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Implementing Vestibular Rehabilitation and
Multidisciplinary Teams in a VA Setting, in partnership
with AVAA

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- [Christy] It's my pleasure to welcome back a wonderful team of clinicians from the sunny Miami VA healthcare system. With us today, we have Dr. Rachel Kansky and also Dr. Patricia Gabbidon. They're gonna share with us today on how to implement vestibular rehab into your multidisciplinary team in a VA setting. And at this time, I hand the mic over to you.

- Thank you so much. Welcome to our presentation entitled Implementing Vestibular Rehabilitation and Multidisciplinary Teams in a VA setting. What we hope to achieve by the end of this presentation is a shared idea and excitement that vestibular rehabilitation is first and foremost for any audiologist who may be interested in bringing this into their practice. Also to exemplify that VRT is not just for any acutely dizzy patient with a neuritis or labyrinthitis case history. We will begin by discussing the diverse scope of pathologies we treat on a fairly common basis, jump into some multidisciplinary relationships we value and how you can implement something similar and then conclude with a VRT case study to demonstrate varying therapy and patient adherence to a program.

So here are our disclosures. And please note that the views expressed in this presentation are those of the authors and do not necessarily reflect the official policy or position of the US government. Here are learning outcomes. Here's what we know. 20 to 30% of adults experience dizziness, which only increases with age and the economic burden can be as high as 13,000 for those with a bilateral vestibular hypofunction. What we know is that one third of adults have a fall each year and the prevalence increases with age and vestibular rehabilitation therapy helps to reduce dizziness and fall risk in those with vestibular hypofunction. The goal of VRT is to help patients reduce symptoms of dizziness and regain confidence and independence.

At the Miami VA Healthcare System, we currently have VNG, vHIT, VEMP testing offered at two facilities, both our main hospital and our largest outpatient clinic. BPPV

screenings are offered throughout all of our clinics. Some are offered on a formal basis, others more on an informal basis, meaning we accommodate the patients utilizing the patient care spaces that are available. We've had VRT since 2017 at the Miami VA Healthcare System, thanks to our colleague, Dr. Krystal Vera, and her efforts with building the framework of this program. VRT is offered face-to-face at two facilities, again our main hospital and our largest outpatient clinic. And we do also offer virtual VRT sessions. Currently, our interdisciplinary teams include the Polytrauma Traumatic Brain Injury Team and the Functional Neurological Disorders Division.

We perform several tests at our facility, which you can see listed here. When vestibular patients first come to the Miami VA, we triage patients, determine what type of testing may be most appropriate. Triage typically occurs by way of a phone call with a veteran asking about onset of symptoms and getting a brief case history. This helps us recommend further testing for the veteran and establish care with our service. So working backwards or utilizing the bottom-up approach encourages you to utilize your understanding of the limitations of VRT and what it entails to better guide your approach to your vestibular evaluations regarding what to include for the test battery and case history. With knowledge and experience of VRT throughout the case history, you're actively trying to determine the particular activities of daily living that the dizziness interrupts and/or interferes with.

For example, if a patient reports that riding in a car provokes their dizziness, important things to note may be, does it occur when they're the driver or as a passenger? What are they doing when it occurs, looking in the side view mirrors or riding in a car looking out the window? If it as a passenger, you may wanna look closer at the patient's response to OPK. The results may be normal, however, what was the patient's experience during the testing? The bottom-up approach can help providers center back to what matters most to the patient as earlier as their vestibular evaluation. Throughout the testing with a VRT mindset, although nystagmus has not noted, you

may find that you're constantly noting particular movements that are provoking the dizziness, especially for poor historians, which could identify the need and/or highlight the benefit of completing the motion sensitivity quotient tests that we're gonna talk about a little later to draw these out further. For those clinics with poor access for vestibular testing or patients with very limited availability, you're able to identify tests that could prove to be crucial if omitted such as the vHIT to better identify how far along a patient is with their compensation journey.

- So let's jump into key elements of a VRT program. One of the first things we consider in a VRT program is who would make a good candidate. What we know from literature is that patients with a unilateral hypofunction may be the classic best candidate. We try to target a wide range of vestibular disorders to avoid getting stuck in a box when met with challenging cases. In our experience, a patient with motivation to improve symptoms and commitment to a home exercise program can still demonstrate improvement in symptoms. Our exclusion criteria at this time consists of those with uncontrolled pathologies like a fluctuating Meniere's disease or third window pathologies like superior canal dehiscence syndrome. Symptoms where we can't really provoke them to structure a VRT program around, these patients would not qualify for the vestibular program at this time.

Special considerations are for those special populations who need some extra TLC. Maybe their symptoms have been ongoing for a while and they're feeling hopeless. Or maybe it's the patient who had a TBI in their twenties and learned to live with their symptoms for 30 years and is now just seeking care. We pay close attention to these cases to see what they need and determine how a VRT program can be structured for their symptoms and their goals. The initial VRT appointment begins after a patient is seen for vestibular testing and symptoms seem appropriate to trial VRT. During this appointment, we perform various types of assessments to see where the patient is struggling from both a vestibular and a balance standpoint.

We consider fall risk when administering the Tinetti Balance and Gait Assessment. We also obtain a baseline dizziness handicap inventory, which we monitor throughout VRT sessions and this helps us determine whether the patient's a good candidate or not. A typical patient who may be a good VRT candidate with audiology would show abnormal DVA or issues with the VOR, some abnormalities in MSQ showing motion intolerance, but relatively normal or low fall risk on the TBA. And while this may be typical, if you're considering setting up a VRT program for your clinic, you're likely already aware that there's no typical vestibular patient. As we broaden our scope with multidisciplinary teams and start thinking more about a whole health approach, we consider the whole patient and what matters to them when enrolling in a VRT program.

- Forming goals is a critical part of our initial session with the patient as it helps them quantify the question, how will I know if VRT worked for me? We consider several factors when guiding patients in setting goals. We consider activities of daily living challenges, scores, and the evaluation scores, results from screeners like the DVA, TBA and MSQ and VNG test results and determining what we feel is realistic for the patient to achieve and of course, what matters most to the patient. Ultimately, the main goal for every patient is to feel less dizzy, right? But having these guidelines in place helps us guide the patient to more measurable and attainable goals. Something worth considering for VRT is having a contract that the patient reviews prior to therapy.

The contract with outline expectations for therapy to ensure that the patient enters the program with realistic expectations. It would also encourage patient compliance in the VRT program. Something else worth considering in a contract is having the patients identify factors that may motivate them to commit to VRT and those that may prove to be obstacles that they know may get in the way of committing to VRT. This is something that we do with our hearing aid patients when we are completing the client-oriented scale of improvement or the COSI, why not do this with our vestibular

patients? This idea of a contract and that particular component of the contract was brought up in one of our multidisciplinary groups specifically for persistent postural perceptual dizziness patients enrolling in VRT. We are in the process of implementing this and looking into perhaps expanding it for all VRT patients.

- A follow-up style of VRT appointment consists again of reviewing goals, any progress the patient feels they may have made and then adjusting the exercises to the patient's current experience of his or her dizziness. It's important to note when a patient first starts VRT, they may feel an increase in initial symptoms, but literature suggests that this can be typical and symptoms usually do subside over time. Although if symptoms do remain high, it may be an indicator the exercise is too difficult. So trying an easier exercise is recommended or maybe even conclude the session altogether for that day. At the patient's follow-up appointment, we also can administer another DHI to measure the objective perceived handicap of the patient.

Throughout the appointment, we do trial various exercise types and determine how to structure the program best for their at-home exercise program until their next follow-up appointment with us. Patient compliance is key. The compliance allows the patient to have continued performance in the VRT program in their at-home exercise program and leads to more successful outcomes. One of the most common types of VRT exercises is adaptation or gaze stabilization. The VOR is an adapted system maintaining compensatory eye movements during head motion, which allows us to have clear vision when we walk or run or jog or any motion. The focus of these exercises is to improve the VOR system by creating error signals for the central nervous system to compensate and reduce retinal slip.

The exercises create changes in the vestibular system's neuronal firing rate in response to head movements. This in turn helps us to increase VOR gain, stabilize gaze and reduce patient symptoms. VOR exercises are typically completed until oscillopsia

occurs. And the frequency rate of the exercises are performed and adjusted faster if the patient's improving or slowed down if the exercises are too difficult for the patient or if the patient's experiencing significant dizziness. Finding the right balance can be a little tricky and we often ask patients to rate their symptoms on a severity scale, zero to five. So zero is no dizziness and then five is severe symptoms, and that way we know how to modify the exercise difficulty as needed.

Examples of adaptation exercises include VOR times one where the patient turns the head while maintaining a fixed gaze on the target. VOR times two, where the patient turns the head in the opposite direction of the moving target all while continuing to fixate on the item. And then VOR cancellation or VOR suppression where the patient turns their head in line with the moving target. These exercises are most effective when performed with head turns. Performing psychotic movements or pursuit movements in isolation showed to be less effective in VOR recovery. These exercises can be modified to match the patient's progress level and also just to keep sessions interesting. So things we consider when modifying our speed. How fast or slow does the patient need to move their head or the target?

The target itself, is it plain, is it multicolored? Does it warrant some sort of cognitive task? The background, is the background plain, simple? Is it stable or is it moving? And then position, is the patient personally sitting in the chair or are they a little bit more advanced where they could stand, stand on foam or maybe even walk? The next two slides will show videos to demonstrate difficulty progression in both VOR times one and times two exercises. So here we have the patient, me, sitting in a chair performing VOR times one exercises for seated, standing, standing on foam, and then eventually if the patient feels comfortable, maybe even walking. Here we have VOR times two where the head will move in the opposite direction of the target item and this can be performed seated, standing, again on foam or walking.

VOR cancellation can again be performed the same and if anyone has any questions, please feel free to reach out about that in greater detail. This data is a suggestion from the most recent American Physical Therapy Association's clinical practice guidelines to help clinicians prescribe weekly clinic visits with an associated at-home program using gaze stabilization exercises. These are the minimum recommendation, but they do help to provide realistic expectations for both the patient and the clinician. As patients are going through VRT, we often check in with them and ask, "Do you feel like you're benefiting from these sessions or what would an improvement really look like to you?" And aside from establishing goals at the initial appointment, questions like these can help check in with the patient and see how they're doing, keeping this timeline in mind because goals can change. If the patient answers no, then maybe they would benefit from some additional resources or different types of resources and we'll cover that a little bit later.

- Habituation exercises involve repetitive movement provoking a patient's symptoms. The literature suggests that habituation exercises causes a reduction in the amplitude of excitatory postsynaptic potential produced by sensory cells. These are just cells that carry signals from the outer parts of your body or the periphery to your central nervous system. This starts off as a temporary change, but the more the habituation exercises occurs, it becomes a permanent change. It's recommended that these exercises are completed one to two times a day with a 30-second break between repetitions. You also wanna make sure to be careful to avoid over provoking the patients and to make sure to incorporate various types of head and/or body movements to address various parts of the vestibular system.

Substitution involves the use of other systems to substitute for missing vestibular function. Those systems can include both visual and proprioceptive systems. For the proprioceptive system, it involves focusing on postural control exercises, which we'll discuss shortly. Most of the substitution literature focuses on strategies for those with a

bilateral weakness. With that said, for vision, the literature suggests completing central programming of eye movements. This involves maintaining gaze during anticipated head movements. For example, if you have the patient make a large eye movement towards a target before they move their head to face the target, that would be an example of central programming of eye movements. Patients with a unilateral weakness, a bilateral weakness, and those without a vestibular pathology uses central pre-programming to maintain gaze stability during predictable head movements.

However, the use of central programming of eye movements to maintain gaze stability is greater among patients with a bilateral vestibular loss. Also, this strategy is only effective for low frequency head movements, specifically less than one hertz. With slower head movements for a shorter duration, the cervical ocular reflex or the COR becomes active and generates an eye movement that's opposite to the direction of the head movement and this compliments the VOR. The COR does not make any significant contribution to eye movements in patients with normal vestibular function. However, it does contribute to eye movements for those with the bilateral weakness and the literature suggests that it does so also for unilateral weaknesses as well. Postural stability recovery is actually slower than gaze stability recovery.

Sorry about that. Yeah, just so you know, postural stability recovery is slower for gaze stability recovery, but postural control exercises, what they involve is actually altering one of the sensory systems initially and later altering multiple systems as the balance improves. So both the visual and somatic sensory inputs can be altered as one's balance improves by practicing maybe standing on dynamic surfaces such as foam or grass or a mat with the eyes closed or with head movements incorporated. Then more challenges can be introduced by maybe tossing a tennis ball or bean bags while walking or doing maybe a tandem walk on a thick carpet, a mat or grass or walking on a treadmill and performing head exercises.

So everyone uses hip and ankle strategies at some point. However, some patients tend to rely on these strategies more than others. There are two postural control strategies that tend to compliment each other. For the ankle strategy, this involves a patient standing in a wide stance and shifting their pressure from the heel to the toe and swaying. When this occurs, the upper and lower parts of the body move in the same direction. This tends to be utilized more in patients that are somatic-sensory dependent, which tend to be patients with a vestibular weakness. However, in contrast, the hip strategy requires a narrow stance and patients to move around their trunk and their hips. The upper and lower body parts move in the opposite direction, either forward or backward.

And this is not typically utilized by patients with a vestibular weakness because it tends to be more vestibular dependent. So ankle strategy exercises involve having the patient make a small sway backward and forward or side to side while keeping the body straight, which means not having them bend their hips or their knees. To vary therapy, you can have the patient maybe reach or lift or throw an object. And then the hip strategy exercises involve having the patient practice movement around their trunk at various speeds without taking a step. To vary therapy, this can be performed at a faster rate, with larger displacement or on a dynamic surface. Examples of this would be having a patient maybe stand on a narrow beam in tandem stance or maybe having the patient stand in single leg stance.

Things to consider when selecting the appropriate VRT exercises. Reevaluating what you're treating by reviewing the vestibular evaluation. That way, we are tailoring the treatment to a particular diagnosis. For example, management of a patient with a unilateral vestibular hypofunction may be managed differently than one with a bilateral hypofunction. Review the patient's case history for not only the activities of daily living or ADL that their dizziness is affecting, but the environments where the ADLs are performed. Patient's environment becomes important because we wanna make sure

we're addressing ADLs that patients encounter regularly. For example, if a patient never really encounters steps nor has steps at home, seeing as therapy sessions are limited in regards to time, you wanna focus on what truly matters to the patient.

You also wanna consider their VRT goals. However, in theory, VRT goals should align with ADLs that are affected by dizziness. There are special considerations for VRT for select patient populations, patients including but not limited to patients with a bilateral weakness. Patients with a bilateral deficit rely on visual cues during the acute stage and somatic sensory cues during the chronic stage, which could prove to be helpful when considering what postural control strategies to work on. Substitution exercises for these patients can involve the central programming of eye movements and COR, which was discussed earlier. Patients with a bilateral weakness are at greater risk of falls. Therefore, it's suggested that if they're 65 years or older with a bilateral weakness, you may wanna consider a referral for assistive device, especially in the acute stage.

However, there's also this trade-off because the literature suggests that you also wanna minimize dependency on assistive devices. Another thing to consider with this patient population is both environment and behavioral modifications. So having them ensure that there's appropriate lighting around, non-slip flooring, avoid rushing, maybe having them plan their movements when in crowded spaces and then maybe maybe even having them work while sitting to avoid falls. Okay. So the research regarding otolith dysfunction and VRT outcomes is quite sparse. We're unable to locate literature for VRT outcomes exclusive to otolith dysfunction. Some medical centers are using prolonged head tilts and bouncing on an exercise ball for VRT. We're currently unable to locate evidence in support of this.

However, we were able to locate evidence in support of trampoline use for these patients. Lack of literature though doesn't necessarily mean the outcomes are poor.

Hopefully more literature becomes published addressing this unique population. A study looking at patients with both an otolith and vestibular hypofunction found that these patients had significantly fewer problems when driving after VRT compared to those with purely canalith involvement. This study did not appear to have tailored their exercises towards otolith dysfunction in any way. For patients with 3PD or PPPD, another study investigated the outcomes of VRT, specifically the use of patient-tailored gaze and gate stabilization exercises. Exercises were tailored to patients' complaints and perceived limitations and therapy was varied based on performance.

For example, the background during gaze stabilization exercises changed from blank to a busy background such as a checkerboard or a moving one such as waves.

Significant reduction in functional and physical subscales on the DHI was noted, but not for the emotional subscale. And this highlights that VRT alone in this population does not necessarily address the mental health component. What we know from the literature is that the best dizziness and mental health outcomes, specifically anxiety for these patients, occurs when VRT is supplemented with cognitive behavioral therapy and antidepressant medications. All right, so here's an illustration of how you can vary gaze stabilization exercises in patients with PPPD. The patient can perform an adaptation task while looking at a moving or complex background with a small target on screen. So here's an example of that. Excellent.

- We know VRT programs require practice for the system to obtain feedback about pathway errors and improve over time. When the patient's symptoms start to reduce with specific VRT exercises, it shows the condition is improving and that the patient may be ready for a more difficult task. The implementation of more demanding tasks and faster reach should be introduced when a patient notes improvement. Advances in technology have allowed us to play around and see how we can use things like virtual reality as an opportunity to make VRT a little more interesting. And if you currently

perform VRT in your clinic now, you know that gaze stabilization exercises may not be the most interesting thing for a patient to perform a couple times a day.

In the literature, virtual reality was defined as using computer technology to create a simulated image or environment, which can represent both a real and fictional world. Studies have shown that virtual reality when added to VRT was more enjoyable and less tiring for the patient and also resulted in greater therapy satisfaction when compared to the conventional VRT group. We can take advantage of the sensory conflict a patient may be experiencing even more by immersing them on their vision into a challenging and stimulating multisensory environment. This also helps to reduce some of the fear and anxiety a patient may typically feel in this type of situation. In our clinic, we use these goggles sparingly, likely because we only have one set, but also because patients are referred to physical therapy to work on functional goals like running or because the patient has chosen to enroll in the virtual VRT option.

The photo here displays options we use to vary therapy like switching up the stimulus type or target item, using a complex background like the stripes here or adding in a cognitive test like the stroop test. Another way we monitor progress is by monitoring the speed of VRT in the clinic, as well as having the patient feel comfortable at a practice at home. During the face-to-face session, we determine a metronome rate that is provoking for the patient, but not too intense where their symptoms feel like they're gonna be pushed over the edge. We counsel them on appropriate speed for their symptoms and then encourage them to monitor their speed until we see them until their next follow-up appointment.

These are two apps that we recommend for our patients to download depending on their phone's operating system, but a metronome is also easily available with a quick Google search. When we start considering discharge, there are some factors that can impede improvement and should absolutely be considered, but these are not

necessarily an end all be all. Things like medication and age, these can prolong the duration of a patient's time in VRT, but they don't typically prevent the patient from achieving any benefit. It's important to check in with a patient about avoidance behaviors as well because these are often subconscious behaviors that a patient has grown accustomed to over time. Recently, I was working with a patient who never put together that, instead of turning his head to make a turn, he was turning his torso in line with his head, avoiding those quick head turn motions.

So after breaking down these walls, the patient was able to take leaps forward in catching himself making the errors and work toward growth and reduction in symptoms. Mental health status also has its role in potential discharge as it's not uncommon for patients to have an underlying emotional component to their dizziness considering that their dizziness is causing a barrier to an enjoyable quality of life. Conditions like anxiety and depression may complicate a treatment plan in VRT, especially since some patients rely on their doctors for support as they may not have a strong support system or network at home. It's important to ensure that patients' underlying comorbidities are being addressed through some form of support like cognitive behavioral therapy, counseling or medications.

Regarding controversial topics, literature seems to be split on whether beginning VRT close to symptom onset affects outcomes. In individuals with acute unilateral hypofunction, it's still thought that delaying treatment may be detrimental to outcomes. However, for those who experience chronic vestibular hypofunction, the timing of when VRT is started does not necessarily seem to affect outcomes. And this is great news because it shows that some VRT proves to be better than no VRT at all. So for this reason, timing of when VRT is started does not necessarily determine need for discharge. Therefore, discharge can be tricky and it requires careful consideration. The easiest case is when a patient recognizes their goals have been met, feels comfortable parting ways and ending their weekly or biweekly sessions.

The water is a little more murky when the patient's DHI scores remain high, if a plateau and therapy is being observed or if symptoms start to increase with therapy sessions. This requires us to take a step back, reassess the purpose of enrollment and what our expectations were for the patient when they first enrolled in VRT. We tend to place a greater emphasis on the patient-centered goals rather than the DHI because we find that patients continue to rate the DHI high as long as symptoms are present, despite us seeing an objective improvement in their symptoms and greater difficulty in VRT exercises being performed. If they are no longer benefiting from VRT but continuing to try sessions, they may be taking a spot away too from someone who would benefit but can't attend due to clinic wait times. We need to explore other avenues where patients may receive better care if they're not progressing with VRT and audiology.

- Does one VRT program exercise plan work for all vestibular patients? The APTA clinical practice guidelines put out a great resource about considerations for VRT and factors that may modify VRT outcomes. In choosing which exercises work best for the patient, we wanna consider what will optimize recovery, reduce distress and improve functional ability to return to activities of daily living and enjoyment of life. Generally speaking, recovery time will vary depending on the patient and associated comorbidities. VRT may also vary based on clinician-related factors such as the setting tests available and available resources per clinic. Special populations may require additional sessions such as those with a cognitive or mobility deficits or those who are taking vestibular suppressants. It is not expected that all individuals enrolled in a VRT program will perceive benefit, but studies show a predominance of benefit compared to harm, whether it be reduction of symptoms, ability to return to work or drive or reduction in autonomic anxiety and/or depression scores.

- You can perform VRT both face-to-face, virtually or as a hybrid model. During the pandemic, we all got a little too comfortable with the virtual platforms like Zoom,

WebEx or even FaceTime, but a hybrid model can be more easily implemented than you might think and it was for us. Our virtual format VRT appointments came to be during the pandemic where we needed to figure out a way to still see patients despite them no longer being able to travel to the hospital to receive care. Our first appointment at the Miami VA was conducted in March, 2020, with a patient who was interested in trialing a virtual modality. She was already familiar with the face-to-face format, which was helpful, so she felt confident in trying something a little bit more different to avoid a disruption in her care.

To do this, we used the VA specific and secure video conferencing platform, VA Video Connect or VVC, and in the next few slides, we refer to the virtual VRT option as VRT-VVC. And we collected some data with our colleague, Dr. Krystal Vera, from 2019 to 2022, comparing outcomes of the conventional VRT to the hybrid VRT-VVC option. Similar to the in-person sessions, our VRT-VVC sessions consisted of reviewing therapy goals, tailoring exercises to patients' unique needs and obtaining a DHI measure. We tried to send the DHI out via secure message email system or through the mail or we administered it orally if we had to during the session. We recorded patient performance data to assess benefit and similar to the in-person sessions, patients were discharged when determined appropriate.

In the VRT-VVC, clinicians or we were able to guide the patients over the computer screen across the computer watching their gaze, looking at their head movements and able to guide them accordingly. And as the patient demonstrated progress, the exercises could be tailored the same way we would do in person working with the patient and this time, what they have in their home. So even though this is something that was first offered during the pandemic, it's now a service that we offer to all patients who are enrolled and able to participate.

- This graph highlights how our clinic's VRT modalities have shifted throughout the years. So in 2019, we were seeing all VRT patients for face-to-face visits only. However as you can see, there was a drastic shift that occurred in 2020 as most of our clinics had limited face-to-face visits during the pandemic. As things began to reopen around the world, so did our clinic in 2021. You can see a shift to about half of patients enrolled in face-to-face VRT visits only and the other half of patients enrolled in the hybrid approach throughout the years. Our data collection halted in the beginning of 2022. Therefore you can see the number of patients enrolled in that year was very low.

However, you can still see a further shift showing more usage of hybrid visits by patients enrolled in VRT. This graph displays the dizziness handicap inventory or DHI scores reflected from calendar years 2020 to 2022. The gray bars reflect the year 2020, the dark blue bars displays the year 2021 and the light blue reflects the year 2022. On the horizontal axis, you can see the average DHI score is displayed with the higher DHI score meaning a greater handicapped. Over the years, a greater improvement between initial DHI and final DHI scores were noted for patients who continued with VRT-VVC. In 2020, although the hybrid approach made up most of the VRT appointments, lesser improvement was seen on the final DHI scores than it was in 2021, where the hybrid appointments comprised almost 50% of the VRT appointments.

In the 2021 calendar year, we saw the most reduction from initial to final DHI scores, specifically a 57% reduction. Offering VRT-VVC was low risk as it allows patients to stay home during the pandemic, yet still receive healthcare services. The flexibility factor, while unanticipated, makes the VRT-VVC program achievable. The hybrid approach to VRT has provided services to some patients who may have otherwise deferred services due to the following limitations, maybe travel limits or restrictions, risk of COVID-19 exposure, their busy personal and/or work schedule. Additional strengths of offering VRT-VVC were learned as we tailored VRT exercises to patients' home

surroundings. Patients performed exercises in their own homes, which allowed for easier implementation of home-based exercise programs between appointments.

Limitations of VRT-VVC may include internet connectivity and/or reliability. Sometimes the internet is down or slow, making the metronome difficult to relay over the video modality. However, workarounds can be having the patient play it on their end as well. However, internet connectivity can cut a therapy session short. As we discussed earlier, even some VRT is better than no VRT. Another limitation is potentially skewed DHI results if you're verbally administering it between clinician and patient. Both the variable visualization of veterans' eyes for nystagmus and catch-up saccades and at-home distractions can be limitations of VRT-VVC. However, the hybrid modality proved to be an effective model for patients as indicated at times by the DHI, but also improvements of their therapy goals.

The hybrid modality allowed us to reach many more patients than we would've had if we only conducted face-to-face visits. Although there were some limitations as we noted earlier, even a brief session of VRT can still prove to be helpful. The hybrid approach presenting VRT-VVC offers improved access for healthcare services.

- So in April '21, we surveyed a patient's experience in the virtual VRT-VVC program. The patient at first expressed hesitation to enroll in the virtual program because maybe it wasn't as effective as the face-to-face option. So this patient's type of dizziness occurred spontaneously without warning and caused him to act cautiously when moving about the home or even when going out outside. This patient lived about 75 miles from the VA, so he was not thrilled about the idea of traveling all the way to the hospital to receive care for weekly or biweekly appointments. He felt safer completing VRT from his home during the pandemic and he felt pleasantly surprised finding the modality effective in reducing his symptoms of dizziness and aiding him in reduction of travel.

He also felt that the virtual platform allowed him to have a more direct way to contact his clinician. And after all, when you're feeling dizzy most of the time, who wouldn't wanna receive care in the comfort of their own home? The multidisciplinary approach is something that we've grown more and more familiar with in the past few years and it's something that we're so excited to share with everybody today. After a patient is seen for comprehensive vestibular testing and his or her symptoms seem appropriate to trial VRT, we consider whether the patient is best fit to continue VRT with audiology or if they benefit from follow-up with another service. Importance of multidisciplinary relationships is so valuable to us because managing some of the chronic comorbid conditions that a patient may be experiencing may also be partially related to why the patient's feeling dizzy in the first place.

So medical management of these conditions like diabetes or hypertension, migraines, autoimmune diseases, anxiety or depression, TBI, concussions or non-balance pathologies, even things like polypharmacy should be considered. And then fall risk and balance training therapy is something we also take into account. To review what a multidisciplinary relationship may look like for your clinic, here are a couple examples of the ones that we truly value. The first team we work with is the Polytrauma team and they're dedicated to case managing post 9/11 veterans who sustained a traumatic brain injury. When working with the multidisciplinary team, other specialties may supplement or even be more equipped at times to better treat the patient symptoms than we can in audiology. So this Polytrauma team consists of the following members, physical therapists and TBI physicians, us in audiology, neurology, psychology, physical therapy, social work, occupational therapy and speech pathology. Each team member contributes to different components of the patient's case and serves as a liaison for establishing whatever the patient may need.

- Another multidisciplinary relationship we have is the new Functional Neurological Disorders Division. The FND division was established by neurology late last year and per neurologists, it's the first known FND division in the VA. This team has proved to provide critical supplemental services for PPPD patients. So it first started with neurology, then we had audiology, speech pathology joined, we have psychology and psychiatry, physical therapy and primary care. The establishment of the FND team is a perfect illustration of how one could go about establishing a multidisciplinary team at your facility. After neurology first recruited the various disciplines to join the team, we reviewed massive amounts of literature regarding the FND disorders. And then, neurology invited an expert who had experience leading an FND team to speak with us. Now we meet monthly to review our cases.

- If you work in the VA, you may be familiar with this Whole Health Wheel. The idea of Whole Health is getting to know the patient, understanding who they are and what matters to them. Looking now at the circle, in the center is you. You are the unique center. Moving outward, the white ring consists of the everyday things that make up you, your spirit, relationship with friends, physical and emotional surroundings, your ability to relax and heal. Then moving outward to the blue ring, this represents the professional care you may be receiving. Do you attend therapy, yoga, acupuncture? What types of prevention and treatment are you engaging in? And lastly, the outermost ring represents your community. This is all about who you surround yourself with and the resources that you have in your community.

Whole Health's focus is on what matters to you, not what is the matter with you. Whole Health is another team that we're fortunate to have available within the VA, but these methods are not unique to this program only. Encouraging patients to look inward, determine what matters to them and make themselves a priority will help them adhere more closely to a VRT program. Sometimes the only support a patient may be getting is from us in the clinic and they may not have that same support system when returning

home. Helping a patient to learn that they do matter and it's okay to make themselves a priority can help shift their focus and help them realize that it's okay to put the time and effort into a VRT program. The psychological aspect of dizziness can commonly be overlooked, but taking the time to treat patients as a whole rather than just their symptoms of dizziness can help make a positive change in their therapy outcomes.

- So there's been some evidence showing some promising outcomes from Whole Health Services in regards to audiology. There have been improvements in balance after Tai Chi, however, evidence suggests that Tai Chi and VRT both improve the balance systems in very different ways. So Tai Chi increases the lower extremity neuromuscular patterns, whereas VRT improves the upper body movements. There have been evidence that show that people who practice yoga for an average of seven years showed an increase in CVEMP P1, N1, P1-N1 amplitudes and a reduction in CVEMP asymmetry ratios when compared to non-yoga participants. Now that particular study evaluated patients with normal vestibular function. However, imagine the implications. It makes you wonder if these improvements can translate to patients with abnormal saccular or inferior vestibular nerve function.

There's also been evidence showing promising effects of mindfulness with vestibular patients, specifically when it was a part of a group treatment that also included cognitive behavioral practices and vestibular rehabilitation. Some of these promising outcomes were improvement in coping, functionality and satisfaction and decrease in overall healthcare utilization in vestibular patients. So we're gonna end with a case study which really highlights and illustrates VRT progression. It does a really good job of doing so. So we had a patient, a 42-year old male patient seen for audiological and vestibular test battery in Miami Clinic in September, 2019. When he first arrived, he presented with reports of a room-spinning sensation. He stated that he felt like things were constantly moving around.

For example, he felt like the walls were moving around him. He also reported an imbalance sensation and a fear of falling as a result. He stated that his symptoms were constant over the past 24 to 48 hours and then he noticed that they were provoked by driving or right-ward gaze. He stated that when the dizziness first started, he was playing video games with his niece the night prior. As far as his medical history is concerned, he was generally healthy and had no known comorbidities. Using the sensory organization performance tests, we screened the patient's balance. There were abnormal results were noted in condition two with Romberg's eyes closed, condition four, tandem Romberg with eyes closed, condition five, Romberg on foam with eyes open and then condition six, Romberg on foam with eyes closed.

And then on the Fukuda stepping test where a veteran demonstrated a right-ward turn greater than 45 degrees. He also presented with spontaneous right-beating nystagmus. It was observed throughout the testing 16 degrees per second, which increased to 42 degrees per second right beating nystagmus upon gaze right in the vision denied condition. The ocular motor battery consisting of saccades, smooth pursuit and optokinetic testing was essentially within normal limits. Although, OPK was slightly reduced. While VPPV screening was negative, veteran continued to report a clockwise sensation throughout positional testing. Right-beating nystagmus was also persistent throughout all positional tests, supine, head right, body right, body left, with the exception of no nystagmus noted in the head left condition. And again, nystagmus persisted with fixation in all conditions.

Caloric testing yielded a significant left-sided unilateral weakness. The video head impulse tests was performed at the following visit, which revealed covert and overt saccades in the left lateral canal, further supporting the suspected diagnosis of peripheral vestibulopathy. So veteran was determined to be a candidate to enroll in VRT with audiology due to observed VOR instability, his reported sensations of rotating clockwise, dizziness and difficulty with performing quick head turns.

- At the initial session when we saw the patient, as you all now know, goals are established. These were his goals, which we kept in mind throughout the appointment and helped us tailor exercises to his symptoms as we went through the program with him. In hindsight, as we've learned more about VRT, we realized that these goals were not the most measurable. Probing more would've been beneficial to both us and the patient. For instance, when you're jogging, what do you experience that causes dizziness? Is it blurry vision? Are you veering towards side to side? Or what types of movements are provoking while driving? Is it turning your head right and left, are you driving on a highway or on a quiet back road?

These types of questions can help us get to know the patient a little bit better and really hone in on where the dizziness is impacting the patient's life. And as we go through the exercise progression, things to just consider are how we vary the target, speed, background and position. So we saw the patient first for his initial session in September, 2019, and then several appointments until it was determined time for discharge. At the initial session, the patient was continuing to report that everything was moving clockwise and feeling like he's on a boat. The DVA was abnormal in both planes and vHIT revealed covert and overt saccades in the left lateral condition. We assigned him an at-home exercise program and he was counseled on the importance of compliance.

Over the course of veteran's follow-up appointments, screeners were performed to measure his progress over time. There we go. VHIT also started showing less overt saccades and greater separation between the covert and overt saccade groups. Patient continued to have difficulty with gaze right and head right movements, but screeners like the DVA and the MSQ did show objective improvement over time. Additionally of note though is the patient's continually high DHI scores. The patient often expressed that he didn't realize how far he had come until he returned to the

clinic with us and saw the challenging exercises he was actually able to complete. At the final visit, goals were established again and reviewed and it was determined that he'd be appropriate to continue VRT with physical therapy due to the dynamic nature of his goals.

Patient was ultimately enrolled with us for a little bit over a month. So at the initial session, we started with VOR times one in the horizontal and vertical planes. This was performed in a seated position with a plane target at his own pace. The initial VRT appointment is really just a base, like a baseline and an intro for the patient so they can see what's to come. The first follow-up visit is where the metronome gets used a little bit more stringently. The veteran reported feeling pretty well here when sitting and that most symptoms are now occurring when walking or when moving. He did pretty well with VOR times one exercises at 120 beats per minute and was also able to trial some different types of adaptation exercises.

And as we rate ask our patients to rate their dizziness on a zero to five scale, veteran was typically about a three or a two and a half out of five. His future follow-up appointments, this is a condensed version over the course of a couple weeks and I'll highlight a few here. So we varied exercises throughout. Some exercises were more difficult than others to prevent fatigue and keep his sessions interesting. The patient was able to complete standing exercises with a playing card target. He was able to tolerate virtual reality goggles using a race car stimulus and complete habituation exercises, passing a ball back and forth to a clinician facing a complex background, again, while standing.

At this point, veteran was encouraged to follow up with his primary care provider about clearance for driving. At the final visit, there we go, the veteran achieved performing VOR times one exercises standing on foam and even while walking at 90 beats per minute. He was using a variation of simple and complex targets with various font sizes

and colors. He reported no longer veering when he runs and that he's even started taking short drives. And then as mentioned, veteran was ultimately referred to physical therapy where he completed exercises with greater difficulty incorporating bozo balls, trampolines and treadmills. These are some examples of targets that we use when we start off in VRT. First, the plain target and then a more visually complex one like the playing card.

We use a stroop task and colored shapes. We also use sentences. These hold no contextual meaning, so the brain can't predict what word may be coming next and various font sizes. So the smaller size will be the most difficult, larger size will be easier. This is our complex background or one of them and we'll typically start the patient off sitting or standing. If they are standing, we'll put a chair in front of them so that they have something to hold onto if needed, if they lose balance or we'll set this up in a corner so that the patient can stand in the corner and have the wall on either side of him or her in case the patient loses balance.

- Okay, so we've covered a lot today. However, a few key points we hope you took away today from our presentation are the following. Both diagnosing and treating your patient with dizziness can be a powerful tool. A VRT program is not a one size fits all program. It works best when it's tailored to the vestibular evaluation findings, what matters most to the patient, patient-centered goals, activities of daily living and your patient's progress throughout VRT. Your patient's motivation to comply with at-home exercise program will promote a positive prognosis and then a hybrid approach to VRT can be successful for the dizzy patient and your clinic. And then creating a multi-disciplinary team approach to help manage the vestibular dizzy patient is critical to treating the patient as a whole. And then also just if you ever need to get in contact with us, thank you so much for taking the time to attend. Please do not hesitate to contact or reach out to us with any questions or inquiries about additional information.

- [Christy] Thank you so much Dr. Gabbidon and Dr. Kansky. But we really do from AudiologyOnline on behalf of the partnership with AVAA, we are just so delighted to have you both come on for the second part of this four-course series for this year. And we do have a comment from Lynette. Lynette says, "Great job, Dr. Kansky and Dr. Gabbidon," and I agree. And yes, for those of you who don't know, AVAA has begun a partnership with AudiologyOnline. We produce one course per quarter throughout the year with phenomenal clinicians and audiologists across our nation who serve our veterans. And they present from a number of cases, from vestibular to oral rehab to general hearing aids, cochlear implants, just wonderful topics that are in the VA. And we just hope that you all take this, even if you don't work in the system, that you take this topic and can apply it to your practice, into your clinic. And again, we wanna thank Dr. Gabbidon and also Dr. Kansky, thank you so much for your time.

- Thank you for having us.

- Yes, thank you for having us.