Custom & Rechargeability – The Perfect Pair!

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- Greetings, welcome to everyone who's joining us here at AudiologyOnline this evening. We at Starkey are extremely excited to be part of AudiologyOnline's first Industry Innovation Summit. And we've got a really exciting session for you this evening with some great speakers. So this evening we are presenting a session that we're calling, Custom and Rechargeability: The Perfect Match. And I have to say, I'm really excited and honored and have the pleasure of presenting alongside two fantastic people that work at Starkey. We have Dr. Achin Bhowmik, he's the chief technology officer at Starkey, and we have Brian Dahl, the quality assurance manager at Starkey. I'm Luis Camacho, I'm manager of education and training. So we've got three of us, we're gonna be trading, sharing screens in this virtual world that we're in right now.

So there'll be a little moment of probably pause between presenters, but I think you're gonna be really happy and we're hopefully really excited to see what we're presenting this evening. Before I hand off presentation rights to Dr. Bhowmik, I do wanna let you know that we have three learning outcomes for this session as well. At the end of the course, you should be able to identify the goals of product design. You should also be able to identify the benefits of integrating sensors into hearing devices, and lastly be able to identify the features in Starkey's custom rechargeable devices. So I'm gonna go ahead and stop sharing my screen, let Dr. Bhowmik takeover and present Reimagining the Hearing Aid, The Integrating Sensors and Artificial Intelligence.

- All right, so thank you very much, and so we enjoy the opportunity to talk to you, albeit in a virtual setting. We are really glad to be able to share our Reimagining the Hearing Aid, especially I'm going to focus on how we have utilized this advanced technologies such as miniature sensors and really new breakthrough algorithms in machine learning and artificial intelligence to make this possible. So we start with our core mission, of every technology I'm going to talk about today, they have been tailored and integrated with two objectives in mind. One is to help our patients hear better, but we've gone beyond that, hearing better is indeed living better, but we've

taken a few more steps towards helping our patients with their overall health with this integrated sensors and artificial intelligence which I'm going to share with you.

So with that I start by looking at the big opportunity that we collectively have as an industry in front of us. The data from World Health Organization that we're all familiar with, half a billion people live with disabling hearing loss that's over 40 decibels of hearing loss. And so you have to amplify 40 decibel just to be able to hear, that is indeed a disabling condition. What's more worrisome, is this number is increasing that according to conservative estimates of WHO, by 2050 we might see close to a billion people with hearing loss, particularly the young people who are increasingly at higher risk due to recreational science. On the other hand, it's actually good news that we are living longer with better lifestyles.

As a result 85 plus years old is the fastest growing population, and 100 plus is the second fastest. So age-related sensory neural hearing loss being such a common condition, we have a lot many more patients that we'll need to help with in helping them hearing better and living better than ever before. So with that, we look at the comorbidities of our patients along with hearing loss. There is a number of health conditions that have been well studied, correlating hearing loss directly with safety and balance. So people with even mild hearing loss are three times more prone to falling and hurting than people with normal hearing. Beyond that, every 10 decibels of hearing loss increases the chance of falling 40%.

Obviously, hearing loss is directly connected with tinnitus as well, whole host of other health issues. One that I'll highlight here is dementia and loneliness, two that tend to be connected with each other in some ways. A lot of good research have shown how hearing loss tends to prompt patients to withdraw from social interactions related to loneliness, and loneliness as opposed to social engagement have been called the silent killer, one of the biggest killers among our health conditions. And that also spiraling

downwards in terms of cognitive declines such as dementia, Alzheimer's et cetera. So with that in mind, we have focused our technology development in order to deliver three values with this Reimagined hearing aids. Hearing aids have long, for many decades have served a similar purpose, and that is to help people hear by amplifying sound, of course.

We maintain that mission or core mission of this product is to deliver better hearing, enhance our patient's hearing, so they can connect better with their loved ones. But we don't stop there, we have invented new technologies to turn these devices that are in our patients ears with sensors and machine learning, so that they can be continuous and passive monitors of our health conditions, alert us something happens, and obviously, alert us when something indeed happens. And that's the health monitoring part I'm gonna focus on. Last but not the least, the world of information. We are reliant on the world of information for everything that we do today and ear is the best conduit. The hearing aids have a unique opportunity to become our own personal intelligent assistant, by not only answering questions such as, hey, what's the weather outside, and who won the Super Bowl in 1982?

But also it should remind us when we have to take our medication or important tasks, et cetera. So the devices we have converted into an intelligent assistant, which we're really excited about. So with all that, this is a journey that I compare with the journey that phones have gone through. We're all familiar with, hopefully many of you remember this phone on the left that was a mobile phone. We all used the phone for a single function that was to make a phone call. The journey that started with iPhone and all the Android smartphones also provide the same value today, is multifunction capabilities. The phone has become the best camera in your pocket. The phone has become the best GPS system in your car and a whole host of other capabilities.

So the phone has become multifunctional, must-have device. We envisioned that the hearing device, while it will help us hear and connect like it has always done, it would become a multifunctional device, multipurpose device using technology, such that it will help us in many more ways, removing that stigma from the hearing aid, providing capabilities for which we want to use the device. Not because we don't use the device because we have to, but we want to, that's our goal here. And in order to accomplish that, we have looked at the area of the era of what I call perceptual computing. Perceptual computing is an era that includes artificial intelligence and machine learning. But in includes a few of us steps, the sensors, the processor, the action, and learning along the way.

This is how humans, we the humans go about doing things. We sense the world, see and hear, feel, we touch, all that. We have this area of sensors, and obviously with the cerebral cortex of the processing elements, we're able to process that information, we take actions as a result, and what makes makes human unique is our ability to learn. So we challenge ourself to see, in it's always can the hearing aid learn from this chain of activities, just like what I call perceptual computing and extended it's function from sensors to learning, to deliver better value. So hence the excitement around artificial intelligence. Much has been talked about it. The world is being disrupted by artificial intelligence, from medical applications, such as radiology, reading that radiology better than even doctors to autonomous cars that can drive by themselves.

AI is creating a major disruption in, hopefully positive disruption to how we go about doing our lives. AI is simply a computer program, a system that can sense, reason, act and adopt, like I explained in the last slide. And very quickly, there are sub categories of it. A branch of AI, which is really broad, but a narrower branch of that is machine learning, where we train the computer or the system, in this case the hearing aid, with lots of lots of data in order to learn patterns from the data and the algorithm evolves as a result. So that's the branch of machine learning within the broad field of AI. Even in

the lower field in there is deep learning where it's a subset and a specific architecture of the neural network, which has many layers in there.

And every layer consisting of many neurons, artificial neurons, in this case, they can learn from past amounts of data. So that's the technical definition in my short time I can go into, in terms of what this field is about. But let me explain how we've used this technology to accomplish those three functions, hearing enhancement, healthable technologies to monitor health and keep us healthy and intelligent assistant. First and foremost, is our focus, our relentless focus, on improving the sound quality of hearing aids. Here, we have utilized machine learning and artificial intelligence to do better than ever before, automatically recognize acoustic environment. Recognizing sound, so that it doesn't simply blindly amplify everything, but it knows what is speech, what is speech in noise, what's machine noise around us, like that annoying vacuum cleaner or the truck passing by, or if there is a wind noise while I'm taking a walk.

The AI system built into video audio devices is able to, every six milliseconds to processing natively, you don't need the smartphone to go with it. We have AI built right into the hearing aid to make a determination on what sound is coming in. So it can make appropriate processing decisions based on those. And we've combined that amazing eye capability with real-time binaural signal processing and acoustic beam-forming for microphones that can be configured for dynamic directionality. And we have also developed recently, and it's incorporated in our latest products, transient noise reduction. So the doors slamming, or the keys dropping or the dish making noise on that counter, will not be blindly amplified along with the speech sound.

And of course we have what we believe to be the industry's best adaptive feedback cancellation technology. So that's the focus on the sound. And I'm really excited about our recent introduction of Edge Mode where we allow that user to simply demand by double tapping on the device or the faceplate of the button, the professional can set it

up in many different ways, to invoke an Edge artificial intelligence that runs on the hearing aid itself to provide an extra clarity and boost for speech, and this became really a serendipity. As we entered into the global pandemic, we started hearing from patients how it has been particularly difficult for them to understand conversations when people around them were wearing face masks.

So we went to the lab and characterized this masks. You can see here at the chart on the left, we're showing data for four masks and yes, particularly the higher frequencies ranging from 1600 hertz to about six kilohertz. Those higher frequencies where the fricative transitions of consonants in speech happened to be, they get attributed as much as six to eight decibels. So we then went back to the lab again, and optimized our Edge Mode machine learning, and AI algorithms to provide an automatic classification. From that emission characteristics, it is able to provide instantaneous adjustment to bring up the speech levels according to the situation that you are in, that's the power of artificial intelligence. We do not have to program it beforehand but it can learn from the environment and make automatic adjustments, to make a lot of patients' lives easy.

This is where new technology brings new benefits to an old field. And besides helping people here with these devices, we're particularly proud about this custom devices that are built. We are the only company with rechargeable custom video AI devices. Particularly with mask, you can see that looks down your ear, the customer rechargeable devices provide extra benefit as it stays in your ear, as you remove the mask or put it on, it doesn't come out, unlike the RIC and BTE devices. So we are really glad to report that our patients are benefiting from this device. We are making a lot more than we thought we would. This device is extremely popular among our customer base today. And all of this come into Livio Edge AI.

Those three attributes I talked about, industry's best hearing performance, healthable technology, which I'll talk about, and intelligent assistant. In this form factors the broadest family of your rechargable devices in the industry, ranging from custom to RICs, to BTE devices. We have brought this technology to many form factors. Let me switch gears and talk about health technology just a little bit. The machine learning algorithm that we built into the hearing aid, again, it does not require smartphone, I want to make it very clear. It's able to measure and characterize social engagement. In other words, if a patient stays by herself or himself in the room and doesn't have social interactions doesn't have conversations, there's no speech present, the device will be able to recognize that.

On the other hand, the social listening situations we're able to recognize as well, how many hours, how long spent in social listening situations. We combine that with active listening, how varied are those listening environments? And then we combine that with device use times to quantify the social engagement metric. Just as as it is important to track physical activities, it's equally important to track social engagement versus loneliness, so we can call up our loved ones and find out what's going on in their lives. To talk about activity monitoring. As you know, we have sensors built into the devices, and we are the only hearing aid in the industry that can measure steps taken per day. You do not need your watch at one with you.

The device with its integrated sensors and algorithms are able to measure physical activities and keep track of this score, so we can check and measure our progress against it, activity, movements, et cetera. And we then challenged ourselves to see besides measuring steps, can we do a little bit more? Could we look at fall detection? These data shows from National Council on Aging, every 11 seconds, an older adult in the US is treated in the emergency room for a fall. Every 19 minutes, someone's dying from a fall-related injury. And the cost to the US economy alone was over $67 billion in 2020. So we are really proud that we've been able to develop a fall detection algorithm

and integrate that along with the sensors and AI in the Livio Edge AI devices, in order to accurately classify all of these studies associated with the fall, the pre-fall, falling impact, resting recovery, such that this device is not only now helping people hear better, but it's saving lives by automatically detecting fall and sending out alert messages to the loved ones that the patients can configuring their applications.

This is the only hearing aid in the industry that has fall detection capability built in. We're proud that this is getting noticed. I mentioned about our desire to remove the stigma that has been historically associated with hearing aids. So this is just one of the many articles in the press that have covered Livio Edge AI devices multiple functions. Bloomberg Businessweek wrote, "The future of wearable technology is called the hearing aid". Because they said, I'm reading verbatim, "Even if your ears are fine, you might want a device that translates 27 languages, tracks fitness and monitors vital signs, all of which Livio Edge AI devices can do." And it really challenges the definition, the very definition of a hearing aid.

Because not only it helps people hear better, it helps people with many more things, intelligent assistance, translates languages, answers your questions, remind you of your medication, and tracks your physical and cognitive fitness and activities, monitors your health. We're really proud that we got a lot of awards. Many that are surprising that hearing aids get them. I call out AI Breakthrough Award for 2020, for Best Intelligent Personal Assistant. The best place or intelligent assistant is inside your ear. We also got MedTech Breakthrough Award. we of course are very proud about our 2019 Time Best Inventions Award, and a whole host of other awards including the CES, the Consumer Show, Innovation Award for Accessibility, in 2021. So with that, I want to hand it off to Brian Dahl, because we'd like to dive a little deeper and share with you the amazing work our engineers have done in designing these devices that seem almost impossible.

In this form factors, how have we accomplished all of this capabilities? So with that, I'm going to stop sharing and hand it off to Brian.

- So, as Achin mentioned, my name is Brian Dahl, and I'm here to help give us a bit of an idea of how did we do it. And really the art of designing and developing a hearing aid, really starts and ends with the customer and patient in mind. and throughout our design and development with the R and D manufacturing and customer teams, we have to make a lot of strategic trade-offs. It isn't quite easy to do these radically different things. And also with that, we have to make sure that we have a keen sense that the device is robust enough to last through its different environmental use cases. Now, to start this off, I'm gonna talk about coffee, not so much because it's probably late, and many of us want to stay awake, but also this is a great example of sharing how our engineering teams create those trade-offs.

And the coffee cup on screen is a perfect case study. So when we look at this coffee cup, it has a pretty decent function. It works, it holds the coffee, it looks really nice, you've probably seen it at a high-end coffee shop, but when I look at it, I see a couple of downsides. I see from a functionality standpoint, there might be problems with the handle. Although the handle looks cool, it's small. And there's also an issue where it might spill onto a person who's drinking out of it or you might put your thumb in it. Also, as Achin mentioned these, the custom rechargeable hearing aids pretty hot sellers right now. So need to make sure that we can reproduce them and produce them at a high volume.

So when I look at that handle, I see that there might be issues within our manufacturing facilities. So when our teams are going through designing and developing and manufacturing hearing aids, we're having to balance these forces, appearance, functionality and manufacturability. And there isn't a clear winner in each one, but if we get them right, we know we can make a product that meets the user's needs or even

exceeds their expectations. Now since appearance's first on the list. I wanna talk us through how we develop and position the device and how it looks. When we're positioning a hearing aid in early development, we have what we call the industrial design, that's quite literally how it looks. And two that we have different axis.

The first axis we have is, we have what we have as the vertical, so it's refined or generic. And on that spectrum you can get a variety of different looking hearing aids. Then on the horizontal, we have approachable and techy. And these axis make a lot more sense when we start putting examples on the screen. So if we had a couple of consumer electronic examples we can see that AirPods and Google, they're in the upper left, they're refined and approachable. They're round shapes, friendly, subtle, elegant. As we put other consumer electronic products, we can see that these are more techy. They're still refined, they still look really good, but they have a different style. And when we look at those on the right side, we see that there might be more going on.

There might be more functionality, more features built into those just by the way they look. Now, if we dig into the archives of hearing aid history, we can see at one point Starkey produced a hearing aid at the bottom. Now it worked, it met the customer's needs, it amplified the sound and it solved their hearing loss. However, it was rather generic looking and it wasn't too refined. And so when the design teams were looking at this, we made a very strategic decision where we wanted to push us into a different space and to highlight all of the features in the device, just by looking at it. And to that, we introduced the Livio RIC. We can see that it's a lot cleaner, it's more elegant, it's more purposeful, but there's also some hard edges in it.

And what that does is it suggests that there's more going on underneath the scenes. Now with last year, last year about this time we were launching the Customer Chargeable, and we can see that it lines up pretty well with that. Compared to other

hearing aids, it's different looking, it's still techy, there's a lot going on and it's a lot more refined. And by way of example, we can see when comparing it to a comparable custom product, we can see it does look visually different. The biggest one is that it doesn't have a battery door. And so we've been able to replace that, say kind of opening feature, that mechanical feature, with a little bit more of a smooth surface, and that helps round it out, that makes it more friendly, more refined.

We've also added the charge contacts right on the outside of the device. Now there's a deep functional purpose which I'll get to, but also adds a feature to it, which signals to others, that it is not a traditional hearing aid. And that's exactly what we want. But as I mentioned before, it isn't just about appearance, it's what's happening with its function and what's going on underneath the hood, if you will. So, as Achin mentioned, we've been able to pack a whole bunch of features into this hearing aid. And with this new hearing aid, specific ones are rechargeability. So now we can recharge this device not have to replace the zinc air batteries and replace those daily and go on the charger at night, and you're on your way.

The other thing is it accesses 2.4 accessories and that opens up a whole new world of functionality, where we get the healthable technology but also the intelligent assistant that comes with it. So with that, when we were designing this product, we had to balance multiple different areas, power, wireless, machine learning, sound quality, and the elegance of the design, but also making sure it's robust. And they're all areas that play off of each other but they also provide a nice tension that help us improve. And with the next couple of slides, I wanna walk us through the power and how to achieve the rechargeability and also just talk through the robust design. Now, if we compare the Livio Edge rechargeable against some, say, generic consumer electronic products, we can see that we've got a four times longer battery life that allows us 19 hours versus a traditional five.

Even more impressive that many may not see, is that we're doing it with, what we would say, a smaller gas tank. So our battery size is what they say, 20 million amp hours, that's how big our gas tank is. And a lot of consumer electronic products, they do those with a larger size. So essentially they're have a bit larger of a gas tank, but a lot smaller of a battery life. So pretty impressive for the team. But now I wanna take us inside the product to show us how did we really achieve it and how did we pack it all in there? Because as we know the ear from patient to patient is significantly different. So when we came about designing this product, we knew we had to do something completely different.

It wasn't just another hearing aid, it was brand new hearing aid with all of these incredible features. And so as we see the see-through view, we can start to see a couple of different ideas when it comes to the architecture. First one, most notably is the charge context, behind that is this large electronics module. And then we've also tucked the microphones in there in a very unique and strategic fashion. Looking at this design, we can also see different architectural elements. So starting from the outside-in, we see the traditional faceplate but we have changed our charge contacts. Those charged contacts, which I'll show in the next side, are very deliberately designed to have multiple points of contact.

Behind that is our antenna, but then the wraparound circuitry. So this is the brains of the operation. This is where all the processing occurs, where all communication to the Bluetooth devices happens, and also, where we ultimately make the device work. So with that, we went with a wrap style, and we can see that we took a very non-obvious solution path where the battery is actually kind of laid on its edge. So traditional hearing aids, traditional customs, would have it say card style where it goes in on its side. But with this, we knew we had to pack it in the tightest fashion, and this was the most efficient form. So it wasn't most inherently obvious but it ended up working in the

end, because that made this electronics module small, concise, but it also gave us all those features that we wanted.

Now, as I mentioned, this is the industry's only 2.4 customer chargeable. And let's talk about those charge contacts, we have four of them. The reason why we'd have four of them, is we needed to provide consistent charging with different shapes of hearing aids. So we know as the hearing aid shell is formed to a patient's canal, there can be a range of sizes. And we knew with our custom charger, that some patients may have to have them in different orientations. So this design is able to charge all the devices rotate 360 degrees around that boast. So it was very intentional designed to make sure we had those to give the constant rechargeability, but also flexibility to design a device that fit uniquely to each customer.

Now, as I mentioned, the device has to last, right? It can't just look good on a PowerPoint or in the office, it has to last. And we know when the device goes into the world, it's gonna be bombarded with a lot of challenging materials, whether it's rain, sweat, dust, even the sun, all of these can harm the device. And when we set out to design the customer chargeable, we decide to take a couple of lessons from the rechargeable RIC, 'cause it actually ended up working out pretty well. So when we designed the customer, the rechargeable RIC, we subject every hearing aid through pretty stressful dust test. And we can see on the right-hand side this is an actual hearing aid that we subjected to the dust test.

And to make it worse we pull a vacuum on it. So we want to try to suck all of that dust into the device to see if we can break it. Now, after this test, the device does work, now we wouldn't recommend anyone do this to their device, but it still works. Now the unique things that we do, is we hide these features to help make it robust but also maintain its appearance. So what you may not see is, that we have extremely tight seams and a multi-function microphone cover. Those two attributes both provide a

visual aesthetic benefit but they also provide extreme dust protection. So we spend a lot of time to get those right, and make sure it works.

Now, what's exciting with the rechargeable custom when we developed that is we realized that this was almost completely sealed device. Because we didn't have that battery door, we almost shut all the ingress paths to the hearing aid. Now we didn't stop just at the shell, we made sure that the microphones are tucked far away in an optimal location to make sure that outside materials can't get into it. So it's tucked high and then also far in back, so that makes it really challenging for any of those materials to get in there. But also what you don't see on this screen, is that we've we've also sealed many key elements of the circuit module. But we also are able to take advantage of a completely sealed enclosure.

So during development, we actually test our hearing aids with what we developed as a new test, as our bubble test. So we're able to completely submerge this hearing aid in water, but instead of pulling a vacuum on it, we're actually pushing at it. So many times, if you have a flat tire on a bicycle, you may put it under water to see where things are leaking. We actually put in five PSI of pressure before this device is considered a pass. Now, again, we don't recommend that this is done in normal use, but this just shows how robust the product is while also still maintaining its attractive appearance. So in the end, we're balancing all of these activities.

How do we make it look nice? How do we make it manufacturable? And how do we make it really, really robust? and really it comes down to our global team. So with that, we hire the best talent from all around the world. We can't do it with just one group of engineers in one location, we have to do it with a worldwide talent pool. And what that does is it helps us listen to different customers, helps us listen to different perspectives but also gains different methodologies of how do we wanna develop structure and

manufacture this hearing aid. So ultimately it comes down to a team of people that bring us to this position. But finally it also has our customers and our patients.

So we pride ourselves on having the best customer service. And that also means listening to our customers so we can design the right product. And as Achin mentioned, about a year ago, as the pandemic was really picking up steam, we started hearing these signals from the market that patients couldn't hear with masks on or that they need a different features. So we're able to adapt very quickly. And with that, the final thing I'll ask, is if you hear anything or you see anything that you want us to do, please let us know, so we can help incorporate it into the next generation designs. And with that, I'll hand it off to Luis, and you can close us out.

- And again, thank you, Brian, thank you, Achin. And I have to say those two presentations really set up my section perfectly, because what you saw with Achin's presentation was really kind of the big picture, if you will, this whole concept that we have at Starkey around the reimagining, the redefining of the hearing aid, and taking it from that single purpose device to the multipurpose device. Taking it from something that is needed to something that is wanted, with all of these incredible features, all of these additional healthable technologies. And then you saw from Brian, how we go from that concept to actually creating something that you can put in your patient's ears every single day and offer them the best hearing possible along with a way to help promote their overall health and wellbeing.

But do it not only in a form that's functional, but in a form that's desirable and is robust and is reliable, so that you can be confident in recommending these devices. And again, what that does is that it brings us to this section where now I get the pleasure of talking about what is it that you can offer to your patients when you're talking about Starkey's? The industry is only 2.4 gigahertz, wireless, rechargeable, custom devices. Brian mentioned, how we listen to you, our customers, to the clinicians, to the

professionals, and if you've been in the industry as long as I have, I'm not gonna tell you how old I am, but just say, I've been working as an audiologist for over 30 years now.

And historically, when I started fitting hearing aids, you know, here in the United States, at least, custom products were the industry's standard. This custom products are what I fit every single day for a decade as a clinical audiologist. It's really just been the last 10 years or so here in the US where the market has shifted to what we consider kind of standard products, Receiver-In-Canal products, BTE devices. And as we started asking our customers, you the clinician, you the professional, why aren't you fitting custom products anymore? It really came down to two factors. Number one, the lack of smartphone connectivity, and number two, the lack of a rechargeable option. These things have become, again, kind of the the standard technology that all patients want these days.

They wanna be able to connect to their smartphones. They wanna be able to have a rechargeable device for ease of use. And the reason customers weren't fit, with the lack of these features, is because you as a professional didn't really wanna have to change your hearing aid evaluation messaging because of the style that you were recommending. You didn't wanna have to have a different story for a RIC and a BTE, and then remember kind of a different story, if you will, around a custom product. You just wanted to be able to say, these are the products, these are the features, here's what I would recommend. This will work great for you. Again, regardless of style, regardless of whether it was a BTE or Receiver-In-Canal or a custom product.

So of course, when we introduced these devices a little over a year ago, I have to say we've seen an incredible resurgence in the desire and the want to fit custom products, and the desire and the want to wear them from the patients, and the satisfaction levels have just truly been through the roof. You can see the numbers here, I'm not gonna

read through each one of these these data points that are here, but the kind of the big picture story is that patients and professionals are incredibly satisfied with the products, with the technology. And it's not a one-time deal, most of the clinicians that have started fitting these custom devices have told us they're going to continue to fit them in the future because of the flexibility, what the technology has to offer and how happy their patients are with these devices.

And another important thing to point out is that most clinicians really feel that this type of technology, this style of technology is filling a gap. It's satisfying an area in the market that really hasn't been there for a long time now. And everyone's again, gotten so used to fitting RICs and BTEs. And there was always this desire from patients for custom products, and so this is filling that need and filling that gap. And also this is a new way to bring in a different type of patient, a patient that's looking for something that is personalized, that's customized for them, that has the sheen of kind of modern day high technology. And that's really what these custom products bring to the table.

And obviously custom devices are personalized. And that is a lot of the appeal here when it comes to custom products and being able to offer these to your patients, because when you obviously take into your impression, order a custom product, you are having a device that's built specifically for them to provide the best hearing possible for them, and also to help support their individual health and wellness goals. Now that's another thing that accustomed device brings to the table for your patients. So let's look at some of the specific details here. With these custom rechargeable devices using the latest lithium-ion technology, on a full charge, The products can offer your patients 23 hours of superior hearing and that's including four hours of streaming.

So, this is gonna get your patients through a full day's usage where they're going about their everyday activities and business, streaming, taking phone calls, listening to music, whatnot, and really not have to be worried that their battery's gonna die at any time

during the day. And when they go to charge it, it's a very quick charge time. So, if you had a totally dead cell, in three and a half hours, you get that full 23 hours of use. So again, easy to use and there's no concern that they're gonna be worrying about, well, is this battery gonna last me the whole day, even if I'm on the phone a lot? It definitely is going to. And then with that integration of the latest 2.

4 gigahertz wireless technology, you've got all the connectivity that your patients expect from a modern high tech hearing aid. And what that means is full connectivity with all of the Starkey accessories. So our remote microphones, or the table Mike, the TV streamer, the remote control, are fully compatible with all of those, as well as compatibility with Apple iOS and Android devices. So you get that direct connectivity that your your patients have been desiring. And of course, this is all running on what we call our thrive platform. So all of these really kind of mind boggling technologies that Achin talked about are available in these tiny custom devices. You know, the embedded sensor technology, the on-board artificial intelligence, the use of Edge Mode and the Edge AI devices.

And again, available in three different styles. So you can offer a full shell, a half shell, a canal aid, whatever's most appropriate or desired by the patient in a variety of faceplate colors, a variety of shell colors, to meet those customer demands. You know, this is really something that meets that personalization desire that your patients have. And along that lines, when it comes to personalization, you can customize the user control interface. Every patient likes to interact with their hearing aids in a slightly different manner. So if you've got the patient that wants the fully automatic device, you can order these with no user controls or you can order with a digital rotary volume control, you can order with a push button only control or of course, you can have the combination of both the digital VC and the push button.

So again, customization is really a key component around providing the best hearing and the best user experience for your patients. You can meet the needs of what they really want in a device. It's not an off the shelf device. One of the things that Achin mentioned is this this tap interface, so we refer to this as the tap control. Sometimes you'll hear us refer to as the double tap. This is an intuitive way to let your patients interact with their healthable products. And this can be set up for a variety of different functions, again, depending on what the patient wants and what they need. You can use the tap control to function as a start/stop of one of the accessories to start, to stop the stream.

You can use it to engage the Thrive assistant for all of the functions that the Thrive assistant has available to it. And for the Edge AI devices, you can use it to enable that Edge Mode using that instantaneous artificial intelligence signal processing to enhance clarity, comfort, and noise in that moment of sound quality that the patient needs, anytime, anywhere, any place that they need it. And this is done with a simple double tap on the faceplate. You can do it with one or two fingers. I've actually have a video here that's gonna show it in action. So you can see this quick little, sometimes again, we counsel around, it's almost like a little knock-knock on the faceplate, a little tap tap on the faceplate.

And those onboard sensors have been programmed, they know that that particular motion is essentially designed to again, enable or turn on one of the features that you program it for in the devices. So it's very simple, very intuitive and ideal too, for people that might have some dexterity issues, and maybe can't find that push button to do something, they can quickly do that double tap for really easy functionality. Of course at Starkey, we are the experts at custom products, and we are the experts at providing power in custom products. We really do pride ourselves on being able to do essentially fit almost any level of hearing loss with a custom device. So with these products, you

have the ability to fit up to 70 gain receiver in all of the styles, full shell, half shell, canal aid.

So you don't really don't have to worry about, well, can I get the power out of a custom product? The answer is yes, you can definitely get the power out of the custom product to match your patient's hearing needs. But personalized power also is what we're talking about when we talk about the lithium-ion rechargeability. Brian showed you kind of how this is all built into the custom products and really the deliberate design around where the battery goes how the recharging pins are placed on the faceplate. The same type of effort was put into designing the custom charger. This is what we call our all-in-one charger. And if you have fit any of our rechargeable RICs or BTEs, this form factor will look very familiar to you.

The general shape of it is the same, but we do have these unique kind of pedestal charging places for the custom products. And you saw how we have those connection points on the face plate. It's super easy to use and again, intuitive, the patients simply placed the faceplates on the pedestals, the magnetic component of it. They really just kind of snap into place. Patient doesn't have to fiddle with it and get it in the correct position. They're gonna snap into place magnetically on their own just through that magnetic connection. You've got the LED indicators that allows the patient to know the status of the charge of the hearing aids. And then of course being an all in one charger, the charger itself has a an onboard lithium-ion battery itself.

So while it's plugged into the wall, not only are the hearing aids being charged, but the case is being charged as well. And what that means is you now have kind of on the go mobile charging. So when you unplug the charger from the wall, the charging case can provide three full charges to the hearing aids themselves. So you've got this almost kind of weekend mode, where you can unplug the charger go away for a couple of days and know that you can charge your hearing aids on the go without having to plug

it into the wall. I've mentioned the charge times you can see here that, again, it doesn't take much to get a lot of of hearing usage out of these devices.

Again, three and a half hours is gonna give that full 23-hour battery capacity on the devices. But 15 minutes literally will give the user two hours if they needed it. 30 minute charge is gonna give them four and a half hours. And then just one hour of charge time, they're gonna get almost nine and a half hours. So even if you've got someone who's working 24/7, literally, and they think, oh my battery's gonna die, they could plop the the hearing aids on their charger for 15 minutes, 30 minutes, an hour, and know that they're going to make it through the rest of the use time because of the quick charge on these lithium-ion batteries. And of course, yeah, again, Achin and talked about everything that we're doing with redefining the hearing aid.

And so we wanna make sure we have all of these game changing features in our custom products as well. So I've already mentioned the direct streaming. This is really, really important to your patients now, that capability to pair directly with their Apple or Android device without any intermediary device and get direct streaming of phone calls, of media, of video, et cetera. So that's a capability with all of these custom products regardless of technology level or style. And again, this is the ideal product for the moment that we're in right now, being able to wear a mask without having to fiddle with the hearing aid. To say today, literally today, I took my mom to the dentist.

She went to take her mask off, and it got hung up on her receiver in the canal product. And I immediately thought, I need to get my mom's custom hearing aids, so she doesn't have to worry about that. But then of course, with Edge Mode, you also have the ability to hear and understand speech better of people that are talking to you that are wearing a mask as well. Voice activated commands, This is a component of that intelligent assistant, and this is an industry only with these products. The ability to do that simple double tap on the hearing aids, and literally just tell your hearing aid what

you want it to do. So you could simply say, "Change my hearing aid to my outdoor memory, or turn the volume up, turn the volume down, mute my hearing aids."

The ability to double tap and add in a reminder. So again, you've got that ability to have your hearing aid literally remind your patient when they need to take their medication or when they've got a dentist appointment or when they need to go to the doctor. And your patients can set these up simply by double tapping their hearing aids and stating out loud, "Set a reminder for me to go to the dentist tomorrow at 9:00 a.m." Very, very simple and intuitive. And to use that intelligent assistant as well, to access all the information that's available on the internet. If I wanna know what the weather's gonna be tomorrow, I can simply double tap the device and say, "What's the weather forecast for tomorrow?

And have that streamed to my hearing aids. So the abilities and the technology in these hearing aids, really even I work for Starkey, it's kind of mind blowing what we can do and have all of this in a tiny, cosmetically appealing, canal hearing aid with up to 70 DB, again, it really, really is amazing. Of course, we also wanna make sure that these products allow for the best programming and the best programming experience. And that's where they're all, of course, available and compatible with our Hearing Care Anywhere Remote Programming system. So via the Thrive mobile app, you the clinician and the patient can interact in a couple of different ways. We've got our Asynchronous Approach, and our new Live Sessions Synchronous Approach.

So again, you can interact with your patients, your patients can send a requests for changes to their hearing aids, kind of anytime, anywhere, any place that it's convenient for both of you, or of course, set up a virtual appointment that we're so used to these days and do a live programming session the video chat on the phone and on your computer. And, I can't finish the section without mentioning that with Livio Edge AI, we do also offer the industry's only caregiver focused mobile app with Thrive Care. The

caregiver role is so important to your patients hearing healthcare journey and again, their overall health and wellbeing journey. And with Thrive Care, the Edge AI patient, that user can share all of their healthable data, their hearing aid use data, whether they've taken a fall or not, all of that can be shared with the caregiver via Thrive Care and secure cloud connectivity.

So that both parties really have peace of mind. The hearing aid wearer knows that their loved ones can check in on them anytime they need and provide any kind of assistance or follow-up. And the caregiver knows, "Hey, I wonder how mom's doing?" They can just open up the app and see if they've been exercising that week, if they've been wearing their hearing aids, et cetera. And again, this is the only caregiver focused technology available in the industry. So kind of in summary, taking all of the information that Achin presented and Brian presented, these custom products offer everything that your patients could want in something that's comfortable, that's cosmetically appealing, that's extremely high tech, that uses the healthable technology, that's robust, and it is gonna be very reliable over time, again, in that very appealing, personalized, customized form factor. Something that's built just for them, that's gonna meet the needs that they have for hearing and lifestyle. So that brings us to the end of our presentation section. I'm going to check with Dr. Lewandowski, and see if we had any questions come through.

- [Lewandowski] Thanks, Luis. We did have a few, the first is for Brian specifically. And so, Brian, the question was, if you were to hold the power cell of the custom product and compare it to a size of a zinc air battery, what's the comparison there size-wise for that custom rechargeable device.

- [Brian] So it would be a little bit larger than a 3-12. It's not quite one-to-one, but it's a little bit larger than that. So I don't know the dimensions quite off the top of my head, but-

- [Lewandowski] I think that answers it just perfectly fine for kind of the comparison we were thinking of. Following on that, another question for you here, Brian, is, do you think that wireless rechargeability will come to CICs and from Starkey? And can you give us a glimpse of when, I get asked this question all the time.

- [Brian] So, Achin, as the CTO, do you wanna help answer that question?

- [Achin] I will do that. And I would say that, as Luis highlighted and so did Brian, we take pride in making industry's best custom devices and we have the same insight, our engineering group, if something is not impossible but just difficult, then you get on it right away. So we'll have some news to share, so please stay with us. Thank you.

- [Lewandowski] Thank you. I think we have time for one more question, Achin, this was directed towards you. Thinking forward, what technology or features do you foresee coming to healthable devices in the near future from Starkey?

- [Achin] Thank you. Great question. So we think that the ear, many doctors and me, the best place to monitor all aspects of your health. So we got started with the feature that we presented today that's already available in the shipping products, but we're pushing those front tires. We want to make it monitoring for all aspects of your health. And that's a very exciting sense of technologies in development along with machine learning algorithms that will turn these devices into your pervasive health monitor.

- So it sounds like lots of exciting things but we can't talk about it yet .

- That's one way to do it. When we have it in the product and released, of course, we're going to be very detailed and see that the direction that we picked as a strategy

to turn the hearing aid into a healthable device. We are investing and working very hard to make that as valuable as it can be for our patients.

- Well, thank you, Sarah, for monitoring the question and answer area. Thank you Achin and Brian, for your time this evening, and thank AudiologyOnline for hosting us, and everyone who's joined us here online this evening. We'll go ahead and end the session, and hopefully we'll see you here online sometime in the future. Thank you everybody.