Advancing the Leading Edge of Hearing Aid Fittings with Real Ear Measures

Sept 10th, 2020

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AudiologyOnline.com Course #35781
Partner: Starkey

- Welcome everyone to Advancing the Leading Edge of Hearing Aid Fittings with Real Ear Measures. My name is Dr. Andrea Hannan Dawkes and I'm a member of the education and training team at Starkey. I'm delighted you've elected to join me today to learn more about our new REM Target Match feature. Before we get started, there are a few housekeeping notes to cover quickly. If you have any technical problems, please stay logged on and call Audiology Online at the number listed here. 1-800-753-2160. There'll be able to help troubleshoot whatever issues you're having and get you back in action and listening to today's class. I do know that the most common cause for technical problems is if you have other software or applications running at the same time that you're watching this class. So you might wanna take a minute to close down any other programs you're running. But again, if you have any technical difficulties, please contact Audiology Online so that you may fully participate in today's session. This course is available for one CEU hour or .1 CEUs. In order to get credit, you must stay logged on for the entire session. Attendance is monitored, and then complete a short quiz comprised of 10 multiple choice questions. To access the quiz, simply log into your AO account and the quiz can be found under your pending courses. You should also receive an email from Audiology Online within the next 24 hours with a link to the quiz. You have seven days to complete the quiz when viewing live courses and 30 days when viewing recorded courses. A PDF of this presentation is available for you in the file share pod found in the bottom left corner of your viewing area. And you can use the icon in the top right corner of your screen with the four arrows heading out in different directions to enlarge your viewing area. There are three learning outcomes for this course. At the end of the session, you should be able to explain the basic reasons to utilize real ear measures and common functions of real ear measures in a hearing aid fitting, describe which real ear equipment and Starkey hearing aids are compatible with the new real ear system within Inspire and discuss the process for using the new real ear system within Inspire. And with that, I think we are ready to get started. Two years ago, Starkey started on the journey to

reinvent the hearing aid because so many individuals who needed hearing help weren't taking the first steps to get it. We knew it was important to do something different to provide state of the art sound quality and performance, but also turn the hearing aid into something that patients ask for and want to wear. To meet that need we launched Livio AI, the world's first healthable technology that was recently named one of "Time" magazine's best inventions of the year. Since then, the team of engineers and scientists at Starkey have been committed to continuing to evolve technology from traditional hearing aids to smart devices that augment human senses and enhance health and wellness in a variety of ways. Today, we're pushing Livio Edge AI even further, adding more styles, more features and new fitting enhancements designed to give patients and professionals the extra edge they've been looking for. We're excited to offer the most complete line of rechargeable products in the industry, ultimate control and connectivity with our Thrive app and Thrive hearing care app, game-changing sound quality with Hearing Reality Pro and an unmatched fitting experience with tools that allow you, the professional, to better engage with your patients and provide the best fitting experience possible. Starkey leads the lithium-ion technology space with an array of industry firsts. The first custom rechargeable hearing aids in the industry, an industry leading charger design, and now the introduction of the smallest and most powerful BTE-R, Starkey provides the largest selection of rechargeable styles in the industry today. If we expand on that just a little bit, and we start with our custom rechargeable hearing aids, they deliver comfort and convenience that really is a hallmark of Starkey's. They're available in three styles, full shell, half shell and canal and offer dual user controls and matrices up to 130/70 to meet the needs of a wide variety of hearing losses. Like our other lithium-ion rechargeable hearing aids, they offer wireless streaming and are compatible with all of the Starkey 2.4 GHz accessories. Another advantage of custom technology in today's world is that they don't interfere with the new normal of wearing a face mask. The patient won't have to worry about their hearing aids coming off or flipping over their ears as they put a mask on or take one off. Custom devices remove the clutter above and behind the ear. And

with Starkey's 2.4 GHz wireless rechargeable devices, the patient doesn't have to sacrifice features or performance making them a valuable option to consider. I also wanna share a few highlights of the newest member of the Thrive platform, lithium-ion family, the BTE-R, which is also available with Livio Edge AI, Livio AI, and Livio, it offers the same great performance and ships with an ear hook, but is also thin tube compatible. Starkey's expanded portfolio of rechargeable products really makes it easy to choose a lithium-ion option to meet your patient's preferences and provide that long lasting performance even while streaming. With the new BTE-R, we've rounded out this technology category, making it possible to serve the needs of more patients than ever. All of our lithium-ion hearing aids are available in three product families, Livio Edge AI, Livio AI, and Livio. With a variety of technology tiers and five styles to choose from, they are sure to delight patients who want outstanding all day performance, are environmentally conscientious, have dexterity challenges, or just don't wanna buy and manage zinc-air batteries. An important compliment to the lithium-ion hearing aids is Starkey's family of chargers. They were designed to be easy to use with lids to allow wearers to close and transport hearing aids and provide consistent quick charging. The standard charger is compatible with both standard products. The RIC-R and BTE-R, and the custom charger is compatible with all three styles of the custom rechargeable devices. The mini turbocharger offers a discreet quick charge for the standard products, making it an easy option for patients on the go or for professionals who need a quick boost of power to be able to program the RIC and BTE styles. Two years ago, Starkey started on the journey to reinvent the hearing aid because so many individuals who needed hearing help weren't taking the first steps to get it. We knew it was important to do something different to provide state of the art sound quality and performance, but also turn the hearing aid into something that patients ask for and want to wear. To meet that need we launched Livio AI, the world's first healthable technology that was recently named one of "Time" magazine's best inventions of the year. Since then, the team of engineers and scientists at Starkey have been committed to continuing to evolve technology from traditional hearing aids to smart devices that

augment human senses and enhance health and wellness in a variety of ways. Today we're pushing Livio Edge AI even further adding more styles, more features and new fitting enhancements designed to give patients and professionals the extra edge they've been looking for. We're excited to offer the most complete line of rechargeable products in the industry, ultimate control and connectivity with our Thrive app. Game-changing sound with Hearing Reality Pro including Edge Mode and IntelliVoice, and finally an unmatched fitting experience with new fitting tools that allow you, the professional, to better engage with your patients and provide the best fitting experience possible. Starkey leads the lithium-ion technology space with an array of industry firsts, the first custom rechargeables, an industry leading charger design, and with the introduction of the smallest and most powerful BTE-R, Starkey offers the largest selection of rechargeable styles in the industry today. If we take a closer look at our custom rechargeable hearing aids, they deliver comfort and convenience, that is Starkey's hallmark. They're available in three styles, full shell, half shell and canal and offer dual user controls and matrices up to one 130/70 to meet the needs of a wide variety of hearing losses. Like our other lithium-ion rechargeable hearing aids, they offer wireless streaming and are compatible with all of the 2.4 GHz accessories as well. Another advantage of custom technology in today's world is that they don't interfere with the new normal of wearing a face mask. The patient won't have to worry about their hearing aids coming off, flipping over their ears as they put a mask on or take one off. Custom devices remove the clutter above and behind the ear. And with Starkey's 2.4 GHz wireless rechargeable hearing aids, the patient doesn't have to sacrifice features or performance, making them a valuable option to consider. I also wanted to share a few of the highlights of the newest member of the Thrive platform, lithium-ion family, the BTE-R, which is also available with Livio Edge AI, Livio AI, and Livio, it offers the same great performance and ships with an ear hook, but it's also thin tube compatible. The matrix for this device is one 130/70. Starkey's expanded portfolio of rechargeable products really makes it easy to choose a lithium-ion option to meet your patient's preferences and provide that long lasting performance even while streaming.

With the new BTE-R we've rounded out this technology category, making it possible to serve the needs of more patients than ever. All of our lithium-ion hearing aids are available in three product families, Livio Edge AI, Livio AI, and Livio. With a variety of technology tiers and five styles to choose from, they are sure to delight patients who want outstanding all day performance, are environmentally conscientious, have dexterity challenges, or just don't want to buy and manage small zinc-air batteries. An important compliment to the lithium-ion hearing aids is Starkey's family of chargers. They were designed to be easy to use with lids to allow wearers to close and transport hearing aids and provide consistent quick charging. The standard charger is compatible with both standard products, the RIC-R and BTE-R, and the custom charger is compatible with all three styles of the customer-chargeable devices. The mini turbocharger offers a discreet quick charge for the standard products, making it an easy option for patients on the go or for professionals who need a quick boost of power to be able to program the RIC and BTE styles. Another important aspect of the Thrive platform hearing aids is the use of artificial intelligence to improve sound quality and deliver game-changing features like fall detection, translate and Thrive assistant. But what does AI really mean? Artificial intelligence is the overarching discipline that covers anything related to making machines smart. So think about artificial intelligence as a broad term for programs that can sense reason act and adapt. Machine learning is a technique for training a machine to do a particular task. The algorithm's performance improves as it's exposed to more data over time. So the machine takes in data and learns from the data and applies what's learned to make informed decisions. I think a helpful analogy for this is to think about how we learn to read. We don't sit down and learn spelling and grammar before picking up our first book. We read simple books, graduating to more complex ones over time. We actually learn the rules and expectations of spelling and grammar through reading. Put another way, we processed a lot of data and learn from it. And that's exactly the idea with machine learning. Feed an algorithm a lot of data, and let it figure things out. If machine learning is about mimicking how humans learn, why not go all the way and try to mimic the human brain.

That's the idea behind deep learning. Deep learning is a subset of machine learning, that's all about using a layered structure of algorithms called an artificial neural network that can learn and make intelligent decisions on its own. We're still a long way off from mimicking the human brain and all of its complexity, but we're moving in that direction. Comfort, clarity, and enhanced communication in all listening situations are at the heart of everything we do at Starkey. Let's take a closer look at how we're using artificial intelligence to optimize these things. Hearing Reality Pro is the suite of features that optimize a sound quality, including things like dual compression, noise management, adaptive directionality, and best in class feedback cancellation. Starkey has always led in the area of signal processing and we presently have over 100 patents on the features that contribute to sound quality. We offer the industry's best implementation of machine learning and AI algorithms in a variety of applications, including the category of acoustic classification and sound quality optimization with Edge Mode. Real time binaural signal processing in the hearing aids mimics how the human brains work. The auditory system brings in information from the left and right sides and integrates that information. And our hearing aids do the same thing. Directionality has been in hearing aids a long time, but we use AI seamlessly to decide when to turn it on, what polar pattern to implement and when to turn it off, providing an intelligent system. When you combine all of this together, the patient experience is incredible. Another exciting use of artificial intelligence in Livio Edge AI hearing aids is with Edge Mode. Edge Mode is on demand adaptive tuning activated at ear level that puts the power of AI in the hands of the hearing aid user. Using continuous analysis of the environment, enhanced feature settings are available whenever the listener needs greater assistance with clarity or comfort, than is provided by the normal signal adaptations by simply using the double tap gesture to engage and disengage the feature. Edge Mode is quick, convenient, and discreet. The world has changed with the global pandemic and set a new normal for how we socialize and interact. Masks and face coverings of various kinds of become a regular part of our daily lives. But all masks are not created equal when it comes to the impact they have on communication and speech

understanding. Face masks not only attenuate the overall level of speech, but they can muffle important high-frequency speech sounds and blocked visual cues important for lip reading, which can make it very difficult for individuals with hearing loss and those wearing hearing aids to hear and understand well. To address this, we went to the lab and study the acoustic transmission properties of various masks. What we found was that Starkey's innovative Edge Mode feature is an ideal application of AI technology and machine learning to address the communication challenges of hearing aid users faced with social distancing, the use of face masks, background noise, and the loss of visual and lip reading cues. There will be a white paper on this coming soon, which will be posted to Starkeypro.com. We know that connectivity is an important part of the user experience. And Starkey is a leader in mobile apps for the hearing aid wearer. The Thrive mobile app keeps getting better, providing the patient with ultimate control and an intuitive interface. With this technology release, we're delighted to introduce several enhancements to the Thrive hearing control app, including user-friendly step-by-step set up screens to streamline the setup process and several new features, including IntelliVoice, find my phone, in-app purchases and live session synchronous remote programming. Be sure to check out other live and recorded courses on AO to learn more about these features. With this technology release, we're excited to introduce three new Inspire features that make it easier to get a customized and accurate fit for an unmatched fitting experience on every level. These include Hearing Care Anywhere live sessions, synchronous remote programming, Multiflex Tinnitus Pro, and REM Target Match. To get started with these tools, you'll need to start by ensuring you have the Inspire 2020.1 version of the fitting software. Before we jump into our focus today, which is REM Target Match, I wanna share a few highlights for live sessions and Multiflex Tinnitus Pro. Hearing Care Anywhere is Starkey's telehealth application for remote hearing aid programming adjustments. It allows professionals to improve the patient experience by delivering programming adjustments directly to a patient's smart device and hearing aids with no need for a personal visit. And it's available in all Thrive platform hearing aids, Livio Edge AI, Livio AI, and Livio. Since the launch of Livio AI in

2018, Hearing Care Anywhere has been available as an asynchronous remote programming solution, allowing both the hearing aid user and professional to manage hearing aid adjustments at their convenience. As I mentioned, it's available in the all of Thrive platform hearing aids and is compatible with all iOS and Android smart devices supported by the Thrive Hearing Control app. There is a nomenclature change to be aware of with this technology release, remote adjustments replaces the former use of the term help request. And we've added an exciting new feature to Hearing Care Anywhere with the addition of live sessions. So this is the synchronous remote programming strategy that leverages live video chat to enable and improve remote care. Live sessions allows professionals to make remote hearing aid programming adjustments in real time using a two-way audio visual link between themselves and the hearing aid user. It will also be available in all of the Thrive platform hearing aids, Livio Edge AI, Livio AI and Livio and compatible with all of the iOS and Android smart devices supported by the Thrive app and hearing aid adjustment capability will be the same with both strategies. And then to touch on Multiflex Tinnitus Pro. This is an exciting new feature exclusive to the Livio Edge AI premium level technology. This is a new tinnitus tool that offers the professional options for customizing the tinnitus stimulus for a personalized listening experience that works with any tinnitus management approach. Our next generation feature for sound therapy management extends the flexibility of our tinnitus technology with the addition of two new signals, audiogram-shaped and custom, which will be available in all styles of Livio Edge AI. There is also a performance update with this technology release to make the new signals available in Edge AI devices already in the field. Keep in mind that you can sign up for additional AO courses that provide the details on live sessions and Multiflex Tinnitus Pro. Now let's shift our attention to REM Target Match For professionals using real ear measurements in the fitting process, we are very excited to offer the new automatic REM Target Match tool, right within the Inspire software. Inspire will interact directly with your real ear measurement system and automatically adjust gain to hit the fitting formula target. It's a fast, easy and simple way to incorporate real ear

measurements that will free up your time, allowing you to focus on personalized adjustments and counseling. Pro microphone real ear measurements, representing valid, repeatable, and reliable method of assessing the real ear performance of hearing instruments. The use of a probe mic or real ear measurement, is the only way to confirm the appropriateness of hearing aid gain and resulting output across frequencies for a range of input levels at the tympanic membrane. Performing this verification during the initial fitting process helps ensure that the user's receiving the appropriate amount of amplification, not too much and not too little. Despite the documented benefits of conducting real ear measurements during hearing aid fittings and best practice recommendations by several professional bodies, real ear measurements are one aspect of audiological service delivery that has not been consistently embraced as a part of the profession standard of care. Several surveys have shown that only approximately 30% of hearing health care professionals are conducting real ear measures on a routine basis. As for the 70% who aren't, there are several reasons cited as to why not: cost, lack of time, not seeing a tangible benefit from performing real ear measurements and not fully understanding how to perform or interpret them. Some professionals also report that even when they match targets perfectly, they still get the same complaints from their patients. So they don't see the benefit in bothering to do them. Some providers aren't quite sure how they can best fill in the gaps to make real ear measurements clinically meaningful and relevant. While there may have been a time where some of these objections were valid, we now have a lot of evidence which shows otherwise. Not to mention improved real ear measurement instrumentation, which makes these procedures easier than ever before. By way of best practices, they do tell us that using real ear is an important step for verifying hearing aid performance. Both AAA and ASHA guidelines state that probe microphone measures should be done for quality control purposes to make sure that the hearing aids are performing the way that they were meant to perform in the individual's ear canal. Even though most fitting software considers the age of the patient, their experience with amplification, and acoustic information like venting and the length of

the receiver or ear mold tubing, think about how different all of your patient's ear canals are. the figure here shows the response measured in nine years with identical game settings using the same hearing aids and input level. But look at the variation. It's on the order of 15 dB. Who wants to be off by that much with any fitting? No one. This is exactly, or this is, I should say, a good representation of what you're going to find when relying only on the first fit calculation. One study shows that the first fit algorithm in 71% of hearing aids failed to meet the targets of a research prescription. In general, the initial fit algorithms tended to provide less than prescribed gain or underestimated the required gain. Another reason that real ear measures are important is that they take into account individual ear information for a more precise and personalized fitting. While we know that initial fit algorithms often don't come close in approximating targets, another important question is do our patients see a benefit when we make adjustments based on verification? And the answer is yes, real ear measurements contribute to higher overall satisfaction with hearing aids and with hearing professionals and provide an overall improved patient experience. Research supports that patients report greater perceptual benefit when their hearing aids are adjusted according to real ear measures as compared to when they are just fit using the initial fit algorithm. Specifically, patients who are fit with hearing aids, using a comprehensive protocol, that included real ear verification reported increased hearing aid use benefit and satisfaction. They also reported reduced listening effort, improved speech understanding, and they came back for fewer followup visits. They were also more likely to recommend their hearing healthcare professional, to friends and family members, than patients who did not receive real ear verification. I think it's safe to say that we all want to see those kinds of results. Including real ear measurements in your hearing aid fitting process will allow you to stand out from the crowd. They can eliminate errors made by professionals or patients who try to estimate speech audibility, which can impact the effectiveness of amplification. And they show our patients that we are able to provide them with the most comprehensive care. As experienced as we are. There's no substitute for obtaining an accurate measurement

initially, and then fine tuning the response as needed. If we don't know where we're starting, how will we know where we end up? Performing real ear verification is one of the ways we can separate ourselves from the competition and show our patients that we're willing to go the extra mile to give them the best experience in service, which can equate to happy, satisfied, and loyal patients. Now that we've reviewed the real world benefits of performing real ear measures, let's talk about the goals of real ear measurement. What are we looking for when we conduct verification measures and how do we make them meaningful? Verification goals can differ from patient to patient. The most common goal for performing real ear measurements is to verify the audibility of the speech signal and the output of the hearing aid. But instead of stopping there, I wanna encourage you to take it a step further and use these measures as part of a comprehensive protocol, that's tailored to fit the specific needs of each patient to ensure benefit and troubleshooting any complaints. Let's take a closer look at this. First, we want to ensure that average conversational speech falls comfortably within the patient's dynamic range while they're wearing their hearing aids. We also wanna make sure that soft speech and environmental sounds are audible, and that loud sounds are loud, but not uncomfortable. Critics of real ear measurements say that the patient report is all they need to verify audibility and comfort. While behavioral reports are very important, hearing aid users are known for being inaccurate in their judgements of audibility, regardless of whether they are experienced users or not. Real ear measures offer you an objective verification of the response. This objective information is invaluable for quality fittings and even counseling. Real ear measures are valuable, but verification methods only address the peripheral aspects of audibility. And we know that every patient is unique. Maximizing speech audibility may not be the only or even the most appropriate solution for everyone. We need to consider the patient's needs, their anatomy and potential dead regions, length of auditory deprivation and their overall cognitive function as well. Just because we're making speech audible doesn't mean that the patient's gonna be able to interpret it, but if it's not audible, then there's no chance that they'll understand it. So it's a balancing act of

making speech audible, but also making it sound good. Real ear measures can at least ensure that speech is audible. The best way to implement real ear measurements is to use them in combination with validation measures and counseling. Right from that initial hearing evaluation, you wanna keep your end goals in mind. It's a good idea to measure UCLS, perform speech-in-noise testing and use self report questionnaires. All of these will be useful in selecting the right technology and pre-fitting measures can be used to compare to post-fitting measures, to ensure patients are understanding speech better, that listening effort is reduced and that their quality of life has improved. At the initial fitting, program the hearing aids and ensure a comfortable physical fit inside the ear, obtain real ear measures and make any necessary adjustments to ensure the audibility of speech and ensure that loud sounds are comfortable. Keep in mind that during the early stages of wearing amplification, your patient might not know what the ideal amount of amplification is. Real ear measurements take away the guesswork and counseling can be helpful on the natural process of acclimating to hearing aids. Keep in mind that use of the automatic experience manager in the Inspire software can also be a great tool to offset the target response and gradually move the patient to the ideal response over time. Allow some time for a climatization to amplification. And when the patient comes back for followup, continue to work on optimizing sound quality. In addition to talking to your patient for their opinions, perform some validation measures like speech-in-noise testing and use self report questionnaires. Where real ear measurements are lacking is in providing a full picture of the patient's performance and cognitive abilities, and validation measures make up for that. Once we have a complete picture of how the patient is performing with their hearing aids, we'll be able to make helpful adjustments. While real ear measures allow us to verify the audibility of speech comfort for loud sounds, our ultimate goal is to ensure patients are satisfied with their hearing aids. Thankfully, we have a lot of tools to do that. As we move into how REM Target Match works, I wanna review a couple of terms first, REUG or real ear unaided gain as a measurement of the natural boost in the high frequencies, in the patient's open ear, without a hearing aid inserted into their ear.

When we insert a hearing aid, it can take some of this away. So we wanna make sure we know what it is and can account for it in our final adjustments. REAR stands for real ear aided response, and is the response with the hearing aid in the ear and turned on. I really like the REAR because the response is mapped in dB SPL and intuitively this makes sense when you're looking at how much of the amplified signal falls within the patient's dynamic range. So this is measuring the gain of the hearing aid across frequencies while inserted into the patient's ear. REM Target Match is our exciting new feature for verifying hearing aid fittings, using real ear equipment and the Inspire software. It provides a streamlined process for automatically matching real ear targets to ensure the audibility of speech sounds and to provide a solid fitting foundation that can help improve patient outcomes. REM Target Match offers a fully integrated workflow through the REM Target Match tool, allows for simultaneous binaural real ear measurements, provides automatic target matching for both the e-STAT proprietary and standard generic prescriptive formulas, includes a live display of measurements relative to target and manual fine tuning is available after measurements are made to further personalize a fitting. It provides a variety of benefits to hearing care professionals. It allows you to match to target faster than matching to target manually. There's no need to control two systems. Again, it provides a fully integrated workflow within the Inspire software. Automatic target match reduces the variability of manually matching targets. Fewer patient followup visits are necessary when real ear measurements are used. The speed and efficiency gives you more time for counseling patients. And you can be assured that you are providing optimal hearing aid benefit for patients through the process of fitting verification. You will need Noah 4, version 4.5.1 or higher, and the Inspire 2020.1 fitting software to use REM Target Match. Noah has an application programming interface or API, that allows real ear system software to interface directly with hearing aid fitting software. This is what allows Inspire to communicate with select real ear measurement systems. REM Target Match is currently compatible with the Otometrix Aurical FreeFit and MedRx Avant REM Speech+ real ear systems and coming soon, it will also be compatible with the Inventis

Maestro Trumpet. There are four simple steps to REM Target Match: setup, calibration, unaided measurement, and aided measurement. We'll take a closer look at each of these now. Prior to conducting any real ear measurements, it's important to perform otoscopy to ensure there isn't any cerumen or other debris that could interfere with the measurements. This is also helpful in that it helps us understand the shape of the ear canal for probe tube insertion. To get started, launch Inspire and connect the hearing aids. You'll find the REM Target Match feature on the quick fit screen in the center between the two fitting graphs. Select REM Target Match, and the REM Target Match tool will open. Step one pertains to setup. You will see the connected hearing aids at the top. If binaural hearing aids are connected, measurements will be completed simultaneously. View the experience level, fitting formula and acoustic options and exit the feature to make any necessary changes before continuing. Acoustic options can't be adjusted once testing has begun. Insure the real ear system you wish to use is powered on and selected in the bottom left corner of the screen. All available real ear systems will show in the dropdown menu. If the hearing care professional only has one system, it will show the name of that system. Click launch to begin. The name of the real ear system will appear in the bottom left corner with a red circle. And then once the real ear system has finished launching the circle will turn green indicating that it is successfully launched. Click next to proceed. Step two involves calibrating the probe tube. Probe tube calibration and proper probe tube placement are essential for the success of real ear measurements. Calibration resolves the acoustic effects the probe tube and microphone can introduce during real ear measurement and must be completed before every test. By calibrating, we're essentially making the probe tube and the microphone acoustically invisible. To complete probe tube calibration, fold the probe tube over and place the probe tube opening on top of the reference microphone. Place the reference microphone approximately .5 meters or 1.5 feet away from the real ear system speaker. Select start. The calibration test will stop automatically when completed and then click next to proceed. Step three involves obtaining the unaided measurement. Room setup and patient positioning are very important. Make sure that

the acoustics in the room are conducive for on-ear measurements. So ideally the room should be quiet with minimal hard reflective surfaces. Seat the patient in front of the real ear system speaker, approximately one meter or three feet away. Carefully place the probe tube in the patient's ear canal without the hearing aid inserted. The typical recommendation is to place the probe tube within five millimeters of the client's tympanic membrane in order to avoid standing waves. If you measure and adjust the black rubber marker to be the average adult ear canal length, then when you insert the probe tube in the ear, generally the black rubber piece should be sitting right at the endotracheal notch or a little deeper, that said you always wanna account for individual ear anatomy when placing the probe tube. And then instruct the patient to remain still and quiet during measurement. The grey line is the average REUG. And once the measurement is complete, you'll see the blue colored line, which is the measured unaided response. When you measure the REUG, the probe tube isn't placed correctly, you'll see a flat response or you'll see a large dip in the high frequencies rather than a peak. If that happens, remove the probe tube completely, reinsert it and start again, or you can try and move the probe tube deeper into the ear canal while keeping an eye on the curve. You'll know that it's inserted correctly when the measured REUG matches more closely to the average response. Press start to begin the measurement. The test will stop automatically when completed and then click next to proceed. Step four is the aided response, but I wanna touch on a few good to know things, before we look at how aided measurements are made. Historically, probe microphone measurements are made using either tonal or noise signals, which were adequate for measuring the gain of linear hearing instruments, but as devices became more sophisticated, the need for more dynamic signals and multiple input levels became apparent. With digital signal processing, it's important for the test signal to have certain spectral and dynamic properties to be processed correctly by the hearing instrument and relate to the prescriptive target. A signal that is close to real speech, and which has similar shape to the signal used to develop the prescriptive method being verified, is also preferred. The International Speech Test Signal or ISTS allows for reproducible measurement

conditions and features the most relevant properties of natural speech. So that is the signal used for aided measurements. It's also important to know that aided measurements are always completed in the normal program, but that the target match will automatically be applied to all programs. During aided testing, the hearing aids are automatically set to an omnidirectional microphone mode and all signal processing features are off. The hearing aids will return to the original settings, once measurement is complete. Nothing could be easier. Targets are matched from 250 Hz to 5,000 Hz. Above 5,000 Hz the variability from probe tube measurements and placement probe tube placement can be very high. So we extend the target match made at 5,000 Hz to the higher frequencies. Also know that if you reenter the REM Tool to take new measurements, previous measurements will be erased. The system will assume that you want to retake measurements. So now let's look at the aided measurements. There are two adjustable options available on the aided response screen, maximum sound level and input level. Select the loudness level at which the system will automatically stop measuring. The default is 120 dB and Inspire will remember the last level used. Consider the patient's UCL measurements when making a selection. Check boxes will allow you to select the input levels at which you would like to measure. The aided measurement will always be completed at 65 dB, but additional measurements can be made at soft, 50 dB, and loud, 80 dB, input levels. All three input levels are actually adjusted during the initial 65 dB measurement. So completing measurements for soft and loud inputs will not result in additional automatic adjustments. They will, however, allow you to view those curves, which may provide helpful insight for manual adjustments. So, at this point, to conduct the aided measurements, carefully insert the hearing aids into the patient's ears without moving the probe tubes and instruct the patient remain still and quiet during measurement. Click start, the aided measurement will run two times. First is the baseline measurement, adjustments to gain are then automatically made to match target. And the second measurement will show the result. The test will stop automatically when completed, and then you click next to proceed. The thin green line on the display is the SPL target. The dotted green line is the pre

adjustment, and the thick green line is the REM Target Match. And then click okay to finish and return to the QuickFit screen. Once back on the QuickFit screen, you'll see measurement based real ear on the side of the fitting graphs to let you know that you've completed the REM measurements. And now what I'd like to do is show you a video of all of this in action. While it's helpful to have me explain each step, watching REM Target Match for yourself will help you see how easy and streamlined the process is. So the video will show you the entire process from start to finish. So let me go ahead and launch that. All right. So here we are in the Inspire software, QuickFit screen, select REM Target Match. Here we've got our initial setup, review the selections at the top. We're gonna launch the Real Ear system. There'll be a green dot to indicate the Real Ear system, it has launched, it is ready to go and you'll get a text description or confirmation as well. Next is calibration. Directions will run and then stop, click next to proceed. Now the unaided measurement. Clear directions there on the screen. Confirmation that the measurement was successful. Proceed to next. And now the aided measurement. Confirmation the measurement was successful, and then click next to proceed. Target matches complete, click okay to accept the changes, there we are, with the new labeling alongside the graphs on the QuickFit screen. All right, so let's go back to the presentation. I hope you were able to see how easy, how streamlined, how straightforward the process is. It's really gonna be a very valuable clinical tool for us. We did conduct an internal study to compare REM Target Match to traditional real ear measurements, to ensure that REM Target Match, that the measurements are equivalent or within evidence-based acceptable tolerances to traditional real ear measures, 10 normal hearing participants, and three individuals with different hearing losses, mild flat loss, moderate flat loss, and a normal to sloping moderately severe hearing loss participated. Hearing aids were programmed using the NAL-NL2 prescriptive fitting formula. And the three real ear compatible systems were used. Traditional real ear measurements were made with each system and device configuration and gain were adjusted manually in Inspire to match 65 dB SPL targets. The process was then repeated using REM Target Match, and the results showed that

REM Target Match performed equivalently or within tolerance when compared to traditional manual REM fittings and performed consistently across all real ear measurement systems to appropriately match targets for different hearing losses and device configuration. So you can count on REM Target Match to be an accurate tool. All right, I've got a few helpful tips and tricks to share with you. So first up, as it pertains to the Experience Manager, when using the Experience Manager feature, the REM Target Match tool will always match to experience level three, but REM Target Match will adjust gain to match the chosen experience level after the target match is complete. So for example, if I set the hearing aids to experience level one, REM Target Match will match target to the experience level three, but then will automatically reduce the gain back to experience level one, to match what I originally chose for the patient. So nothing could be easier. The default maximum sound level during measurement, I think I mentioned before, is 120 dB. You have the ability to select the maximum sound level we should consider, we wanna encourage actually you to align the level with UCL measurements to ensure REM Target Match is not too loud for the patient. Once you exit the REM Target Match tool, there isn't a way to access the real ear measurement curves again. If you reenter the tool, the system will assume you want to repeat the measurements. So a screen capture is the most effective way to save the measurements. Helpful error messages will appear in the following scenarios. If calibration, unaided or aided measurements are outside of the tolerance limits. If the hearing aids get disconnected, of course, or if the Real Ear system gets disconnected. If the hearing aids can't reconnect to the Inspire software on their own, the tool will have to be restarted. To clear real ear measurements, the REM Target Match measurements. You can select the tools menu and the upper toolbar, choose Clear REM Target Match from the dropdown menu and then select okay to delete. You can also clear a set of measurements by repeating them. So in conclusion, I hope everyone can see how quick, easy and accurate REM Target Match is and will even feel inspired to begin incorporating real ear measures into your hearing aid fittings, if you're not already using them. Real ear measurements are an important verification tool to ensure

the audibility of speech and make sure sounds fall within a patient's dynamic range, but they should be viewed as one step in a comprehensive approach to hearing aid fitting and followup that also includes ensuring optimal sound quality and measuring real world performance with amplification. The ability to provide a quality high standard of care is an absolute must in order to compete in this age of advanced technology and truly meet the needs of savvy patients who've whose lifespans continue to lengthen and REM Target Match can help you do that. So in conclusion, I hope everyone can see how quick, easy and accurate REM Target Match is, and will feel even inspired to begin incorporating real ear measures into your hearing aid fittings. If you're not already using them. Real ear measurements are an important verification tool to ensure the audibility of speech and make sure sounds fall within a patient's dynamic range, but they should be viewed as one step in a comprehensive approach to hearing aid fitting and followup, that also includes ensuring optimal sound quality and measuring real world performance with amplification. The ability to provide a quality high standard of care is an absolute must in order to compete in this age of advanced technology and meet the needs of savvy patients, whose lifespans continue to lengthen, and REM Target Match can help you do that. And then finally, I just want to invite everyone to learn more. There are a whole host of courses available through Audiology Online, one hour courses that cover all of the new elements related to our technology release. So Livio Edge AI: The Best Just Got Better. Nice overview course. You've already participated in the real ear measurement course. We've got a class dedicated to the Thrive mobile app to Rechargeable Technology, to Inspire and Hearing Care Anywhere live sessions and Tinnitus Management. So definitely check those out. Those are the one hour classes. We also offer a series of Starkey at a glance sessions. These are 15, 20 minute quick sessions that are focused on a particular product or feature. So be sure to check those out as well. They're not available for CEU credit, but they might be able to give you some nice focused information if you will, that can help you clinically. So with that, I wanna thank everybody for joining me today. I appreciate your time and attention and take care. Thanks so much.