation, which may really help them to see or address some of the things that they can't see about themselves.

So maybe that's part of why she couldn't apply the things that she already knew and taught other people to herself. So I think the takeaways are that there are a lot of ways to use sound therapy and counseling to benefit someone who's suffering from tinnitus. And especially in this case, I might've thought that someone who was intimately familiar with the concepts of cognitive behavioral therapy, might be able to apply them to themselves. And that might just not be the case for everyone. So even someone you might think, might not need your help might actually. And the second story I wanna tell you about is a man name that we'll call Robert. And he was initially seen in July of some year in ENT and was being seen for a second opinion of a diagnosis of Meniere's disease. He reported bilateral tinnitus left, being more noticeable than the right, again, just like my previous patient and bilateral hearing loss. The tinnitus he reported was not particularly bothersome, but definitely noticeable. And he was reporting some

dizziness, which I think makes sense, given the diagnosis that he was working with. Upon exam, otoscopy was normal, external auditory canal, tympanic membrane, middle ear, all normal and well aerated. The audiogram revealed a flat, moderately, severe sensory neural loss in the left ear with 48% speech understanding at an enhanced level and a sloping to moderate sensory neural hearing loss in the right ear with 84% speech understanding at an enhanced level. So the diagnosis that he was given at this appointment, which coincided with the diagnosis, he was already working with, was Meniere's disease. And the tinnitus that he had reported was consistent with what we know the tinnitus that is typically seen with Meniere's disease presents us. So typically a low pitch tinnitus, that's a low sensation level and fairly easily masked with environmental sounds, and that is what he was reporting. So the plan was to get an MRI, which ended up being unremarkable. He was referred to audiology for hearing evaluation. He was referred to a balance specialist and on the day of that evaluation, the physician concluded that he was likely suffering from hydrops, and that he had a pattern of test results that was potentially suggestive of possible bilateral disease. So that's something we were always thinking about in the future. And he was supposed to be following up in six months.

So seven months after that, and he didn't come immediately for the hearing aid appointment. And he followed up seven months later and we had to repeat the audiogram because my state licensure laws say that, "The audiogram has to be current within six months." So we repeated the audiogram on this day, and it's a fairly similar pattern, maybe a little bit more low frequency loss in the left ear than before. And when we're thinking about hearing aids, for this type of loss and for someone with this type of diagnosis, we're always trying to think about what might happen in the future. So eventually even though he has 48% speech understanding in the left ear on this day, he may get to a point where the Meniere's kinda burns out. And then he has really no serviceable word rec on that side. So this was something that we were thinking about, even at this point, just talking about some of the options with him. And there is evidence to say that, "Someone who has tinnitus and an ear that's unable "for any

reason, "can be helped by CROSS or BICROSS technology." And the idea is kind of similar to phantom limb in that if you can kinda trick your brain into thinking that, it's perceiving something that it's not, you might be able to deal with some of that overactivity and try to manage that a little bit better. So we talked about all the things you talk about normally. For hearing aid discussion, one ear versus two ears, all the styles that will be appropriate, all the different technology level options. And then related to Meniere's, we were thinking about the potential for fluctuation, poor word rec eventually when he gets to the point where it's burning out. And then there's of course, that tinnitus that we were trying to help him with as well. The article that I have listed down in the bottom is a good article to reference related, to just considerations for Meniere's disease. So on this day, again, 48% speech understanding. So then he waited another six months and decided to come back again, and again, we had to recheck his hearing.

So you'll see the results of the newer test on the right here, and some fluctuation in that low frequency. And on that day, 60% speech understanding. So if you get a sprint chart out, that's not gonna be a significant change from 48%, but it's just going along with that fluctuating hearing loss that we often come to expect with Meniere's and it's really difficult to know what to expect going forward. So something that we presented to him as an option was what I'm calling a convertible hearing aid. So if he decided to do this, we would program program one to be binaural amplification and program two as a BICROSS. And this is an option for certain devices. And it was actually really good timing 'cause we had just had a training with Unitron and they were talking about the capability for their devices to do this. So I decided to give it a try. And so we ordered some Moxi Dura 600s that had to be at the 600 level or higher, with some custom micromolds. And we programmed the first program to be binaural. So we did all of our probe mic measurements, these are the electro-acoustic checks. And then on the second program, we programmed it to be essentially a BICROSS. So the way we did this was, it's kinda like an off-label hack of the binaural streaming phone program. And Unitron has a really good document, it's that first link you see on the bottom there to

walk you through exactly how to do this in the software. There's pictures, it tells you set this ear as this capability and make this ear the preferred phone ear, and it tells you exactly what to do. So it's really, really helpful, and I would totally recommend checking that out if this is something that you're interested in. And then of course, if you're doing CROSS or a BICROSS, it's always good to verify that that feature is, or that capability is working the way that you think it is. So down on the bottom, there are instructions from Phonak related to how to complete probe mic measurements with a CROSS or a BICROSS. So that's something you can check out if you're interested as well. When we saw him at the three week follow up appointment, he reported that, "He had been primarily using the binaural setting, "which would be programmed one, "as his hearing really hadn't fluctuated severely." And I said, "Question mark yet," because this is something that he may experience in the future, but just had not at that time. He reported also feeling just more balanced in the binaural setting, having input coming from both sides. And thankfully, tinnitus was no longer a problem. I wouldn't say that, he felt it was significantly distressing before, but it was definitely noticeable, and now at this point he really was barely noticing it. So I think that the take home for this patient is if you have someone with hearing loss, that's expected to fluctuate, or if you're not sure if it might be expected to fluctuate. This could be an option for you, if you wanted to go this route sometime in the future, and even if you don't go with it right off the bat, it could be something that you incorporate later, just to give yourself some more options. And with that, I'm gonna turn it over to Dr. Oliverio.

- [Tia] All right, thank you. So let me get my slides up here, okay. So I've chosen two tinnitus cases, one reviewing the evaluation and one reviewing the treatment side or management side of tinnitus. We are going to be starting with the evaluation of tinnitus. Now, I know we all know those traditional methods of evaluating tinnitus in the clinic. So I wanted to branch out a little bit and discuss something we don't use as often, which is electrophysiology, specifically, Canon ABR indicate that tinnitus is present. Typically when a patient reports tinnitus, a common practice is to complete an audiologic evaluation, meaning pure tone, speech audiometry, and then we're gonna

note, any significant noise exposure history, any medications, habits that are associated with tinnitus that the patient completes. And we can also go as far as to complete a tinnitus matching evaluation. Now all of these are great, but all of these also rely on the patient to report their own subjective experiences. So hearing ringing in their ears, they're pushing a button when they hear tones and comparing two sounds for matching. So all of those are behavioral or subjective. Why do objective measures matter? Well, they can verify and quantify patient complaints. Two really great examples from the previous presenters when Dr. Jedlicka was using a video otoscope to show Mr. B that there is no evidence of an implanted device in his ears. And also what Dr. Zitelli mentioned about using OAEs to show those patients with normal hearing and tinnitus and objective measurement.

So it just really helps the patient to understand, and it really quantifies any patient complaints. These other two options, compensation and pension claims, and legal claims, we basically want as much objective measures as possible. Now I'm going to be talking a little bit later, about some studies that go into neural sources of where in the brain is tinnitus, where is it generated? So I thought it would be helpful to do just a very quick ABR review here. Now, typically I'm looking at waves one through five for ABRs, and that is used to determine possible retrocochlear pathology, or to do a threshold search ABR. And we are gonna be comparing the right ear response to the left ear response, and also comparing all those waves to norms, whether those norms are from your own clinic or they're from a more national study. So this is a picture of a textbook ABR. And those of us who do ABRs know that they hardly ever look like that, but you can see that there is, a wave one, a two, a three, four, and a five, so all of those are looking good. Okay, so to make it a little more complicated, this is a reminder of some of the sources or generators of those waves along the auditory pathway. So just of note, wave one is generally considered to originate from the auditory nerve, the distal portion of the auditory nerve, wave three from the cochlear nucleus and wave five from the endpoint or the termination of the lateral lemniscus. So the exact neural source of tinnitus is not certain. There is a ton of research on this, but often the

cochlear nucleus and the inferior colliculus come up quite a bit. So there again, there was a ton of research on that, but that is a whole another topic to explore. So this is our case, This is a 53 year old man, whoops, I missed a slide here. Here we go. This is a 53 year old man. He completed a compensation and pension audiologic evaluation. His left ear is much worse than his right ear. He has normal hearing through the mid frequencies, going to a mild sensory neural hearing loss in the right ear and very similar in the left ear, except that it is sloping to a moderate to severe. So definitely a high frequency asymmetry left ear, worse than right ear. He does have bothersome tinnitus in both ears, he considers it to sound like ringing or crickets, and this has been present since his military service.

So for approximately 30 years, he has noticed ringing in his ears and it has worsened in the past year. He has noted no changes in diet or life stressors, medication changes, but he does want me to know that he is upset and disappointed in his most recent compensation and pension rating results from his audiologic evaluation. So he believes that he should have been rated as higher percentage for hearing loss and tinnitus. This is certainly not my area of expertise, so I cannot comment on those ratings, but I just want you to note that he had a very emotional reaction to those results. Okay, he did complete a hearing aid selection and fitting appointment and is a fairly consistent user of his hearing aids. Prior to the fitting appointment, an ABR was completed, and that was completed to assess for potential retrocochlear pathology, and determine if he needed to see ENT urgently, potentially for some imaging. So up above there, you'll see his ABR results. So wave five interaural difference, were comparing the right ear to the left ear and we have an interaural difference of 0.09 milliseconds. Now every clinic is different, but typically clinics are using anywhere from 0.2 to 0.4, and anything beyond that is considered atypical or abnormal, so his is perfectly fine. And then the next one down the wave one through that should be five difference a is 4.1, and this is typically around four, four is ideal. It can certainly be smaller, especially with those cochlear hearing losses, but just looking at his data overall, it's a normal ABR, no real concern for retrocochlear pathology. These results were discussed with the patient,

and I explained my recommendation that we monitor his hearing loss annually to look for any changes, or sooner, if he feels like a change has happened. At the end of counseling. I asked him if he had any questions, and he asked, "Well, my hearing loss was tested. "Why didn't you test my tinnitus?" He was under the impression that the ABR was a test for tinnitus or a way to measure his tinnitus. Now at this point, I did review with him the Progressive Tinnitus Management or the PTM that we use here. And then I explained that we would be proceeding to a hearing aid fitting appointment, but other management options are available. I also explained that in this clinic, we are not in the practice of regularly incorporating ABR results into a tinnitus assessment appointment. However, his question did spark my curiosity specifically in how his ABR, this ABR from an individual with bothersome tinnitus, compares to studies that look into if an ABR can point at a neural generator, or if a pattern in latency of amplitude of ABR, can be observed in those patients with tinnitus.

So that brought me to Gu and Milloy. They had studies that do show some ABR patterns in those individuals with tinnitus specifically, they've have found reduced wave one amplitude. And we know that the wave one amplitude or the wave one is coming from somewhere, around the distal portion of the auditory nerve. They also found enhanced wave five amplitude. And we know that that is coming from the inferior colliculus, the termination of the lateral lemniscus somewhere in that area. Now this is isn't really surprising because we can expect a reduced amplitude wave one, was sensory neural hearing loss and even an increased latency. So that doesn't surprise me, but it is interesting that the enhanced wave five, around the inferior colliculus, lateral lemniscus, it could indicate that there's increased random neural activity at that level. However, into Guest study, which shows the exact opposite of those findings. So he's saying, "There is no correlation between ABR measures "and noise exposure reports, no reduced wave one amplitude." And so they are actually wondering if based on this, is it possible that tinnitus has nothing to do with cochlear neural synapse loss. And relating this back to my patient, this is the reason why, I cannot comment on objective measures for his tinnitus. I could not pull up his ABR and say, "The amplitude

of wave one is this, "the amplitude of wave five is this. "And so yes, you do have tinnitus or no, you do not." My patient is reporting bothersome tinnitus, but he had really great amplitudes on both of those waves. So my results are aligning more with what Guests found, but that could be patient to patient, very different. Some take home messages. Definitely more research is needed to determine if ABR can accurately reflect, a person's tinnitus perception. We are not using this in an audiological evaluation for tinnitus, patient counseling, legal compensation claims, certainly not at this point. One question that kept coming up in my research is, could electrophysiology predict if a person will experience tinnitus in the future? So certainly not right now, but that's just something to keep in mind. Okay, so moving on to our next topic, which is Group Tinnitus Management. At the Pittsburgh VA, we have a really great class on Tinnitus Management. It is typically three sessions that meet about every two to four weeks, and each session is about an hour long. We use the Progressive Tinnitus Management and the PTM handbook that was created by Henry, Zaugg, Meyers and Kendall in the class. And basically, we work through that workbook so that it's structured and we get to be educating participants on what tinnitus is and how to manage it.

So we are very lucky to have access to a psychologist who specializes in cognitive behavioral therapy. She actually works a lot with pain management patients and speaks on the similarities between pain and tinnitus. Especially since they are both subjective experiences that are very hard to measure, they're by patient report only, but they can be very, very frustrating. So groups are relatively small. We do that on purpose to encourage bonding and asking of questions. And we do encourage participants to bring their support, you know, family members, support members, everyone. So I'd like to cover one patient that we've worked with here that has completed the tinnitus management course. This patient is a 67 year old male. He has had tinnitus for 45 years and it has gradually become bothersome in the past 10 years. So this is something that has been present since his military service. He was a gunner in the military. He also worked for several years outside of his military service as a steel

mill worker, which was a very common occupation here in the Pennsylvania, Ohio, West Virginia area. And he also does some target shooting and power tools, so lots and lots of noise exposure, no hearing protection was worn in the past, but he does wear it now, so good on him. He completed audiologic evaluation, which showed normal hearing through about 1000 Hertz to a severe to profound high-frequency sensory neural hearing loss. So he did complete the THI which resulted in a score of 68, which is considered severe. Noting that he has complained of disrupted sleep, any kind of some difficulty going through his activities of daily living, especially if they're in quiet areas. And he has found that his tinnitus is very, very difficult for him to mask or even to turn his attention away from it. Within the THI score of 68, breaking that down into categories, his functional score was 18, his catastrophic score was six and his emotional score was 44.

So that's the highest one, was emotional. This gentleman wears open-fit RIC hearing aids. He has a tinnitus program in those hearing aids at his request, but he tends to not like to use it. He tends to like to use the app on his phone that is proprietary to his hearing aid manufacturer. And he also uses a Bluetooth speaker at night. He just sits it on his nightstand and he plays some noises and he says that it helps, but that his tinnitus is still sometimes bothersome. So he was very hesitant to join this group class. Eventually he did join and he did complete all three sessions. But prior to joining, he was describing himself as, "Not a people person" and "Not a joiner," and he prefers "Alone time." So we really felt that he could benefit from relating to those others experiences. But we of course did present the option of continuing with individual tinnitus management if he wasn't comfortable joining a group. He came around to the idea once he was told, about the structure of the class, the number of meetings, the topics covered, and the real kicker was when his wife and daughter said, "We're gonna come with you, so you better be there." So he had a lot of encouragement from his family. So he did complete all three sessions and his family members were there right next to him for all three sessions. He did at the end, feel that he benefited from the sessions from the skills that he learned in the class. His THI dropped from a 68 to a 38,

and a 38 is just on the cusp, between a mild to moderate handicap. So that's quite an improvement. And the subcategory that dropped the most was the emotional subcategory. So Thomas in 2011, has this great study about group classes and what they helped to facilitate. One of them being information exchange, and that's simply being able to tell your story that can be so therapeutic. Social comparison. That's something like, yes, I've experienced that too. And then coping. Coping being I'm not alone in this experience and then developing new coping skills. So in groups that we're doing this in the human dynamics of the groups are super therapeutic. And just anecdotally, I really enjoyed listening to participants at the later sessions because they would discuss what coping skills worked and which ones did not work. And we've had a lot of good laughs about when we were sharing those experiences, which is really remarkable to laugh and to be able to joke about something that was so bothersome to you, maybe just a few weeks ago. Now there's another study by Collins from 2009, and he basically is just listing off all of these great benefits of group therapy, lower clinic costs, reduced need for future services, better participant satisfaction, that's key, and self-efficacy, better overall health status, compliance and quality of life. You know, of course, quality of life is super important in the field of audiology. So these are all great benefits.

And I'd like to add that if a cognitive behavioral therapist or a psychologist is available, patients can be very open to working with them, and that just makes all of those benefits so much more pronounced. Okay, so this is a video that is available to view on YouTube that we play in our group class. It is called the Unwelcome Party Guest. And the premise is that you are throwing a party, the guests are arriving and they're having a great time, but then this bothersome person arrives, and he's the little guy on the left, who's looking a little disheveled. So he arrives and he's uninvited. This person crashes the party, and they're really interfering with party activities and lowering the fun mood that was previously there. So you make the guests leave. You say, "You're uninvited," and he leaves, but they keep coming back. So you make them leave again, he comes back, you lock the door. Well, he finds a way in through a window. He always finds a

way in, and so now it's to the point where the whole party, which was previously fun, is now centered on finding a way to make this unwelcome party guests leave, so the fun can continue. But then you realize if you just let them in, yes, you are going to be annoyed, they are annoying, but the activities eventually continue, the fun party activities and overall the mood lifts. So it's not as ideal as if he never showed up in the first place, but it's a much, much better strategy, than focusing all of your energy on this one bad uninvited party guest. So that is a really a cute video on YouTube that I would recommend you incorporate into tinnitus management. It's acceptance and commitment therapy, but it's also just a really sweet video to watch, and it makes a lot of sense. So some take home messages. If your practice does not yet offer a group tinnitus class, definitely consider forming one. It takes not a lot of effort at all. At the bare bones, no equipment is needed, you just need trained providers. And then this is something that can be done and completed via telehealth.

So I know with the current pandemic, we don't want a lot of people in a room together or as little as possible. So this would be a great option for a telehealth class. Some patients, just like my patient, may be reluctant to join a group, but just encourage them to get involved by using past group experiences, support from family members and just educating them on what to expect. I find that a lot of apprehension to joining a group tinnitus class is just anxiety about what is going to happen in the class, am I gonna be asked to speak or share my story? So give them as much information as possible so they know what to expect. And then if available, can definitely consider a mental health professional, a psychologist, cognitive behavioral therapist to speak to the group. CBT or cognitive behavioral therapy is so valuable to add to this tinnitus group. Our veterans in particular have said that they appreciate that one-stop shop, where they can ask the audiologists more tinnitus questions, and then they can ask the cognitive behavioral therapist, more therapy and management-based questions. And it's just like a perfect marriage. All right, and that's all I have.

- [David] Excellent. Thank you, Dr. Oliverio, that was fantastic. And now, this is one of my favorite portions of the presentation here. We are going to address some of the questions that were asked throughout the presentation. So the first question that we have is for Dr. Zitelli. This question was asked in a stated, imbalanced go hand in hand. Was there anything done for your patient's imbalance, and did she have any vestibular tests done?

- [Lori] Yes, thank you for asking. She had been referred to the concussion clinic and I don't have access to all of those notes, but I can see that she was diagnosed with vertigo of central origin with unspecified laterality. And I can see that they had documented some of her goals, which were to be able to work at her computer without an increase in dizziness and to drive without dizziness. So I can see by the end of her physical therapy journey, which was about a month and a half after she started it, she met both of those goals. I can also see that she started with a dizziness handicap inventory of 56 and ended with a score of 12. So their goal, was to help reduce some of those environmental sensitivities that she had been experiencing, and it seems like they had achieved that.

- [David] Perfect. And we had another question asking if you could review the essentials of treating tinnitus and patients with profound unilateral hearing loss.

- [Lori] Yeah, this is a really hard thing to do. We know that many people who have tinnitus with profound hearing loss, do benefit from cochlear implantation. I think probably that's not the primary reason why people do it, but we also know that some people who experience tinnitus and end up having a cochlear implant have worsening of their tinnitus. So it's definitely not something that is a guaranteed cure or treat all for that. For someone who has a unilateral profound loss, using a CROSS or a BICROSS, depending on the hearing of the other ear is a good option. And many people do feel like it helps them to like, it tricks their brain, essentially into thinking they're getting stimulation to that side, so they don't notice the tinnitus as much. Some people feel

like they notice that improvement even without the use of the tinnitus sound generator, and some people really like the addition of that. So you wouldn't, if you were using a CROSS or a BICROSS, the ear with the hearing loss, would not be directly receiving the tinnitus sound generator, but that interaction in the brain is very helpful for some people. So it would still be going to the side of the better ear regardless.

- [David] Excellent, all right. So the next question was actually for me, and this was involving the first case where we were discussing the patient that was non-compliant with all of the treatment recommendations. And the question was, did you change your counseling with other patients to not lead them? So for example, it was said in this case that the patient complained of occlusion after being fitted with the earmolds, and we had warned him of that. Well, I still do tell patients about the potential occlusion that could occur with your mold, especially somebody who is going to use an earmold in an ear with essentially normal hearing in his left ear and then would just the high frequency hearing loss in the right ear. And one of the reasons why I discussed that so thoroughly with him, was because my initial recommendation was for us to try different dome sizes with him, just to see if he could find one that was more comfortable. But he, when we were just explaining the options, he just became really focused on the actual earmold options.

So I still keep most of my counseling the same for patients that tend to become just fixated on certain things. I may have scaled a bit back, but I think in this case, the person was more likely just repeating back the negatives that I had discussed with him rather than actually experiencing it. Because as we saw with his datalogging, he was only wearing the hearing aid, he only wore for an hour, and that was on his way home from the appointment. The next question I asked for me as well, was asking about the Starkey SoundPoint tinnitus feature. So now this person was wondering what is meant by adjusting the noise generator without any identifiers. Well, in the four quadrants what's happening is, when the person is moving the mouse around to listen to the different masking that's occurring in through the device, you're changing the shape of

the frequencies that are being provided with a sound generator. It's also changing the intensity as well. So a person may open this up and think, "Okay, if I go up, "it's going to become louder, "if I go down and it's going to be softer," that's not necessarily the case. Or if it's somebody that has any type of acoustics background or they understand, you know, how a tuner would work, or if they know like with the keys on the piano, think, "Okay, if I go to the right, "it will be more high pitch, "if I go to left it'll be more low pitched," that's not the case. It's completely randomized, so that way, when the person opens up this program, then they can move the mouse wherever. And it's not going to go to one specific intensity, or it's not going to shape the sounds in a certain way. It's completely randomized. So the patient, when they're looking at the screen, they just see four different quadrants where they'll move and every different space will have a different sound.

So they really can't predict what's going to happen based on when they move. Now, the last question that we have here for today is just to ask about what are the subscales of the THI. Well, the THI consists of three different subscales. So this would be the functional, catastrophic and emotional subscales. So they're all broken down with the types of questions that are asked out of the 25 that are on the list. Now functional makes up the largest portion, emotional middle, and then catastrophic, has the fewest questions in there. But a lot of times when we're looking at this, we're going to look at the overall score, being the most important, unless you see certain trends where say a person has a very, very high functional score, but catastrophic and emotional are lower. So those are how those different categories can be used to better get an understanding of what the person's experiencing. But like I said, most of the time when you're looking at it, just a general overall score will give you a good idea of what the patient is experiencing. And with that being said, that was our last question for this presentation. We thank you so much for listening and we've really enjoyed this process. I would like to thank Dr. Zitelli and Dr. Oliverio for joining me in this. And I would also like to thank Carolyn Smaka and the entire crew at AudiologyOnline for

allowing us to give this presentation. And we hope to be able to speak to you again in the future. Thanks so much everyone, and have a great day.

- [Carolyn] Thank you Dr. Jedlicka and Dr. Zitelli and Dr. Oliverio. It's been a great informative presentation and thanks to everybody who logged in today and for your additional questions, we hope everyone has a great afternoon, and we hope to see you in another AudiologyOnline course soon.