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Beltone Serene Feature Review

Presenter: Laura Schachtel, AuD, FAAA

- [Kimberly] And welcome everyone to today's webinar, Beltone Serene Features. We are so pleased to welcome with us Dr. Laura Schachtel. And Laura, I'll hand things over to you.

- Thanks, Kimberly. Hi, everyone. Again, I'm Dr. Laura Schachtel, the Product Training Development Manager for Beltone. And today's quick, fast-paced session is going to cover the features of Beltone Serene. So, yesterday we talked about the hardware of it. Today is more the feature set. So I'm going to review data from some new research studies that we've done over the past few months to really prove that our great features really do what we say they do for your patients. So these would be features like Crosslink Directionality 4, Ultra Focus 2, the Our Environmental Classifier, and M&RIE. So all of these are features that your patients need in order to hear their best in noise and now all of that is packaged into our teeny tiny little micro RIE with Beltone Serene.

So as Kimberly stated, there are a number of handouts. There are the duplicate handouts from yesterday. So if you joined me yesterday, they're the same except the notes handout would obviously be for these slides. Again, if you're unable to download the handouts from Audiology online, we have them on our training homepage, www.beltoneuniversity.com. Most of them are found either under that Product tab or specifically in the Beltone Serene tab. So with that being said, let's move on to our learning outcomes and get started. So after today's session, you should be able to describe how Beltone Serene allows patients to hear their best in noise. Be able to describe the advantages of using bandsplit directionality. And lastly, list the patient benefits when fit with M&RIE.

So for those of you that weren't able to join me yesterday, I just wanna take a moment and introduce you to Beltone Serene.

- [Narrator] Experience more of life with Beltone Serene hearing aids.
- Chef.
- [Narrator] Our best yet at helping you hear in noisy situations. Hear with confidence, even when life gets loud. Beltone Serene lets you focus on what people are saying and hear what's important to you.
- What are you still doing here?
- Oh, I...
- Wow. That's fantastic.
- Yeah?
- Yes.
- Okay.
- [Narrator] Experience Beltone Serene today. Call 1-800-BELTONE or visit Beltone.com.
- So, one could say that Crosslink Directionality 4 is the heart of Beltone Serene. It's the feature that will allow your patients to hear sounds all around them. But what might you call Beltone Serene's brain or core? I like to call it the air traffic controller. What causes all those highly marketed features like Crosslink Directionality 4, like our Smart Gain feature to turn on and off? The industry word is the environmental classification system, but we just simply call it the environmental classifier. So let's now dive a little

bit deeper into this feature to understand why I call it the air traffic control. But you could say GN calls it the brain of the hearing aid. So all hearing aids have some type of classification system to gather data from the environment, so the hearing aids listen to the environment and depending on what the environment says, the hearing aids make decisions about when to activate and deactivate certain features and operations for the patient.

The environmental classifier evaluates the overall sound level, the signal-to-noise ratio, and the types of sounds in the room. So spectral shape, amplitude, modulation, and many other aspects of the sound in the user's environment. Now, some environmental classifiers run in real time to provide up to the moment analysis of the user's environment resulting in a nearly infinite number of possible feature activations and signal strength. And this is what we do. You can very clearly see this in our Smart Gain feature where we have our seven environments and you can kinda see the sound intensity. So quiet, moderate, and loud of how we kinda break down some of the sounds. Now, other brands in the market strive to create a more rigid structure.

So they have more categories or certain buckets where the hearing aids listen to the environment and put them into specific categories. So this is speech with moderate noise with some background noise with this. So it's a little bit more rigid structuring, but it doesn't really matter. The point isn't what philosophy or method is best used. The real question is when we're talking about an environmental classifying system, how accurate is it? Because after all, if the environmental classification system that is responsible for the overall function of all of the features and thereby the expected benefit that our patient can have from these features, it's only when these features work as intended that we can actually achieve and provide our patients with real world benefit that they really want.

The last thing we want is to have the hearing aids go into a directional mode and then somehow pull the patient away from what they need to be hearing. We don't want the hearing aids to go into some type of schematics where it's actually doing less benefit for the patient than what we wanted. So in 2017, we did a study to prove our environmental classifier was accurate, and in that study we found it to be 90% accurate and more accurate than any other manufacturer that we tested against at that time. But that data is now several years old and we wanted to confirm that our environmental classifier really is the best in the industry still. So we basically reran the study we did before using Beltone Serene, and then four hearing aids from other manufacturers as well.

So this study used nine different sound scenarios, so nine different sounds that were then kinda classified by real normal hearing judges, as they call it, to be speech and quiet, speech and noise, and then noise only. So these nine sounds were just looped together. Each one of the hearing aids were then put into a test box. Those nine sounds were then pumped through the test box. The hearing aids kind of rocked out in that test box for about 12 to 14 hours. Just wanted to make sure we got enough data logging to really see the data. Once the time had come, we took the hearing aids out, connected it to the manufacturer software and read the data logging.

So what you're seeing on the screen are the results, and you can see that all five brands are really accurate for quiet and speech only. So that's that dark blue line. And that all of us are still struggling or we're not quite as accurate for speech and noise, which is that lighter blue line. And I just wanna mention that for Brand D, the reason why there isn't the speech and noise line is because the way their data logging works, it classifies speech and noise and it kinda puts it in with that noise bucket. So, their speech and noise is in somewhere with the noise so that's why that data point is missing. So, what you can see if you average up those three sound environments for

each manufacturer is that again, Beltone serene is 90% accurate at classifying and more accurate than our competitors are.

So it really just reconfirms what we knew all the way back in 2017. So when our R&D department looked closer at the data, they found something I think is a little bit odd. So a sound that all of the human ear judges, right, everyone saying what sound, if it was speech, speech and noise, they all unanimously stated that this sound was definitely noise. But our competitors were classifying this noise as music, at least for some of the time. Now, each one of our other competitors have a classifier category specifically for music, right? So they heard a sound that they think is music, they're classifying it as music. So what was this noise source that these four hearing aids thought was music?

A vacuum cleaner. So the sound of the vacuum cleaner triggered at least for part of the time, that noise setting for these four hearing aids. And we noticed that when music was a category, like these four brands have, there are more classification errors, meaning in the real world, these hearing aids might mistake background music as the signal of interest for the patient. So this could be like a grocery store or a department store where there is some type of background music or some type of background jingle, but the patient's really wanting to have the conversation with the sales person. So, what could happen if the hearing aids thought that, ah, it's music, that's what the patient wants to listen to.

Well now the hearing aid's probably doing something to enable music enhancement, changing the settings in the hearing aid to have the patient enjoy music when really the patient's going, that music is background. I don't want to hear it. I really wanna hear the salesperson in front of me. So, that is why we have a separate music program. Since music listening, music enjoyment is usually an intentional activity, as in I'm going to a concert, I want my hearing aids to stay put, I don't want them moving around as the intermission comes or as there's a big crescendo with the music. I just want my

hearing aids to stay put as they are. And then when I'm ready to leave the concert, I can go back into my all around program.

So the patient drives their music enjoyment. So once we establish that the hearing aids are actually classifying the environment accurately, we can then move on to what is undoubtedly kind of the main headline feature when it comes to hearing and noise. And that's directionality. So for many years, Beltone has used the philosophy that individuals, the patient, should decide what they want to listen to and not the hearing aids steering them to what the hearing aids think the patient should be listening to. So our approach is with something called asymmetrical hearing where the ears communicate with each other using ear-to-ear to help the patient focus on the speech in front, but still monitor the environment.

And this approach allows, again, the patient to hear all around them even when they're in that directional setting. So Crosslink Directionality 4 is our seventh generation of providing directional benefit to our patients without them, again, feeling cut off from their environment. But let me take you on a little journey to how we actually got to our seventh generation. So all the way back in 2008 with Beltone Reach, we started this asymmetric journey with something called Monitored Directionality. Then in 2010 with Beltone True, we changed the name to Spatial Directionality because we are now applying bandsplit directionality. So both Spatial and Monitored Directionality had one ear that was always directional and one ear that was always omni, they did not switch.

This was just permanently how it was set. So, we had bandsplitting back in 2010 with Beltone True. Then with Beltone Promise and Beltone First, we had Crosslink Directionality. So now instead of each ear acting kind of as its own independent thing, entity, their hearing aids are now talking back and forth. So they're acting as a team, as a real pair now with Crosslink Directionality. Then in 2015 we had Beltone Legend and we added on personal sound ID. And personal sound ID added some more localization

cues and an artificial pinna restoration algorithm 'cause again, we realized and recognize all the way back in 2015 that we weren't really helping our patients as much as we could by not allowing those pinna cues to be added into the signal that they were hearing.

So kind of a first iteration towards that M&RIE receiver. So then with Beltone Trust and Beltone Amaze, we had Crosslink Directionality 2 where we reconfigured the microphones to fill in some of that, what I call over-the-shoulder listening, right? That directional ear, the sound that was coming from behind that directional ear, our patients still weren't hearing. So again, trying to just give them more sound all around them. Then in 2020 we had the launch of Beltone Imagine and Crosslink Directionality 3. First time we've ever talked about a four-mic beamformer and ours was weighted, meaning we tried as much as possible to always ensure that our patients had the best signal-to-noise ratio no matter what environment they were in.

And when measured against omnidirectionality, we were able to provide patients a 4.2 dB signal-to-noise benefit. And now that we have this four-mic beamformer, it's not the hearing aids working as a team, it's the hearing aids being one holistic system now. And so that brings us all the way up to Crosslink Directionality 4 with Beltone Serene. Again, our four-mic beamformer compared to omnidirectionality allows for an 8.61 dB signal-to-noise ratio improvement. Again, according to Market Track, 86% of patients still struggle to hear with their hearing aids in noisy situations. So if you remember, we introduced three technology improvements with Crosslink Directionality 4. We were able to widen our sound mapping, we increased our processing detection and selection for how those microphones moved.

And then finally, we increased the precision of our beamformer. Now remember that all three of these improvements work at the same time across any sound environment enabling your patients to automatically tune in to what they want to listen to. So, let's

quickly review how we provided these improvements to our patients. So, when we talk about widening our sound mapping environment, we're providing more input to the sounds around to our patients. So again, they're more aware of what's going on all around them. So using ear-to-ear audio streaming, the low frequency sounds from that focus or directional ear streams to the monitor or omni ear, improving the omnidirectional signal of that ear. This allows us to fill in that blind spot, thus making sure that our patients are more aware of what's going on around them.

So you can kind of think of it like this. All of the cameras and sensors in our newer cars, they're there to help us see what's going on all around us to give us more information so we can be aware of the obstacles in our environment and help us make the best decision to navigate out of the situation keeping everybody safe. And this is very similar again to what Crosslink Directionality 4 is doing with our Beltone Serene hearing aids. So we all know that hearing aids, again, they're always adapting and we just talked about how great of a job we do at classifying sound environments. But we realized that we might've been a little bit too careful and took a little bit too much time when we made the decision to change directional patterns for our patients.

So because of this, we've redesigned our microphone decision making process and we now make decisions twice as fast. So this means in about six seconds we can transition from an omni to a directional mode or to an asymmetric mode so that the patients are hearing the best that they can a little bit quicker and not taking so much time to really think, is this the right move or not? Now, historically as beamformers collected sounds, they neglected to account for the reflections of the head, neck, and torso of the hearing aid wearer. But accounting for these reflections is something that our brains naturally do. So, when a hearing aid wearer's brain gets aided sound information without these reflections, what they're hearing is a little bit unnatural to them.

So to improve upon this, we retooled our hearing aids to allow for more data points or more samples of the sounds to be collected. So more data gave us more information and therefore the ability to develop a better higher resolution signal. And again, using ear-to-ear, the higher resolution signal can be bilaterally synchronized so that the signal in our beamformer is more precise. This now allows us to account for the reflections of the patient's head, neck, and torso, providing a more natural sound quality. This precision in the beamformer makes a huge difference in speech understanding and noise even compared to our Crosslink Directionality 3. The results of our testing showed again an 8.61 dB improvement to speech understanding and noise when compared to omnidirectionality.

Again, allowing us to state that we can provide a 150% improvement. Now this all sounds great, but we wanted to be able to prove to you that the intended benefit is really being provided to your patient. So to do this, we did another study and for this study we programmed our hearing aid and another manufacturer's hearing aid that also uses a four-microphone beamformer. So apples to apples. We programmed each hearing aid with two programs, omnidirectionality in the first and then the second with the four-mic beamformer being activated. So that was Ultra Focus 2 for us, just so that nothing was changing in the room, had it set in Ultra Focus 2. So in a sound booth, we presented some white noise to a hearing aid that was placed on the right ear of a mannequin head and then that head was mounted to a turntable so it was constantly spinning in a circle.

And this allowed us to measure the hearing aid response from 360 degrees. So what we were able to obtain is something called a circular spectrogram. So just to orient you to this, the higher frequencies are closer to the head and the lower frequencies are further out. More intensity is represented by the red coloring and less intensity represented by the blue coloring. So as you can see here in omnidirectionality, we have all of that sound, all of that intensity coming from the right ear, the ear with the hearing

aid, and really not much coming on the left side because it was nicely head shadowed. Here is the omnidirectional response from our competitor. Great, it looks very, very similar to ours.

So this is wonderful, they look very similar. Now, here's the measurement taken with our hearing aid in Ultra Focus 2 and what you see is exactly what's being marketed for Ultra Focus 2. You can very clearly see an area of very focused audibility in the five degree asmus in the middle frequencies between one and 5,000 hertz. This is our binaural beamformer, which helps make speech more audible when in background noise. And you can also see an area of wider directionality in the higher frequencies above 5,000 hertz. This is the area where multi-band directionality is being applied in a more fixed hypercardioid response, which preserves spectral cues that are important for localizing sounds. So what does this mean for our patients?

It means that the feature your patients are paying for, so narrow directionality, that doesn't make them feel cut off from the environment and preserved localization cues really are working as intended. Now, this is in contrast to the other manufacturer's binaural directional beamforming or their Ultra Focus 2 equivalent. Maybe in front you have some very narrow directionality, but on a whole, when you look at that, their directional beam is a lot more diffused. It's not as focused as ours is. So another feature that we have that our competitors are just starting to maybe dip their toes into is bandsplit directionality. So when your patients are in a quiet room, their hearing aids will be in an omnidirectional mode and they can hear sounds from all around with full and rich sound quality, which is just what they want.

The problem is when they have a conversation with background noise, so in this situation, they would move into a program with directionality to help hear the person in front better. But this has two limitations. One, the directional system works mainly in the high frequency range, which can make the sound quality tinny, weak, and

unnatural. Two, they can feel cut off from their environment because they can't hear what happens all around them. And that's a little unsettling because normal hearing people can still hear what's going on all around them. We're not cut off from the environment all around us. So, at Beltone we combine the comfort, the nice sound quality of omnidirectional processing with the enhanced speech clarity given by directional systems.

And we do this by using bandsplit directionality. With this we can preserve low frequency localization cues and the natural sound of your patient's own voice without a additional processing and still provide speech clarity when in that directional mode. So this is that same spectrogram that we just reviewed on the previous slide. So when in a directional setting in noise, the low frequencies, the light blues stay omnidirectional. The high frequencies in green use an independent fixed directionality to help preserve those spatial localization cues. And the mid frequencies in the darker blue, that is where we apply our binaural beamformer. So by maintaining an omnidirectional response in the lower frequencies, both low frequency roll-off and the proximity effects are completely reduced and good sound quality of one's own voice is preserved regardless of which listening mode of Crosslink Directionality 4 your patient is in.

So let us contrast our bandsplit directionality with a different manufacturer, so not the one we just looked at, that uses full band directionality. So again, you can very clearly see we don't have much intensity in our low frequencies. All of the intensity is in the mid and high frequencies. Here is this different competitor. When you look at their system, and this is full band, they have a nice, narrow focus directional beam. They're doing great with directionality. But notice how much intensity is in the low frequencies. And again, you have all this low frequency intensity because every frequency went to that directional beam. So this means that this patient wearing this hearing aid might have some issues with the natural sound quality of their own voice and there might be some extra background noise in that directional signal.

Now we just reviewed how great Ultra Focus 2 is to provide your patients with hearing in front of them, but it is a manual program, your patients need to move into their hear and noise program to activate this. But what happens if a patient forgets to go back to their all around program 'cause a lot of patients forget to push their programming buttons? So we wanted to make sure that we weren't cutting off access to sounds all around the patient, which is part of our sound philosophy. So we did a study to make sure that if a patient forgets to go back to their all around program, they're still able to hear sounds around them. And then we tested against three other competitors who also in their marketing claim state that they allow patients to hear all around them.

So, we set up the test this way where the signal the single talker target what we're measuring is that light blue triangle. Then to make it a more challenging test, the darker blue triangles, those are single talker like masker. So it's just another voice just to confuse the patient. And then to make it even harder, those white triangles are speakers that are now pumping in speech babble. So all sorts of speech coming at the patient, again, they're meant to pick up the single talker target from that light blue triangle. So for this study we're looking at signal to noise ratio. So the lower number is the better result and the results show on average, so if you average our three other brands and compared it to us, we are 4.

4 dB better or can offer 4.4 dB of improvement to signal-to-noise ratio compared to everybody else. So what does this mean to your patient is well, should they forget to go back to their all around program, should they forget to go back to Crosslink Directionality 4, they will still be allowed, they will still have access to sounds all around them and again, still be able to decide who and how to listen to the different voices in their environment. So it means they're not gonna be cut off from the sounds around them. Yes, we would love them all to go back to their all around program, but if you have that patient that just keeps forgetting and the only reason they go back to all

around is 'cause they dump their hearing aids in the charger overnight, they'll still be able to hear everything around them.

And maybe if they're not, they'll realize they need to press that button. But again, our competitors who claim they allow hearing all around them, they're not really doing a great job for their patients. And so, for those of you that are newer to Beltone, we have this special receiver type that again is unique to us called M&RIE. And again, it combines the two traditionally placed microphones of the hearing aid with a third microphone that's placed at the end of the receiver and that sits in the ear canal. So this combination gives patients the best of both worlds. Natural sound of custom products and the advanced features and ease of use as an RIE. And we have done lots of studies over the past three years or so to show improve the benefit of using a M&RIE receiver.

So some of the highlights of these studies is that 90% of listeners prefer M&RIE for just having natural sound quality. We were able to measure a 2.6 dB less in listening effort than compared to listening with just a standard receiver. 31% more accurate front back localization that only increased or just happened to increase even more to almost 60% after the patient has worn that receiver for about four months. 95% of users report an effortless non-streamed phone call, meaning they can just put their phone up to the ear, not have to push buttons, not have to worry about feedback, and that M&RIE reduces wind noise by up to 15 dB without reducing gain. So, we wanted to kind of confirm that we truly are providing natural wind noise reduction.

So yes, we did another study, but this time it wasn't us doing the study, this time it was the National Acoustic Laboratory, so NAL in Australia. So a kinda third independent laboratory basically repeated our wind noise study. So here's what they found. We all know that wind noise reduction, it's helpful in reducing the sound of wind and it works the best when the wind noise is coming from the front of the patient like you see in this

picture. And in this configuration they measured a 16 dB reduction and with our wind noise feature on, which is great and it really highlights how well our wind noise reduction feature works when the wind hits the front microphone and then the back microphone 'cause that's how our algorithm is meant to work.

And when using M&RIE, there was an additional six dB of wind noise reduction even though the feature was turned off. But I don't know about you, but if wind's coming at me and my eyes are tearing, I'm probably gonna turn my head like this. So now what happens to the wind noise reduction? Well, now the wind is hitting both microphones at the same time. That's really not how our feature was intended to work. So it shouldn't be surprising that only a five dB reduction in wind noise was measured. But when they measured with M&RIE, they obtained a 20 dB reduction naturally again because the microphone is being protected by the ear canal. And this just really confirms the claim that we talked about.

We said 15 db, they're getting a little bit more. So again, we're a little bit more conservative in our number reporting. But let's look a little bit deeper at the frequencies that our being reduced here? So this graph shows us that both wind noise reduction and M&RIE help reduce wind noise in the low frequencies by about 10 db. And that's because wind noise is generally classified as a low frequencies noise source. But since the mid, but notice, sorry, that the mid frequencies here between one and 6,000 hertz don't flatten out. So that shows that M&RIE is providing a four to 14 dB improvement to hearing even though they're providing natural wind protection. So they're not decreasing gain in those mid frequencies, which is huge because it helps maintain that nice audibility in the mid frequencies, which is where our beamformer lies, which is where we really help patients hear through any type of noise.

So again, with M&RIE, we're getting natural great wind noise protection, but we're not reducing any gain in those very important mid frequencies. And this is a handout that

you hopefully have downloaded, but I'm just gonna go through it quickly. And again, just reminding you if you have any questions, please feel free to go ahead and type them in now. I just wanna remind all of you that we have more features and more availability for adjustments when we use higher level technology. So again, Crosslink Directionality 4, Ultra Focus 2 are only available in our 17 level product. And again, there's more flexibility and more adjustment options when we use higher level technology. And then when we look at our kind of connectivity for those sound enhancers and our Beltone HearMax app, they're only available on our 17 level products.

So again, this is a handout that you can easily download. So just to summarize, Beltone Serene allows patients to hear their best using Crosslink Directionality 4 where we've widened the sound mapping, we have faster processing, and a more precise beamformer. Our more precise beamformer is also used for our strongest directionality, which is Ultra Focus 2, and unlike some other brands, we don't include music in our environmental classifier. This ensures our patients do not have the wrong features activated. For 10 plus years, Beltone has used bandsplit directionality. This has allowed us to provide good overall sound quality and natural voice perception. And finally, M&RIE provides natural wind noise protection without reducing gain. So, with that, I just wanna go ahead and thank all of you for taking that quick 30 minutes out of your day to hear a little bit more about our Beltone Serene feature set.

So, if there's any other questions, please feel free to type them in. Otherwise, again, I hope you join me tomorrow to hear about our wireless CROS Transmitter. Very excited to share that information with everyone. So, no other questions. So again, thanks everyone. Hope to see you tomorrow.