



## Sound Bites Podcast Transcript

### Episode: Dr. Doug Beck on AI

Dave Fabry: Welcome to Starkey Sound Bites. I am typically your host of this podcast. My name is Dave Fabry. I'm Starkey's chief hearing health officer, but in this episode, we're doing Turnabout Day, as we would've called when I was growing up in high school. The tables are turning, and in this episode, I'm being moved to the metaphorical other side of the microphone to do a deep dive into hearing health technology, including artificial intelligence. My friend and hearing industry veteran, Dr. Doug Beck, who is obsessed with technology as I am, will serve as the guest host today. So Doug, welcome to Sound Bites, and go ahead, take it away.

Doug Beck: Thank you, David. It is an honor to work with you. I've watched a lot of the Sound Bites video clips and I think it's a great venue, so I'm honored to be sitting on the other side of the chair and interviewing you for a little bit.

Let me start with, today's primary topic is artificial intelligence, and when I think of artificial intelligence, I think about it, that's a big umbrella term. Under that we have maybe machine learning. Under that maybe we have deep neural networks. [00:01:30] The ability of computers to solve problems, to process information, and to determine and engage a maximal response seems to be the working definition of artificial intelligence. It's not just measuring, it's not just metrics, but it's got to do something with it. So does that work for you? What would you say?

Dave Fabry: Yeah. Yeah, I mean, I think you set the stage well, I think. AI, artificial intelligence, has become a term that is both ubiquitous and a meaningless buzzword in many ways in that I think it is important and appropriate to frame it in the context of our discussion. And when we think of, as you said, an overarching definition for AI is really a system, or in our case, hearing aids that are capable in the purest sense of adapting or learning, even reasoning. When we think back to Alan Turing and some of the visionaries who began working with AI, the definition of a win with artificial intelligence, if you consider that a win, is when a person cannot distinguish between whether they're conversing with another human being or a machine. And so, the ability to do that, I think, is what will define success with AI.

Then, as you said, under machine learning, a subset of that, it's really a rule-based system where we apply ... Let's pull it into our domain. If we're thinking about it with speech and categorizing acoustic environments, which is essential to what machine learning can do to provide automatic switching and application of directional microphones, noise management, wind noise management, special processing that's different for speech and music, all of the things that we've grown to come and expect hearing aid users to be able to do by simply wearing their devices and going throughout their day.

Doug Beck: Sure, sure.



Dave Fabry: The first challenge is, how well and how accurately can a machine learning system categorize different acoustic environments? And then, to your point that there's something to be done is then, how well can directionality, compression algorithms, wind noise management, noise management, how well can those solutions be applied, and what is the benefit to patients in the long run?

Doug Beck: Yeah, and we're at that point now, it's 2024, where I want to go back to Hans Moravec, in 1997, from the Carnegie Mellon University, had an incredible prediction. In his abstract it says, "It's predicted that the required hardware and software will be available in cheap machines in the 2020s so that the processing power and memory capacity necessary to match general intellectual performance of the human brain can be approximated." And so here we are, and we've pretty much got relatively inexpensive DNN available.

And DNN, to me, it's so important to separate that from digital. Of course it is part of digital, but it's much more advanced. When people think about deep neural networks, what they should be thinking about is how they can talk to Siri and ask almost any question and Siri will have an answer that's probably correct 98% of the time. You can go to your Google photos or your Amazon photos and I could say, "Hey, here's a picture of Dave Fabry. Show me all my pictures of Dave Fabry," and it'll go throughout my instant backlog in memories, are, and within a few milliseconds I have all the pictures of Dave Fabry. DNN is much more sophisticated than simply digital, so tell me how that's applied in Genesis and Genesis AI. What are you doing with DNN that separates it from the pack?

Dave Fabry: Sure. One thing, I do want to back up just a little bit.

Doug Beck: Sure.

Dave Fabry: Because you said that the prediction was in the 2020s. We've got five and a half years left, and I don't think that it's necessarily outside the realm of possibility that we will achieve that definition still within the 2020s.

Doug Beck: Fair point, yeah.

Dave Fabry: But it is subject to Moore's law and the hardware part of this where transistors ... Moore made that prediction and it lasted far longer than he ever thought that it would, and he unfortunately died a year or so ago. So, it survived through his life and I don't think he ever thought it would.

Doug Beck: And to be clear, Moore's law was that the ability of memory and chips and processing would double about every 18 to 24 months, and he made that prediction, I believe, in the mid-'60s.

Dave Fabry: Yeah, and he made the prediction that the number of transmitters ... transistors on an IC would double every two years, and that has held up.



Doug Beck: Transistors, yeah.

Dave Fabry: People have talked about the death of Moore's law on the hardware side, but perhaps even more interesting and germane to this topic is that on AI, the computational power and artificial intelligence, is doubling every three and a half months.

Doug Beck: Which is shocking.

Dave Fabry: So that's why we've seen just astronomical, exponential improvements in AI processing. OpenAI and ChatGPT sort of took the industry by storm. We deal with natural language processing with hearing aids, if you will, when you think about some of the features that we're incorporating, like translation, transcription.

Doug Beck: Yes.

Dave Fabry: And that ability to have natural conversation is what enables that new interface, if you will, through the human voice into the computer or into the phone or whatever you're interfacing, and think about those applications for hearing aids is what's so exciting. And it is improving and accelerating in that improvement at an extremely rapid pace.

One of the additional nuances, if you will, of AI that goes into the Turing definition and others related to that is the natural language processing and a computer's inability to show empathy.

Doug Beck: Yes.

Dave Fabry: There's been a lot of examples where computers and using artificial intelligence really are not yet capable of bridging that gap into empathy.

Doug Beck: Empathy, right.

Dave Fabry: And that'll be when I think the success of this achieves, and one of the reasons that Starkey uses human operators ... Anytime a patient or provider calls into the company, they get a human voice. Because we haven't yet found that the ability to fool the person on the other end into a user experience that replicates human communication is at a level where we feel confident that people don't get frustrated when they're dealing with stops in time, the momentary glitches, that impact many of the voice commands using AI and chat.

Doug Beck: And that's a wonderful asset for Starkey, quite frankly. I don't think any of the other major manufacturers have real people answering the phone, and it does make a difference. One of the things about technology that we spoke about years ago was this idea that your hearing aids could maybe have a better feel for your intention. And we talked about that years ago using geotags, and what I meant by that is that if you go into, let's say, a Starbucks, your hearing aid is already online. If you're a regular Starbucks customer and it knows you're in Starbucks, so maybe it'll turn on a tighter



directionality. Maybe it'll turn on more noise reduction, maybe it'll do X, Y, or Z using geotext. But I think we're pretty far past that at this point, aren't we?

Dave Fabry: Yeah, it's a really good point. When we first introduced Halo, which was our first made-for-iPhone hearing aid from 2014, we were using acoustic environmental classification. And just to unpack that a little bit, now, hearing aids, modern hearing aids ... When you and I first started in the profession, if we wanted to fit a patient with directional microphones, we needed to have the patient manually switch via a switch on the device, a button, from a quiet environment to a noisy environment that would incorporate directionality.

Doug Beck: Sure.

Dave Fabry: Now it's table stakes. People expect that even across all of the tiers of technology, patients can put the devices in and if they desire, they don't have to interact with their hearing aids or an app any more than that, and they just go throughout the day. The device categorizes the type of environment as quiet or noisy or speech is present or musical, etc., using a machine learning classification system.

So people can argue, "Sure, well, we've had machine learning for a long time," but that's just scratching the surface. Because when we launched Halo, we used that machine learning classification plus geotagging to try to improve slightly on, as you said, let's say you go to Starbucks, or in Minnesota, we go to Caribou every morning, and it's the same environment roughly the same time of day, so it's busy, the baristas are working.

Doug Beck: Sure.

Dave Fabry: So it gets closer to, say, well, if I've saved a special coffee shop memory, it'll apply those settings, once it recognizes automatically, automagically, that I'm in the coffee shop. But we wanted to go one step further. When we began incorporating inertial measurement units in our devices and began to use a feature we call Edge Mode, dating back to 2020, when we launched this feature, so that it would now incorporate not only sophisticated machine learning classification, but situational intent, as you said.

Doug Beck: Sure.

Dave Fabry: The user's intention to say, "I'm in this environment right now," let's say I'm using geotagging and I'm saying, "Okay, it's in my favorite coffee shop, but today there's a different barista working, and she's soft-spoken and I can't quite understand her the same way I could my regular barista." So by simply tapping on the device or pressing a button in the app, we do an additional acoustic scan that takes a look at the unique set of environments at that moment in time, not just in the location, but at that moment in time to say, "Right here, right now, what's in front of me is what I want to hear." And then it applies special offsets on the basis of the acoustic parameters in that environment for that person in front of them with additional offsets beyond what the machine learning classification system can do.



And what we ... Yeah, go ahead.

Doug Beck: And this is so important, because what's happening now, early on in the introduction, the commercial introduction of deep neural networks, some of the DNNs out there were static. In other words, that system had been trained on voices or phonemes or syllables, human speech sounds, and that's great because then it could recognize those and do a better job processing that while leaving some of the background noise behind unprocessed. But now, we're getting away from the static DNN systems and we're into more of a dynamic deep neural network, and I think this is where the benefits that you're seeing in the newer systems come about, because we're able to process in real time.

Dave Fabry: Correct, and our Neuro Sound processing includes an onboard DNN accelerator to say that in Edge Mode it's taking an additional bite of the apple to classify that environment to that unique situation that the individual is in right now. It's not dependent on training of that model for that specific environment, or as you say, a less-than-dynamic environment, because it's taking into consideration right then, right there what the individual is. And when we first started it, we just simply optimized for clarity of what's in front. When we continued to enhance that feature to now allow individuals who want to use Edge Mode to be able to say, "Well, I want best sound, which provides additional offsets beyond the Personal program," our automated program, we can also have them select to enhance clarity even further in challenging environments for someone who's soft-spoken, for someone who's in a noisy environment, any way to improve clarity of the voice beyond what is capable from the typical Personal AEC program.

Doug Beck: Sure, sure.

Dave Fabry: Or finally, they can also suppress the noise even more aggressively than what would be done automatically. And by doing so, it personalizes to that environment for that individual, combining very sophisticated machine learning classification plus the DNN that allows for that optimization.

And when we've conducted studies ... We completed a study with Stanford last year on Edge Mode in comparison to the Personal program, that one using very sophisticated classification plus the optimization through directionality, noise management, whichever features are required in order to achieve that success. And when we did this, when Stanford did this, they found that the additional benefits on speech intelligibility were about a db and a half beyond what was achieved through the use of the Personal automatic program.

Doug Beck: Seriously?

Dave Fabry: That is not comparing omni to directional, where we know that that's about a 4 dB benefit, if you're lucky, without venting, and it can be decimated from that to be 2 dB benefit. This is comparing using that machine learning plus listener intent provided an additional 1-1/2 dB or so benefit on some of those speech measures that they



evaluated. That's a significant finding. If I can get 15% to 20% better word recognition, that's going to not only enable me to be engaged in the conversation better, ease of listening is likely improved, and the overall user experiences is improved. And I think it's a harbinger of where we can go with DNN as we see computational power continue to improve and AI models continue to improve at that doubling every three and a half months or so.

Doug Beck: Yeah, and if I can frame that a little bit, because when you say 1-1/2 dB improvement, most people don't get that. Here's the way it really works. When you're using directional premium hearing aids and you put them in the directional mode versus an omni mode, you're going to improve the signal-to-noise ratio typically by about 2 or 3 dB. If the stars align and everything's great, you might get 4 dB. So, that signal-to-noise ratio is critically important for the patient who needs a benefit in listening. They don't just need things louder, they need things clearer.

And this becomes so important when you think about Mead Killion's work from 30 years ago when he was first developing the QuickSIN, he said, "People with normal thresholds, normal hearing, normal listening ability need about 2 to 3 dB signal-to-noise ratio to get 50% of the words correct." But then he said, "People with a traditional mild to moderate loss, they need about 8," so there's an awful lot of difference between somebody with normal thresholds, normal listening ability, versus somebody with a mild to moderate loss. And it's not just about making it louder, it's about improving the signal-to-noise ratio. That to me is much more of a foundational issue, so when we can improve it by 1-1/2 dB, that's roughly 15% of word recognition improvement, so it's kind of a huge improvement, and so, I didn't want to let that go without commenting.

But when we're talking now about a dynamic deep neural network system, something like what we have now in Edge Mode, tell me about the impact of that on fall detection and general health and wellness, because now we're doing multiple processing at one time in parallel universes.

Dave Fabry: Yeah. Well, before we leave Edge Mode completely, I do want to just talk about the continued evolution of that feature, because when we started it, we began only with Edge Mode situational and we provided best sound which had offsets that were intended to improve clarity of speech. But now we incorporated that additional granularity to allow even more, further enhancements for speech clarity, whether it's a soft talker wearing a face mask that's ... Hopefully we're out of that era.

Doug Beck: Sure.

Dave Fabry: Or behind some sort of screen, or whether it's someone in a noisy environment, it can optimize even greater for that or suppress more noise. But people said, "Well, if Edge Mode is so great, why don't you just incorporate that into the Personal program?" Our automated classification system. And we said, "Well, it may be ..." I used to talk about it as ludicrous or now Plaid Mode on a Tesla. You don't always want that extreme



acceleration, and similarly, you may not always want those aggressive offsets to provide clarity, even within the same person.

Doug Beck: Sure.

Dave Fabry: Sometimes situationally at the beginning of the day, I'm a little sharper. The end of the day, I may be a little bit more fatigued. And if I'm at a conference and we're going to a reception and it's noisy, I don't want those extreme offsets, so I can suppress noise more in that situation.

But people and patients and providers continue to say, "Well, if it's so good, put it in so you can make it automatic." And so, in the latest product enhancements, within Genesis AI, we now have the ability to use Edge Mode automatically. It will continue to adapt rather than the end user having to tap in and tap out of Edge Mode throughout the day. So, we're moving towards a more automated approach for the user experience. I have many patients who just say they want to put the devices in and set it and forget it.

Doug Beck: Forget it, yeah.

Dave Fabry: But they want the benefit of that enhanced clarity or that enhanced comfort.

Doug Beck: Sure.

Dave Fabry: And now they have that with Edge Mode Automatic on the top tier devices. The lower tier devices have those other variations of Edge Mode, but this is one area I think, for professionals, that enables them to talk about that Automatic Edge Mode as a differentiating feature on higher tier technology. I think even with sophisticated DNN Algorithms continuing to adapt and evolve, we're going to see the need to combine machine and human to deliver better results by taking into consideration sophisticated acoustic processing and categorization of sound environments.

Doug Beck: Yes.

Dave Fabry: Plus, the listener's intent to say, "Right here, right now, this is what I want to hear."

Doug Beck: Yeah, and you have to start somewhere. It's important that we know historically that patients do like having control over their hearing aids. There was a period of time about 10 or 15 years ago when it was a big discussion, should we have a volume wheel or not? Because we had so many automatic compression-based circuits that we could vary the volume and keep it sort of at MCL most of the time. But I think as we progress towards as good a unit as we can possibly build, we have transparency times two.

And what I mean by that is, I think it's very important, I think cosmetics is a huge issue, and we talk about access and affordability that got us to OTC. But the numbers haven't changed a lot. Now, it's been almost two years of OTC, and I think the third leg of that stool, which frankly wasn't brought up very much at the FDA, is the issue of cosmetic



appeal. And this is the nice thing about the custom products that you have available is when you have custom products, often they can be nearly invisible or invisible in the canal, or in the canal, ITCs. And these type of products make it, I think, much more pleasant for the patient, because a lot of people ... I was doing a paper on this recently, and if you go to 2024 and you put in "cosmetic, comma, hearing aids," you see that's still a big thing for so many patients.

Now, my point of mentioning all this, these products now, when you're talking about Genesis AI, they're available in custom, they're available in the smaller products, and frankly, the BTE is what I've always referred to as a micro BTE. And I think that's so important because the goal, I think, of many fittings is to be transparent times two. And what I mean by that, it should physically not detract. It should be pleasant, it should be attractive, it should be invisible if possible, and acoustically, we want a sound that is so comfortable and natural that we quite frankly forget it's even there. And you and I actually wrote an article about this, I think it was 14 or 15 years ago, that hearing aids should be transparent physically and acoustically, and I think that's what you're approaching now.

Dave Fabry: Yeah, I mean, the cosmetic appearance still is ... Stigma still exists.

Doug Beck: Oh, sure.

Dave Fabry: But I'm finding that among the younger generation, baby boomers, first-time users, are less stigmatized, but they have higher expectations for the performance of what the acoustic benefits that can be provided in every environment that they want to listen to. But now, getting into that, one of the areas I think that's often not given its due is the user experience. And many of the patients that I work with, to your point about transparency, acoustic transparency, physical transparency, they don't want to have to always engage with the device.

Doug Beck: Right.

Dave Fabry: Hence, the Edge Mode Automatic. Other area that I've seen is, typically in the past when I'm setting up with these modern devices, I'll use the automated, what we call the Personal program, that automatically adapts.

Doug Beck: Yes.

Dave Fabry: Then I'll give a situational program, like a restaurant or a crowd program or a outdoor program. One thing I'm seeing since we introduced Edge Mode several years ago, in my hands at least, when I look at the data logging for patients and I instruct them how to use the manual programs plus Edge Mode, and especially Edge Mode Automatic now, that they're using the Personal program and Edge Mode in lieu of manual programs to get to that point. They don't want to interact and have to remember, now, which program, which beep or which program did they say to use in restaurants?





Doug Beck: Sure, sure.

Dave Fabry: And instead, all they have to do is remember to use Personal plus Edge Mode, and it's combining that machine and the human intention. To really get at the bottom line of what you're saying, choose the form factor that's important and appropriate based on your hearing loss. Look at how it is that you want to engage through an app through tapping on the device. Edge Mode is a feature that does not require that the patient has their phone with them.

Doug Beck: Yeah, which is brilliant.

Dave Fabry: They can activate or deactivate Edge. It truly was not named by accident. It's edge computing because everything you need to incorporate Edge Mode is on board the hearing aids without requiring a connection to the phone for those who want it.

Doug Beck: Which is wonderful, really, [00:24:30] because nobody wants to carry a lot of stuff. Before I let you go, I do want to cover a little bit about DNN and multiple path processing and the fact that you still have these fall alerts coming through. And tell me about fall alerts, health and wellness, in the newer products.

Dave Fabry: Yeah, so you've hit on one, that we've been using inertial measurement units in our devices since 2018 that are capable of monitoring physical activity. And we've continued to evolve that feature so that within the app, the MyStarkey app on the Genesis products, it will automatically log how many steps a patient takes throughout the day, whether they're walking, running, riding a bike, and it will log those activities. Why do you say that, why is that important? I can do that on my wrist, but yeah, you can do that part on your wrist. You can't do the monitoring of social engagement, which is so critical, given all of the research suggesting loneliness, isolation, depression, possibly even cognition in those individuals who are at elevated risk for cardiovascular disease may decline in untreated hearing loss.

Doug Beck: Sure.

Dave Fabry: Well, the issue, then, of the physical activity part is because of the direct link between hearing loss and cardiovascular disease.

Another comorbidity that we know is significant, and even a mild hearing loss places you at roughly three times the risk of a fall compared to your normal hearing counterpart. So in 2019, we introduced a fall detection feature that is capable of using that inertial measurement unit to detect when the patient's wearing their hearing aid and they're connected to their phone. It detects a characteristic measurement signature, if you will, movement signature of a fall, and then it will select ... The end user can select up to three individuals to serve as recipients of a fall alert via text message.

Doug Beck: Sure.



Dave Fabry: And if I'm wearing my devices and I fall, I hear an alert in natural language processing that says, "Fall detected. An alert message has been sent."

Doug Beck: That's great. It really is.

Dave Fabry: So I know that I'm connected to my phone, it's sent. Then when one of my three contacts opens up their phone and looks at the text, one of them, it will say, "Alert received," and that lets me know that I'm not that old woman from the '80s who fell and couldn't get up and wondered whether anyone knew about it. So, I know when someone received it, and then they're looking at their phone, hopefully calling me or texting me, and if I can't respond, maybe I was knocked unconscious.

Doug Beck: Sure.

Dave Fabry: They can use location services. You talked about geotagging earlier. Another benefit is they can see on a map where I was when I fell, call emergency services, or come and see if I'm okay at that point.

Doug Beck: Sure.

Dave Fabry: And we think because of falls ... Falls are a tremendously expensive health feature.

Doug Beck: Oh, yeah.

Dave Fabry: Not only economically, emotionally, causing stress to family members. It involves the whole family, the whole village really, when an aging person wants to live in their own home, and the family members are worried about their loved one who may be at risk of a fall. And as you know, a fall often starts a downward spiral in health. The fall may not kill you, but it will contribute to a lack of mobility, isolation, loneliness, depression.

Doug Beck: Absolutely.

Dave Fabry: That downward health spiral. My own mother died several years after suffering a fall where she broke her hip, and so-

Doug Beck: And that's right.

Dave Fabry: Go ahead.

Doug Beck: That's just about the most common result of a fall in an older person is the breaking of a hip, and that does start, quite often, a downward spiral, and that's very, very common. If you look that up on Google today in 2024, you'll see that it is still a very, very important caveat. You have to look out for these things, and the sooner the patient is seen and treated, the better, of course.



Dave Fabry: Look, and having that conversation for clinicians, hearing and balance is within our scope of practice.

Doug Beck: Yeah, oh, sure.

Dave Fabry: And it should be that we're looking at the patient beyond just two ears that we're doing real-ear measurements on. We're thinking about the patient's welfare as a whole, and having that conversation may initially require a little bit of adaptation. But the CDC in the US has come up with three questions that can effectively determine whether an individual is at elevated risk for falls, and it's simply, do they worry about falling? Have they fallen in the last year? Have family members talked about it? And that will sort out ... It's three questions.

Doug Beck: Yeah. It's very basic, it's basic.

Dave Fabry: It's not even requiring you to expand your scope of practice all that much. But what we also know is, while a fall detection feature ... And we're the first and only one in our space to have that feature, and we think it is something that enables professionals to operate at the top of their game in terms of best practice, but it's not really ... And it uses AI in the sense that those acoustic signatures, the switching to the phone, the alert's sent, the natural language processing, a lot of things you can take for granted.

Doug Beck: Yeah, sure. Right.

Dave Fabry: But while a fall detection feature is great, we want to go further and we want to begin to use those sensors. So, the CDC has developed measures called stopping elderly accidents, death, and injury. And they've come up with objective measures that are typically done in a clinical environment, done to assess an individual's balance, strength, or gait.

Doug Beck: Sure.

Dave Fabry: And they can identify deficiencies that typically requires a professional to look at a person doing these exercises, simply standing up and sitting down, how many times can they do that in 30 seconds without using their arms? Walking and turning around and sitting back down, or balancing with their feet astride or in front of each other. And we thought, well, we hypothesized, we could do this using that same inertial measurement unit, so we again partnered with Stanford. We had some very promising results that individuals can do this, these measures, in the comfort of their own home. And then if they identify a weakness on balance, strength, or gait, that then they can do exercises that can improve that deficiency, ultimately with the long-term goal of trying to help individuals help themselves to reduce fall risks before that fall occurs.

Doug Beck: Sure.

Dave Fabry: All of that involves artificial intelligence.



Doug Beck: It does, and I think it's a great application. Two things come to mind, number one, some people will still say, "Well, what does this have to do with the hearing aid?" And when you go back to the study you quoted, I should say that was Frank Lin's study, I think it was 2011, maybe 2012, Archives of Otolaryngology. And when he said, "As hearing loss increases to moderate ..." I believe at that level of a moderate sensorineural loss, it was a times three risk for a fall, so that's where that comes from. And these are our patients, when we're dealing with older patients who have more significant hearing loss, this is the patient who this is so important for, physically. So Dave, before I let you go, I want to talk a little bit about the clinician and end user benefits for this advanced AI. What can you tell me about things, even trivial things like changing wax guards, what can you now do with this advanced AI that we couldn't do two years ago?

Dave Fabry: Sure. Well, the first one, how do I know when to replace wax guards? I would say, "When it's necessary."

Doug Beck: Sure.

Dave Fabry: And we use acoustic-based assessment, if you will, and a storage if you will, of a feature we call SoundCheck. I believe we're still the only one in our space to have this feature where a daily diagnostic or weekly diagnostic or anytime a patient starts to notice they're not hearing as well with the devices, they could sort out what's the reason. They can run a test that is run in just a few seconds that will tell them, are the microphones working? Are the receivers blocked for any reason, including wax? And is the circuit functioning? All of that can be done by the patient in the comfort of their own home or wherever they have an environment that's quiet enough that they can run this SoundCheck feature.

It's a great example of something that combines acoustic measurements that can be stored on the device and a quick automated test that will ensure that their devices are functioning properly in every environment where they are. Another clinical benefit that we do is called ... We know that real-ear measurements is a part of best practice, and yet a lot of clinicians find that they don't have the time to do it or they don't feel the benefit or the value. You and I have preached on this for decades.

Doug Beck: Oh, yeah.

Dave Fabry: We now have a feature called auto REM that is incorporated into our devices that enables a clinician who has a real-ear measurement system that they're comfortable with, and they use for best practice, to speed up that initial target match by allowing the system, using AI, to simply match to whatever targets, including proprietary targets.

Doug Beck: Yes.

Dave Fabry: Because now, they can actually load the proprietary targets into the real ear. They don't have to do it. It's already stored in there and it will match to those initial targets and acoustically match the device to the patient's ear, taking into consideration all of the



individual acoustic parameters that are measured via real ear, but faster, roughly twice as fast as if the clinician themselves is matching target. That's something machine learning is really good at doing is simply matching to a given target, or looking for specific adjustments that it can do very rapidly.

Doug Beck: And auto REM, I think you guys introduced that about four or five years ago.

Dave Fabry: We did.

Doug Beck: And this is a nice application of that same type of technology. It's taking something that you have and that you're improving and saying, "How else can we use this?" And I like the idea quite a lot of measuring the SPL to make sure it is where it's supposed to be. That's brilliant.

Dave Fabry: Yeah, there's a lot of acoustic factors, as we talked about with Edge Mode relating to the speech understanding and noise. We talked about the health and wellness features. There's a lot of other features that we take for granted, like the Self Check or the auto REM, or the last one is using that natural language processing that I mentioned earlier.

Doug Beck: Sure. Tell me about that.

Dave Fabry: To consider that in the US, there's a significant number of aging individuals who are on medications and chronic medications multiple times every day, whether they're taking them coming off of a surgery or after some illness or whether it's a chronic regimen.

Doug Beck: Sure, sure.

Dave Fabry: We know that compliance with a chronic regimen to medication is only about 50%.

Doug Beck: Right.

Dave Fabry: And one of the things we thought was, could we, in the app, allow either manual reminders to be put in that says, "Take your medication three times a day," and you'll hear it in your voice, "Take your medication. Drink water." Dehydration in the aging population [inaudible]

Doug Beck: Right, right, so much better than a beep alert, right?

Dave Fabry: So much better.

Doug Beck: Because you get a beep, you have no idea.

Dave Fabry: You hear it in your own voice. But then we've also taken it a step further with Smart reminders to tell the person, "Put your hearing aid in in the morning." "Run Self Check once a week." It'll remind them to do it. All of these things really fill the three buckets of sound quality, speech intelligibility, health and wellness features, and using that natural



language processing for everything from these intelligent reminders to real-time translation transcription ... The mind just boggles in terms of where we're going. And I know we're out of time, but I'm really excited, and I don't want to leave this conversation before I say that the role of the clinician is still paramount in this process, to engage with the patient, to find out how they want their user experience to be.

Doug Beck: Absolutely.

Dave Fabry: To pick out the best form factor, to use best practice to ensure that they're fitting the devices to the patient.

Doug Beck: Absolutely.

Dave Fabry: And following that patient on their journey.

Doug Beck: Exactly. And David, I'm so glad you said that, because to me, it's all about, can we understand what the patient's needs, the patient's goals, the patient's expectations are, and can we meet them? And it's so important. Often it doesn't get done, which is a shame, but it's so important. I'm glad you underscored that. You're right. We are out of time. I want to thank you for being on the other side of the mic of Sound Bites. I enjoyed learning about this new product and this new process, and I'll look forward to maybe doing this again sometime soon.

Dave Fabry: Thanks very much, Doug. Appreciate it.