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Starkey CROS, BiCROS and AmpCROS Solutions

Presenter: Andrea Hannan-Dawkes, AuD, FAAA

Welcome everyone. I am Dr. Andrea Hannan-Dawkes, a member of the education and training team at Starkey and I'm delighted that you have elected to join me today to learn about Starkey's CROs, Bicros and AMP CROs solutions for patients with single sided deafness. Before we begin, I know that Melissa provided a little bit of information already on some of the housekeeping, but I wanted to. Oops.

I'm just having some trouble here getting things to advance.

Sorry everybody, give me one second here. Little technical. Technical. There we go. Okay, super.

So Melissa covered this already, so just few FAQs, right? Definitely ask your questions as we go along. I'll answer them at the out at the end of the presentation handout. You know, definitely a nice option for takeaways from the course today. Ceus.

You do have to have a paid audiology online unlimited CEU access membership to earn the 1 hour or 0.1 CEUs and of course that will be dependent upon going into AO and completing the multiple choice exam assistance or technical support. A few options for you there as well. Well, so don't hesitate to reach out if you have any difficulty.

Wanted to invite you to review the risks and benefits that are applicable to all courses. I'll give just a moment here to review the information and then of course this will also be available in the handout foreign. Go ahead and keep moving forward here. So Learning Outcomes so the three learning outcomes for our course today. After completing this session you will be able to list the Edge AI products for treating single sided deafness.

You'll be able to identify the microphone configuration options for CROs and by cross fittings within the profit software. And you'll also be able to explain how to configure an AMP Cross Cross solution.

This is our agenda for the course. During our time together I will discuss the impact of single sided deafness. I'll explain Starkey's CROs, bicros and AMP Cross solutions and related programming considerations as well. I'm also going to touch on Cross verification and validation. I'll share a little bit on the Starkey accessories and functionality as it pertains or applies to Cross and Bicros applications.

And then we'll wrap everything up with some good to knows and helpful resources.

So single sided deafness is one form of unilateral hearing loss in which one ear has no usable hearing and cannot benefit from the use of a traditional hearing aid. An individual with single sided deafness may have normal hearing or some degree of hearing loss in their better ear the inability to derive benefit from a hearing aid may be the result of a couple of different things. There may be profound hearing loss, very poor word recognition ability, perhaps a significantly reduced or compromised dynamic range, perhaps hyperacusis, or even degraded speech understanding with binaural presentation of sound. So there are a number of possibilities that result in an individual not being able to wear a hearing aid in one ear.

There are several possible etiologies for single sided deafness, and I've listed a few of the most common here for you. An acoustic neuroma. There can be blunt trauma to the head that results in a transverse fracture of the temporal bone, perhaps sudden idiopathic sensorineural hearing loss that perhaps you know comes from a viral infection. For example, Meniere's disease is sometimes at the root of an individual not being able to wear a hearing aid. Certainly cvas or cerebrovascular accidents like a stroke can also create this type of difficulty for an individual.

Labyrinthitis or even ear or brain surgery. Often the cause of unilateral hearing loss is unknown. But again, these should look familiar to most of you by way of common etiologies for single sided deafness.

Single sided deafness can really pose some significant communication challenges and also impact the quality of life in a negative way. We know that there can be spatial orientation or localization errors. There can be reduced speech, understanding and noise can certainly be problematic. And there are a few psychosocial effects as well that can impact overall quality of life. So let's just take a couple of minutes and unpack each of these.

We'll start with localization and this helpful definition. Localization is the auditory system's remarkable ability to determine the spatial origin of sound, which is a fundamental aspect of how we interact with our environment. Unlike vision, where there is a direct spatial topographic mapping between the objects around us and the cells in the eye, auditory localization requires the brain to compute the location of sounds based on the differences in how sound waves reach each ear. This complex process allows us to perceive whether a sound is coming from the left, the right, the front, back, above, right, or below us. So I liked.

This certainly provides a nice description or definition of localization. And I even like the comparison to the auditory system here.

So the process, and if we kind of, you know, dive in a little bit deeper. The process of localization involves both binaural and monaural auditory cues. Binaural cues are derived from the ability to sample the sound field from different locations, namely by the placement of two ears on each side of the Head and monaural cues are derived by the shape of the outer ear. Specifically here we're talking about the pinna and the concha, which filter sound as it enters the ear.

We use binaural cues of interaural time and level differences to help localize sounds. So how does this, you know, what are some of the factors on the table and kind of what's behind it. So an interaural time difference occurs when sound from a single source arrives at the two ears at different times, depending on the location of origin. Logically. Right.

It's going to arrive later at the ear furthest from the sound. An interaural level difference occurs when sound from a single source is at two different levels. At the two ears, the head actually ends up creating a shadow, resulting in a softer level at the ear that is furthest from the sound. So the differences that exist allow the brain to determine where a sound is coming from in the environment. For sounds below 500 Hz, the auditory system relies mainly on period related interaural time differences.

And that's because low frequency wavelengths can make it around the head. And you can kind of see that in the schematic I've got for you there. There's not much impact from the head on the overall level. And so essentially the wavelength of a low frequency sound is much longer. Right.

Than the dimensions of the head. So making the head an ineffective obstruction or baffle. For high frequency sounds above 1500 hertz, the auditory system relies mainly on interaural level differences. So we've got shorter wavelengths, you know, of those high frequency signals, they end up being subject to reflection and refraction by the head. Level differences are large for high frequency sounds because the head ends up being more of, you know, more effectively blocks the signals as a result of the much shorter wavelengths.

So again, I think you can make that out in the imagery that I've got on the slide for you.

So we've got interaural level differences, inaural time differences by way of the binaural cues that the, that we use for localization. I want to talk a little bit about monaural cues as well. These again are derived by the filtering or shaping that takes place by the outer ear. The angle of incidence of the sound waves creates patterns of peaks and notches that you can make out in the graph there. Most notably in the higher frequencies, between 4 and 10,000 hertz.

And this filtered response is known as a head related transfer function. The pinna makes can really, you know, individual anatomy. Right. Each person is different. The pinna Makes a unique acoustic mark on every sound that enters the ear, thanks to complex contours.

It's these acoustic signatures, if you will, that not only help disambiguate the location of a sound source, but also allow the listener to experience the uniqueness of each sound space. And as I said, you know, every ear has its own unique spectral filtering pattern. So we've got a few examples plotted out here.

When we talk about, you know, unique head related transfer functions, I think this is an important conversation by way of, you know, what happens when sounds original originate in the midline of the head and are therefore then equidistant between the ears. Right? Or maybe I should say this is kind of the value or an example of how this plays out and helps the, the individual. So the monoral cues, what I'm showing you here are recordings made with signals that are originating from the front of the listener in green, above the listener in blue, and then behind the listener in red. And just a note that the blue function shown here represents again, those signals on top of the head, not adjacent to the right ear.

But all of these are going to produce identical interaural time and level differences at the two ears. So that's where these monaural cues really come in handy. The unique pinna cues. And these head related transfer functions can help identify the location of sound sources. When those binaural cues are ambiguous, they also provide that sense of externalization and that sound is coming from outside of the head rather than inside the head.

So I know they're kind of small there, but they're each different. The green, the blue and the red, they're each unique. So, you know, certainly worth saying that individuals with monaural hearing are. Folks with single sided deafness aren't able to take advantage of binaural and monaural cues the way someone with normal and symmetric hearing can. So a little bit on the science behind localization without going too in depth.

And then a second really important consideration for those with single sided deafness pertains to speech understanding in noise. Work done by Cherry in 1953 identified spatial separation between sound sources as vital to the ability of normal hearing listeners to hear well or listen in background noise. Different spectral, temporal and intensity cues between competing sources provide again those valuable interaural time differences and level differences as well. And then when you dive into the research a bit or kind of, you know, the work that's been done over the years, according to Bronkhorst and Plomp, normal hearing listeners can analyze the cues to extract spatial location which again then, or which facilitates the understanding of speech in a noisy background. So definitely some helpful resources there.

So speech understanding can be problematic. And let's expand a little bit on this and talk about the head shadow effect. The head shadow effect can actually contribute to improved speech recognition and background noise. It's an effect that occurs when sound is attenuated because of the head creating a physical obstruction. Frequencies above 2000 Hz can be attenuated by as much as 15 to 20 dB, while frequency is lower, you know, than a thousand, for example, are typically attenuated by less than 10dB when speech and noise signals originate from different sources.

Right. It stands to reason that the ear farther away from the noise has a better signal to noise ratio, which can substantially impact the audibility of speech by, you know, creating that advantage, that signal to noise ratio advantage, thanks to the reduction of the noise level.

So an individual with binaural hearing can differentiate speech signals surrounding noise, but that ability is compromised with, you know, in individuals with unilateral hearing loss, which lends itself to making speech understanding and speech difficult. In fact, research by Valente and colleagues indicated that individuals with single sided deafness actually need a 13dB increase in signal to noise ratio to achieve speech recognition in noise performance that is similar to individuals with normal

hearing. So that's our second significant consideration with single sided deafness. And then, yeah, here we go. Next up, the psychosocial impacts, I think more so now.

But it used to be the case that some of this wasn't really highlighted or spotlighted. But really there's some important considerations here for individuals with single sided deafness. So these individuals can experience anxiety, frustration and even have difficulty multitasking secondary to cognitive overload. And those with profound unilateral hearing loss may sometimes even be perceived as socially awkward due to the body language and the mannerisms that they've adapted in their constant attempts to maximize hearing ability. And if that occurs, or even in response to the challenges that may exist in different environments, that can really open the door to social isolation, which we know is a significant problem for individuals.

All right, so having talked about, you know, the three, you know, considerations here with regards to the effect or effects of impacts of single sided deafness. Let's jump into a little bit of data here. I wanted to take a look as I was preparing this course and look at the incidents of unilateral hearing loss and even the prevalence. And so here's one data point. In the US the overall incidence of new cases of adults reporting moderate to severe Unilateral hearing loss is approximately 1.5% or that would equate to 1.7 million people.

So a significant number of individuals. And then as I mentioned, I wanted to take a look or kind of try to tap into the prevalence of of asymmetric hearing loss as well. There's currently no standard audiometric criterion for defining asymmetry. So prevalence estimates really differ depending on the audiometric criteria that are used. Suan and colleagues conducted a national cross sectional survey to estimate the national prevalence of asymmetric hearing loss among adults.

And they looked at two different audiometric criteria, if you will. The American Academy of Otolaryngology Head and Neck Surgery specifies asymmetry as a difference between pure tone

averages that's greater than 15 dB. And according to this definition, the overall prevalence of asymmetric hearing loss and their large study size was nine and a half percent. And that a couple ways to calculate pure tone average, that nine and a half percent came from using the the pure tone average using higher frequencies. So spanning 4,000 hertz to 8,000 hertz.

And certainly we know a lot of the consonant sounds of speech reside in those higher frequencies. And then just to give you a taste of it, you know of a different another kind of their study, but another way of defining or looking at asymmetry. The other criteria they looked at comes from the Department of Veterans affairs which specifies asymmetry as a difference greater than or equal to 20dB across two contiguous frequencies or 10dB across three contiguous frequencies. So using this criteria, prevalence was much higher, a little over 25%. And they were kind of looking across a broader range of frequencies as well.

500 Hz to 8,000 Hz. So various reading you can do there. While not individuals with asymmetric hearing loss may present with one unaidable ear, some certainly will. And so what are the options for an individual with single sided deafness? They certainly may elect to do nothing.

Some patients especially who have one normal hearing ear and then of course you know, no usable hearing in the other ear, but very often will compensate over time or perhaps better said, kind of learn to live with it. Amplification is an option and that's what we're going to dive into today. Cross Bycross and Amp Cross Solutions Bone Conduction hearing aid is an option for these folks as well. A BAHA device, right. That is also a treatment option for single sided deafness.

And certainly cochlear implants are also now an approved treatment for ssd. So a few possibilities for individuals.

So today we're going to explore the Crosby Cross and amcross solutions that are offered in Starkey's Edge AI hearing aid family. This is an all wireless technology family that was introduced in the fall following seven years of research and development to really bring to the table unparalleled sound quality, next generation connectivity and even benefits that go beyond better hearing. So the Edge AI family is available in a variety of hearing aid styles, not all of which are applicable to CROs solutions. So we'll talk about that in just a second and I do want you to know there are three technology tiers as well. All right, so with regards to Edge AI, I wanted to just tuck in a couple of slides about this hearing aid family in the event that you haven't had the ability or privilege to work with it yet.

The neural processor is at the heart of the Edge AI hearing aids delivering enhanced speed, power, signal processing capabilities. And with Edge AI we've got 100 times more DNN processing than in our previous Genesis AI family. And all of the styles and technology tiers also include the or a 2.4 GHz radio with LE audio for that next level connectivity and enhanced streaming sound quality. So good, good power and chip and DNN applications there. I think this, this is one of a great slide.

I chose it because it really summarizes what Neurosound Technology 2.0 delivers for individuals. It really focuses on making the complex process of hearing better. Provides the ability to listen with ease in every environment. So good to know. Important to know that Edge AI is the first family of hearing aids to introduce a DNN powered speech probability predictor that is 30% more accurate at identifying speech across complex listening environments, including that multi talker babble noise that can be very problematic for individuals.

This is really important because signal classification or sound classification, it drives the bus by way of the features and the signal processing. So the greater accuracy we have, the better we're able to treat and manage the sound. Also there's a 6dB additional reduction in low level noise with edge AI and there's a 13dB improvement in signal to noise ratio in noisy environments. So truly remarkable product

family. So just with a little bit of the background and some of the highlights if you will, on sound quality performance.

Let's dive into the CROs solutions. I do want to point out that it's that Starkey uses the term CROs for systems comprised of a receiver and a transmitter. That means references you may see in Starkey materials are going to be applicable to patients who need either a CROs or BiCROS approach to better hearing. There are two style options available, the RIC RT and the RIC 312. The rechargeable RIC RT provides patients with up to 29 hours of battery life on a single charge, which certainly surpasses the number of hours in a day.

For those who prefer a Zync air power option, the RIC3 12 was going to provide up to four days of battery life. And it is important to know that the transmitter and receiver must match by way of style. So as you're making selections, It'll either be 2 RTs or 2 RIC312s.

All sound is delivered to the better ear in a CROs application. So a non functional receiver is worn on the poor ear. It is attached to the transmitter. It looks exactly like our regular receivers, except it does have the term CROs written on it. So that allows for easy identification.

And the beauty there too is that it allows patients to have the same fit and feel in both ears. All rechargeable Edge AI hearing aids are compatible with the Starlink 2.0 chargers that customers have come to know and love. There are two form factors there. The premium charger has the onboard battery, which will allow patients to remove the charger from a power source and when fully charged, receive three complete charges while on the go or not connected to a power source. And just a quick mention on that.

In both options, The Starlink charger 2.0 you see on the left does not have the onboard battery. Both of them do, however, offer turbocharging, which is going to provide three hours of hearing aid use in 10

minutes of charging. So let's go ahead and start with CROs. I'm going to kind of give a definition or explanation for CROs, Bicros and AMCROs. And let's go ahead and begin with CROs.

So in the CROs amplification, CROs stands for contralateral routing of signals. It's designed for individuals with unaidable unilateral hearing loss. A transmitter is worn on the ear with hearing loss and a receiver is worn on the normal hearing ear. And then the acoustic signal is routed from that poor ear to the normal hearing ear.

Cross candidacy requirements include the patient having one normal hearing ear and again, one ear with hearing loss that does not benefit from amplification. As I mentioned earlier, this could be the result of a variety of different factors, right? Maybe profound loss, congenital or acquired, or maybe there's poor word recognition ability, hyperacusis and the like there. So there's the cross application, essentially We've got a patient with one normal hearing ear and one unaidable ear. So let's take a look at bicros.

BICROS stands for bilateral contralateral routing of signals. And in this strategy, it's designed for individuals with hearing loss in both ears, including one ear that does not benefit from amplification. So we still have a transmitter worn on the unaidable ear and the receiver is worn on the ear with better hearing. The acoustic signal is then routed over to the better ear where input from both microphones is amplified. Candidacy requirements, bilateral hearing loss.

Right. One ear that can benefit from amplification and one that cannot. And then the third possibility for individuals with single sided deafness is the AMCRO solution, which stands for amplified contralateral routing of signal. This application is going to be applicable for those for individuals with hearing loss in one or both ears. And it's intended for people with one ear, the poor ear that has reduced word recognition ability, but who appreciate or can make use of sound for the purposes of localization or spatialization.

So in this configuration, we've got two hearing aids being worn and amplification also being sent from the poorer side over to the better side to help with that word recognition, speech understanding. So the poor ear receives signal that, you know, again, helpful for orientation, environmental awareness and all the things. But then we've got the better ear helping with speech understanding.

And then essentially when we talk about the AMCROSS solution, it's really a hybrid of a BICROS system and binaural amplification. So speech maybe, you know, isn't recognizable in the poor ear, but again, they like the, the amplification on the poor side for localization. Right. Better environmental orientation and awareness. So what we do with Amcross, we use an acoustic telephone program to send input from one side to the other for additional assistance.

So it really is a pirated approach, if you will. We're taking a system designed for one person, binaural telephone, and we're using it for another purpose. It's definitely not perfect, but it may meet the needs of some patients. This option, certainly, you know, because we're the patient, is amplified in both ears. It also allows individuals to take advantage of binaural summation and that resulting increase in loudness that occurs when stimulating both ears at the same time.

And that can have some advantages or benefits for hearing as well. So now that I've taken a moment to kind of define the three systems, let's talk about some valuable features that pertain to the CROs technology. And as we go forward here. I'm going to continue to unpack more around CROs, BICRs and AMP CROs. All right, so let's go ahead and talk about one of my favorite features which is labeled here as cross modes.

So good to know that there are three cross modes available when you are the patient is using a receiver and a transmitter. There is the hearing aid only mode, cross mode and Bicros mode. And what I'd like you to do with this topic is kind of separate from patients to status and focus more on how the

microphones are going to work for the individual. Hearing aid only mode enables microphones on the receiver aid and it disables audio streaming from the transmitter. Cross mode is going to disable all microphones on the receiver and just enable audio pickup from the microphones on the transmitter so that it can be streamed over to the receiver.

And then by cross mode here we've got both all microphones active on both the receiver and the transmitter. And so let's just jump in and take a little bit of a closer look on when we might consider these various modes. So a hearing aid only mode may be something that the patient uses when they don't want the cross stream. Right. We've only got the receiver microphone active in this case.

You know, an example that comes to mind is that this may be a helpful tool when driving in a car. If or even as the passenger, when the poorer ear is near the window. We certainly don't want to pick up road noise. Right. And transfer it over to the better ear.

So there are a number of different noisy situations where this may be helpful. The car example, you know, the receiver having that active can really potentially help with conversations that may be taking place in the car or maybe even listening to music, depending on the programming that has been implemented. So both CROs and Bicros patients may be able to take advantage of hearing aid only mode. The CROs mode. This is picking up signals on the poor side and sending them over to the normal or better hearing ear.

In this case, the receiver microphone is off and the transmitter microphone is on. Right. It's all about receiving and kind of managing, if you will, signals coming from the transmitter. And this is going to be the typical configuration used for cross patients who do have one normal hearing ear. And then bycross mode, this is often used when a patient has hearing loss and needs amplification in their better ear.

So your kind of your by cross pair, if you will. They want to be able to hear sounds on the poor side, but also need the pickup and amplification on the receiver side as well. So typical configuration for a Bycross patient, but based on kind of the by cross mode, if you will. I wonder if you can think of or even like a traditional CROs candidate, if you will. So one normal hearing ear, is it possible that a CROs patient could benefit from bi cross mode?

And the answer to that is yes, absolutely. There is independent directionality and noise control in the receiver and transmitter. So this can provide a really nice advantage for individuals even again across patient with one normal hearing ear because it's difficult to hear in background noise. Right. And it's very taxing for them as well.

So this, the Bycross mode can be used as a valuable tool even for the cross patient. So wanted to kind of illustrate those a little bit and kind of talk you through the incredible flexibility that you have within the programming software. The mode that you select, you're able to select a mode, I should say, in each program that you implement in the hearing aids and you will see labeling and profit on the fitting graphs for easy identification. So and the fitting graphs have got populated there, highlighting the terms cross and by cross so you have an easy way to identify what's been implemented for, for that individual. And we're going to talk more about programming in just a minute.

Also, by way of helpful features, when a by cross mode is used, there will be access to the by cross balance control in the fitting software. It's a great tool that allows the professional to regulate the signals, the microphones on the receiver and the transmitter kind of relative to one another. So equal sensitivity that you can see in the middle there, that's the default setting and typically is the end goal for patients. But you can use the balance control pin and it kind of like drag it towards, you know, closer to, you know, towards the receiver, towards the transmitter, depending on what you're trying to do to again kind of manage the sensitivity of the receiver and transmitter microphones. Each step kind of indicated

by the hash marks there, results in a 1dB change.

So it'll be plus one on the side you're moving towards and 1dB down on the opposite side. So overall I should say it's a 2dB step size. So it's 1 and 1. Right. The maximum difference between the two is 10dB.

And just want to reiterate that what this control is doing is adjusting microphone sensitivity and the pickup sensitivity on each side does not affect the gain or hearing aid response. And any adjustments made using the balance control are going to apply to Any or all I should say by CROs programs that you have implemented. Patients using Starkey CROs technology are able to use the My Starkey app which really provides some wonderful flexibility and features to support better hearing and overall health and wellness. The smartphone being used is only going to detect the receiver, so appearance and functionality will be largely consistent with that of a monoral fit. The receiver being worn in the better ear certainly is the only part of the equation that's delivering sound.

However, the transmitter will be identified or detected in the app itself, which is going to allow the ability for the patient to have the cross balance feature should you implement a bicros mode for them. So they're really empowered on the go day to day to be able to regulate or manage the sensitivity of the receiver and transmitter. Microphones can be a wonderful tool. So did want to be sure to mention that as well in the app they simply tap on my hearing and they will see cross balance and then a nice easy slider to be able to regulate that. Different environments, situations, talkers positioned around an individual can really.

This can really be a nice tool. And then by way of helpful features, just a quick call out on auto shutdown, the rechargeable transmitter. So with the RIC RT option, there's an auto shutdown that is designed to help conserve battery life. The transmitter is going to automatically power off when it goes out of range of the receiver for more than 30 minutes. You know, maybe they've set down, you know,

their transmitter and they walk away and so now it's out of range, they're out of range from one another.

So it's a nice power save tool. Simply just have to, you know, power on the transmitter again, push the user control and that will be restored. So now let's look at some more programming considerations when it comes to cross and by cross functionality as the Let me back up a step here. As the Edge AI hearing aid family is comprised of only wireless technology, wireless programming is used. So we've the compatible wireless programmers include NOAA link 1 and 2.

Also when it comes to programming, do know that the cross receiver and transmitter must be paired together at the initial fitting. Thereafter the transmitter does not need to be present just as a sidebar there. And the stream from the transmitter to the receiver is always active during programming. So the patient has the opportunity to experience this, you know, transfer of sound, if you will, as you are going through and visiting various screens and or making any changes that are necessary. Pairing of the receiver and transmitter automatically occurs when they're brought together.

In a fitting setting session. If a patient's been fit with a compatible monoral hearing aid and then later decides to try CROs, you know, tries adding a transmitter, it's easy enough to add one into the fitting. The hearing aid itself that they've been wearing will retain all of its previous settings once it's been kind of reidentified as a receiver. Again, once that transmitter has been added, only the receiver is going to populate in profile. So that's, that's what will be visible to you. The ear wearing the transmitter will be faded out.

I'm not sure if you can make that out in this image I have. I apologize, but there's a. The fitting graph will be grayed out and it'll say transmitter on the side wearing the transmitter.

When a receiver and transmitter are synced and kind of brought in and kind of, you know, married together, a cross by cross screen is going to appear in the left navigation flyout menu. And I've got that

highlighted for you here. There are two different ways to access those three CROs microphone modes I mentioned before. One of them is through the cross by cross screen and another is through the program dropdown. So I've got an image of each of these.

So here I'm showing the left navigation menu that cross by cross screen and then in the bottom left corner there you can see the ability to implement a microphone mode. So that's very visually friendly, I think, and straightforward. Another option that you have is to select the program dropdown menu and then there you can make out hearing aid only CROs or bicros. So a couple of different options there. I talked about the bicros mode balance control earlier.

Again, just really nice flexibility for the professional. You're only, you know, this is applicable when a bicros mode has been implemented. And again, just a valuable tool. Some, some patients are going to need to acclimate, you know, to picking up sound on the poorer side. So just a nice tool there.

User controls. There are a variety of user controls that are available for both the receiver and transmitter. Ear to ear functionality, right. Pressing on one side and creating a change is automatic here. So those buttons are going to be grayed out in the software.

If the double tap feature that is only going to be applicable to the receiver and good to know that mute on the receiver mutes the entire system. Do want you to know that the rechargeable RIC RT is going to have the push and hold user control configured to sleep mode when shipped. So that is to give them a convenient way to kind of power down if you will go into that very deep sleep mode to conserve battery life. But you've got all kinds of flexibility with user controls. You can use several or you can use none.

All kinds of possibilities there Here I'm kind of showing on the left side of the profit software, you click on the user control indicated in blue and then you can drag it over and drop it into the control of your choice on the right. There's a lot of flexibility again with these controls. The microphone and what I've

this is just one example, if you will. In this example we've got the microphone on the right side, the transmitter receiver on the left side. And what's been selected here is the ability to enable mute on the right side.

So you can see that in push and hold and that can be helpful for times when the patient doesn't want to hear from the poor side. So another possibility, right, for how to kind of make the system work to the patient's advantage. And then this individual has also enabled a program control on the transmitter side. And now perhaps if there's a few programs with different modes plugged in, got an easy way to go between microphone modes. And this is just one clinical example of many.

Balance control can also be implemented as a user control. If that's going to be helpful, it's going to again do the same thing. It's going to allow the user to increase sound pickup from one side or the other side. If they shift the balance again, they can go towards receiver, towards transmitter and they've got some nice flexibility there.

Indicators for cross applications. There is a cross stream start indicator, cross stream stop, stop and then individual indicators for low battery and mute as well. So these can be really helpful. They're actually, you know, if I focus even on stream start and stop, pretty straightforward, the low battery and mute. I think it's helpful certainly to have different indicators to identify or relate to the receiver and the transmitter.

So that's going to help the user know which side has a low battery or is being muted, for example. So there's a nice ability in the software to demonstrate these either through the hearing aids or through the computer icon and play through the sound field. The balance indicator will play when adjustments are made to the balance control. And there's an indicator for maximum default, minimum home and even stand steps that can be enabled or disabled. So you know your patient and what may be most helpful.

Telephone use. Streaming to the receiver side is certainly available with compatible smartphones.

Patients who do well holding a phone up to their better ear may certainly continue to do so. But if they do hold a phone up to the transmitter on the poor side, the transmitter will send the sound of the phone over to the receiver. And just a note that if you do decide to assign a telephone memory, all telephone memories are going to be locked into the hearing aid only mode by default.

So keep that in mind. The cross stream is going to stop during a phone call and the receiver side will pick up the phone signal. So you a couple of, you know, considerations there if you will.

All right, some good to know here for cross by cross after the initial fitting, I think I said earlier, profit does not need to communicate with the transmitter. Hopefully patients have both parts to the system, right and are wearing them consistently. You can program the receiver with or without the transmitter present. And then I already mentioned the auto spot sleep feature. If the transmitter is set down or removed from proximity to the receiver, you can also unpair a CROs system and convert a receiver back to a monaural hearing aid fitting if you will.

So you go and you just return the hearing aid to manufacturer settings. On the connect screen you select receiver only and then you click on Tools from the menu bar up top and then you select Clear Settings and reset device. So when you do that it's going to clear all patient data and settings and include all, including I should say all programming, you know or program specific cross by cross information. And then when the process is complete you simply select. Okay, so maybe you've given a transmitter a try, right?

And it's for some one reason or another a no go for the patient. It is easy enough to convert the system to a monorail fit. Wanted to point out. Oh sorry, here's my little video I got ahead of myself but just kind of following up on what I was saying about what you'll see in the PROFIT software. We do have a wonderful cross system initial fit protocol.

Quick tip for you available@starkeypro.com these quick tips are written by the education and training team and we do them in a manner that's 1, 2, 3 ABC with pictures to make it easy for you to follow along. So feel free to go to starkeypro.com and download that. Next up in the agenda, I wanted to talk about verification and validation. We know that both are very important to every hearing aid fitting. Verification, right.

Real ear measurements and what the intent there, or what that brings to the table is the ability to confirm that a system is working as designed. Validation. On the other hand, these are subjective outcome measures. Perhaps aided Speech testing and what that tells us or adds to the equation is to ensure that any hearing aid or CROs system is working as desired. We do have a helpful quick tip@starkeypro.com that will walk through measuring the head shadow effect and for verifying both cross and bicros configurations.

Real ear unaided responses or aided responses are measurements are made depending on the protocol that's selected. So essentially the probe tube will always be in the better ear that where's the receiver while the speaker azimuth and the location of the reference mic change. So it'd be pretty tedious to talk through each one every point. So I just wanted to give you a little snapshot of that but do know we've got a wonderful quick tip that you can download there in the validation department. We know certainly there are a variety of subjective and objective outcome measures that are available that are designed to help, you know, identify, identify, validate hearing aid benefit, improve performance and patient satisfaction.

I, I'm a big fan of validation. I think it's a really important step to kind of document hearing aid benefit because again it, it reflects how the patient is doing with their amplification system and that the we're delivering what we're intending to deliver and it makes a quality difference for the individual. Just a quick call out that the CO C, AFAB and IOI HA are integrated into NOAA under the questionnaires

module to make them easy to access aided speech testing capabilities. Certainly some use measure, you know, srt, some do word recognition. Quicksin one of several by way of speech and noise can be a nice, easy impactful way to look at the benefit provided to an individual.

So now let's jump into amp cross fittings and take a closer look there. So as I mentioned earlier, this approach is a hybrid of a bicros system and binaural amplification where we've got hearing aids being worn in both ears. Again, kind of the use case for this. Perhaps there's degraded word recognition ability in the poor ear, but that ear does appreciate sound for the purposes of localization and kind of that environmental awareness, if you will. The bicros function is intended transferring signal from the poor side to the better side to help with speech understanding.

Right. To deliver that important speech information to the better hearing ear. And we do this using an acoustic telephone program that sends input from one side to the other for bilateral listening. The amp cross configuration uses a dedicated binaural telephone program again to stream content information from the poor hearing side to the better ear and A binaural fitting. So I've got a screen grab there from the software.

When you're selecting the telephone program, what you want to do is you want to the send signal should be assigned to the poor ear and the receive signal that's indicated there should be aligned to the better hearing ear. So depending on the patient right, we've got right sending the signal to the left or we've got left sending the signal to the right. In addition, under programs and configure phone options, you're going to want to select microphone on with 0dB of attenuation for the received signal. We don't want that signal being sent to the better ear to be reduced in any way. So that will be an important consideration.

And it is helpful to know that when, you know, when we're kind of hijacking, you know, a telephone program for this purpose, there are some considerations when it comes to signal processing

capabilities. So with a telephone program, only omnidirectional microphone mode is available and the noise reduction capabilities are restricted. So binaural speech and loud noise and transient noise reduction aren't needed and therefore they're not available in the telephone programs. However, the other noise management strategies are. So the patient's still going to be in good shape.

But it is important for professionals to know when it comes to accessories. Some patients really derive a lot of benefit from the use of accessories. Control and convenience are available certainly for individuals with single sided deafness thanks to the two wireless accessories. For Edge AI hearing aids, we've got the Starlink Edge TV streamer that is LE Audio capable, so it's AuraCast ready if you will, and the Starlink Remote Control 2.0. If you issue fit a TV streamer, do know that that's going to be automatically optimized for the monorail fit configuration.

That's going to ensure that the signal is not split between two hearing aids or in this case between the receiver and the transmitter. So that will automatically occur, which is helpful. The remote control is a really valuable tool for patients who have dexterity or tactile sensation difficulties, or perhaps they don't like to use apps on their phone. The favorite button there I've got highlighted can be programmed within the software for a function that's going to be most helpful to the patient. So I've got a few of those options listed there as well.

And exclusive to the Edge AI family is the ability to use the program button with a long press to reset the hearing aids back to home settings. So, you know, program one Default settings. This functionality allows you to use the favorite button that we just looked at in a different manner. So even though it just adds some flexibility to this system for individuals and then a couple of good to knows here. When it comes to accessories, accessories are going to pair and stream only to the receiver side and the transmitter and accessory or phone stream are not simultaneous.

So if I'm listening with my CROs system, my sister calls, the stream is active, I'm hearing that I'm not hearing my sister. The phone call and the transmitter microphone pick up at the same time. It's one or the other. As soon as I hang up the phone call with my sister, the transmitter streaming resumes. It's all very seamless and automatic for the individual.

So I mentioned my Starkey earlier. It is compatible with a wide range of both Apple and Android smartphones and tablets. I think it's helpful to know that for Apple users only the receiver is paired to the phone and as a result the transmitter is not going to appear in the native controls of the phone. For Android users, however, both the receiver and transmitter must be paired to the phone and I think you likely know this as well. The differences that exist between Apple and Android, please know that is not as that is not as defined by Starkey.

It's the way those operating systems work and what is required for both. Though for both operating systems the home screen is going to appear as it does for a monorail fitting. So because of course it's the receiver, right, that is delivering signal, the usable signal to that better, better ear. All right, so that was some good to know and kind of helpful touch points on various aspects. So as we're kind of concluding today, I'm just going to give another shout out to a variety of resources that are available for you@starkeypro.com I've got a few of those quick tips on the screen for you here. Please go to Starkey Pro and download those.

I think they'll be really helpful. And then also white papers. You can go into the to the Pro site and access the white papers and get some additional valuable information there. I just wanted to give a shout out to Telehere by way of a valuable resource. Here is available for all Starkey hearing aid fittings, not just CROs technology.

And we've got the two form factors, the synchronous and the asynchronous applications. Synchronous certainly being that real time audio visual engagement with a patient and then the asynchronous is

accomplished through the my Starkey app at the convenience of the patient and professional. So just keep that in your back pocket as well, depending on your clinical dynamic. So I hope you've enjoyed learning about the wireless CROs options that are available with the Edge AI product family as we wrap up here. I do want to mention that these hearing aids are really delighting both patients and professionals thanks to that neural processor, the embedded DNN and NeuroSound Technology 2.0 that kind of manages the soundscape.

I know you're really going to love what this technology offers patients with single sided deafness. And a fun fact for you that is really important actually when it comes to better hearing. Starkey has over 300 patents worldwide related to sound quality and noise management and 85 patent applications since Genesis AI. It's really remarkable and definitely communicates Starkey's commitment to helping individuals hear better. So if you have any additional needs or support related to cross options, please don't hesitate to reach out to your dedicated account representative or our amazing customer service team.

And with that I want to thank everyone for joining me today. If you need to log off, I understand. Looks like we're right at time. If there are any questions, I will navigate now over to the Q and A area. And again, thanks so much everyone for joining me.