

This unedited transcript of a continued webinar is provided in order to facilitate communication accessibility for the viewer and may not be a totally verbatim record of the proceedings. This transcript may contain errors. Copying or distributing this transcript without the express written consent of continued is strictly prohibited. For any questions, please contact customerservice@continued.com

Roll Up Your Sleeves: (Hands-on) REM Basics With CARL
Recorded January 17, 2023
Presenter: Clayton Fisher, M.Cl.Sc

- Welcome, everybody, and thank you very much for being with us today. My name is Anna and I'm the Education Manager in Inventis. So, it is a real pleasure for me and for Inventis Academia to have all of you here today for this webinar on Real Ear Measurements, organized by Inventis, but conceived by Clayton Fisher, owner of a Treat Hearing Health Care. Clayton is a Clinical Audiologist and Audiology Consultant. Clayton consultant work centers around clinical education regarding best practices for hearing aid fittings. Furthermore, he releases periodic clinical video tutorials on his YouTube channel. Thank you very much, Clayton, for accepting our invitation. Thank you so much.

- Thanks for having me.

- So. Thank you. Title of the webinar: "Roll up your sleeves: Hands-On REM Basics with CARL." But who is CARL? Clayton will introduce Carl to us shortly. During this session, Clayton will provide pragmatic tips and tricks for learning the basic hands-on techniques and skills required to become competent and confident in performing Real Ear Measurement. As usual, I strongly invite all of you to write down any question in the space provided that you should see on the screen. Keep in mind that your contribution is fundamental to expand the borders of Academia, so after the event, you'll receive a survey, I kindly ask you to fill out. The survey will help us to understand your needs, to get your ideas in order to provide the best educational support ever. But now, Clayton, it's your turn, so enjoy the webinar.

- Thanks, Anna. And thanks everyone for joining us today. All right, so we are talking about REM: Real Ear Measurement, which is, as you may or may not know, one of my favorite topics. So let's just hop into it. Now, if you're like me, you might be thinking, "Wow, really, do we really need another REM basics webinar?" Sort of back to basics, because there are a ton of them out there, but my thinking is, yes, we do, but this one is gonna be different than all of the other ones out there. And the main reason is, is

because it's going to focus entirely on the practical aspects of Real Ear Measures and not the theoretical, okay? So if you're hoping for all sorts of textbook definitions, you're not gonna get that today.

We are going to do a fitting together. We're gonna use real equipment, we're not just gonna talk about it. And so it's not just gonna be a slideshow. We're really going to get into it. And we are going to make mistakes together and we're gonna troubleshoot together. So this is going to be a different experience from anything you've had on Real Ear. Before we get into it, I'll just tell you a little bit about myself. I have worked with various organizations and one of the main things I like doing the most and that I do well is helping clinicians to try to do their job better, okay? So that might be optimizing their equipment, whether it's older equipment or newer equipment to allow them to use it in a more direct streamlined fashion.

It might be creating best-practice protocols that are really meant to, you know, optimize patient outcomes, but that aren't overly burdensome to follow, because there's no point in having, you know, a protocol if no one follows it. And then, you know, I just do a lot of training and support for clinicians to help ensure that they have the required skills to basically do their job as best they can. Okay, so our goals for this workshop, and I call it a workshop and not a webinar because really that's the idea, is to, well, it's called "Roll Up your Sleeves," and we wanna sort of get our hands dirty a little bit. So the first learning objective is just to get you feeling more comfortable with your REM equipment and your REM software.

I also want you to feel more comfortable with calibration techniques because, you know, we wanna make sure that the results we're getting are accurate and you can feel confident in that. We don't want that to be a barrier to doing REM. And I want you to feel more comfortable interpreting your REM results, and the fitting data that you see and hopefully improving upon it. And, you know, a final goal is hopefully maybe just to

get you motivated and pumped up to use your REM equipment. So the outline for today, basically it's two parts. The first part, I'm just gonna line things up, and we're gonna talk a little bit about the context today. I'm gonna tell you what we're not gonna be talking about.

I'm gonna be talking a little bit about some philosophical stuff with our relationship with our equipment. And then I'm gonna tell you a little bit about my non-audiological background. And then part two is really just the doing part. We're gonna do a demonstration of a fitting and we're just gonna walk through every step and see what happens. So we're gonna look at patient equipment and equipment setup. We're gonna look at measurement accuracy and calibration, and then again, interpreting and making improvements. What we won't be covering today, I promise you that we will not discuss the well-documented known benefits of running Real Ear Measurements. I also won't be talking about why choosing to ignore best practices is unethical.

And if you want to dig into that a little bit further, Katherine Palmer had a great article in 2009 on that in "Audiology Today." And if you want more information on these topics, check out my YouTube channel: "Hearing health Awareness." I've got tons of videos up there, and I've gone over these at length and I don't feel like talking about them anymore. What we won't cover today as well is terminology. We are not gonna go through all the different acronyms. We are not gonna go through the different prescriptive methods. If you want more information on these topics, you could just check out, you know, your old textbook. Gus Mueller has great REM articles in his "20Q" series.

And then there's just a ton of audiology, I mean, there's gotta be a dozen or two dozen videos on AudiologyOnline on all this aspect of sort of beginner Real Ear Measurements. So my assumptions today is that if you are participating, I assume that you know that running Real Ear Measurements is a good thing to do and it's the way

that you can ensure ideal patient outcomes. I assume that you want to be doing REM routinely, but maybe you're not, or you're doing REM routinely, but you wanna understand it a little bit better and you wanna feel more confident with it. And if you don't fit into any of these three things, that's fine too; I'm sure you're gonna learn a lot anyway.

So I'll just tell you a little bit about why I use Real Ear Measurements. I've said before that audibility isn't everything, but it's almost everything. But Gus Mueller said it even better. He said, "Audibility always wins," okay? So the reason I run REM is because I want to ensure that audibility is adequate for the patient, and the only way to do that is to measure it, and then hopefully you can improve upon it to try and improve the fitting. It's the improvement in audibility that is achieved through a hearing aid fitting that is the key factor in predicting the degree of benefit and satisfaction a patient is gonna get. And so the improvement meaning the difference, the improvement in audibility in terms of percentage between aided and unaided.

Not necessarily how much aided audibility they have, but how much improvement have we seen. And my last webinar with Inventis was, the entire webinar was based on measuring audibility and using the SII to do that. So if you haven't tuned into that, I'd encourage you to check it out on AudiologyOnline. And so, you know, all I can say is just thank goodness for having automatic aided SII, and unaided SII and SII difference calculations because, you know, the REM software just calculates that for you nowadays, and it gives you an immediate read on the patient's audibility and how much that's improved. SII is speech intelligibility index and that's just the percentage of speech that is audible to the patient.

One thing that's really cool with Inventis is that with their new software, they both give you the unaided SII prediction, they give you the measured aided SII and they also automatically calculate the difference for you, which I don't think anyone else is doing,

and I just really appreciate that so I don't have to do the math myself. Okay, a bit more context. So, you know, REM systems have changed. They have gotten better, they have gotten easier to use. You know, the Trumpet, for example, is computer-based. All you need is a speaker and a connection to your laptop. So it's very user-friendly. It's all triggered from your computer and it's all portable. And all of those things are things that I appreciate a great deal.

So there's no, for example, sending audiograms to the device or sending your reports, you know, back to your computer. It's just all done on the computer, which is really, really handy. Also, the way that we learn, teach and practice has also changed. So yeah, Anna said, "Who's CARL?" This is CARL. Meet CARL. He is a patient simulator, and he's been around, oh geez, probably for three or four years now. And quite frankly, I don't know what I would do without CARL nowadays, especially, you know, being in this sort of educational role. But basically having a CARL in your office allows you to practice key techniques and do so in a safe environment where you can make mistakes, you're not gonna hurt anyone.

And of course you don't need a patient, which I love. So the not so good for this workshop, I've just realized through experience that many clinicians just really aren't gear savvy, right? And I'm sure a bunch of people here can, you know, you're probably like, yeah, that's me. Or you know, maybe you're not technical per se. And I have found that a lot of clinicians are not fully comfortable with their equipment. A lot of them can get by on it, but they're not fully comfortable. So in addition, you know, training across programs varies drastically. It doesn't matter if it's an audiology program or hearing instrument specialist or dispenser, even within those, there can be a great deal of variability in terms of how much exposure people get to Real Ear Measurements.

You know, doing practicums can be great to create good habits if you get someone who's really good at it, like if you were one of my students, then, you know, you'd be

getting a good base in it. Or if you happen to do a practicum where someone says, "Yeah, you know what REM, yeah, we don't really do that," you know, that would be obviously very bad for a student because they're learning one thing in school and then they're seeing another thing out in the real world. And, you know, I've noticed that over time it's just so much easier to main maintain the status quo. And I fully understand that change sucks, no one really likes change, so.

So these are the things I've been thinking about as I prepared this workshop. Okay, we don't have a formal poll here, but just which of these do you think is the biggest barrier to performing Real Ear Measurements: So A: ignorance of the benefits, B: cost of the equipment, C: access to the equipment or D: none of the above? Well, the reason why I listed these is 'cause these are the big ones that are typically, you know, cited in these various talks that I've been referencing. So let's just go through these. Ignorance of the benefits. Well, this could definitely be a factor, right? If you don't know how much running Real Ear can improve your practice and your patient outcomes, like if you've never actually experienced that, then you're gonna be less likely to do it.

However, you know, there's been a ton of work that's been done through these different webinars and workshops and my YouTube videos and all this stuff that different articles, Gus Mueller's done a million of them, and of course every best practice guideline has Real Ear measurement in there. So at the very least, people know that they should be doing this. Maybe they don't fully understand what they're missing out on and what their patients are missing out on. But I don't think that that's the biggest one. Cost of the equipment is often cited. Well, how much does the pair of premium hearing instruments cost? Like, you know, 6, 7, \$8,000 sometimes. Well, I can tell you that the Trumpet is less expensive than the most expensive premium pair of hearing instruments.

One pair, right? And how many hearing aids are you gonna fit with this thing? So yeah, that doesn't make any sense. Or C is very interesting, access to the equipment. You might think that just having access to the equipment would increase your likelihood of using it. But as we're gonna find out next, that is not always the case. And that's really, and I'm showing this old Verifit here that's kind of been left to collect dust, and I've seen a lot of those over the years. So my answer is D: none of the above. So according to a 2012 survey of clinicians by "The Hearing Journal," about half of clinicians, 48% of those who had a Real Ear system don't use it, they just don't use it.

It just sits there collecting dust, which might seem crazy to you, but anecdotally I can confirm that this is absolutely true. Just because it is sitting next to you in your office doesn't mean that you're going to use it, which kind of seems crazy to me. And I was trying to think about an analogy for this, and the only thing I could come up with was like, you know, something negative. Imagine you're walking in the rain, and it's just pouring rain and you don't have an umbrella and you're thinking, you know what, I'm still getting where I'm going, but this is not ideal. I'm getting soaking wet. But you have this alternative and that's a car sitting right there, and it's warm, and it's dry, and it's faster and you're not gonna get splashed.

And I almost see like the, you know, the Verifit or the Trumpet or whatever device it is that's sitting there not being used, it's that warm car. And, you know, and so the question is, is like why not just get into the car, right? What is stopping people from using their Real Ear devices? That's what we're gonna get into. It is my opinion that the big barrier, perhaps the biggest barrier is lack of training and familiarity with the equipment and procedures, okay? And this is what greatly impacts the uptake of REM and thus of course the patient outcomes, okay? So clinicians who do not use Real Ear Measurements are often not comfortable with the hardware, and the software and just they can't use it very easily.

Calibration and ensuring accuracy is an issue. You know, I've often heard that as like, "Well, I'm just not sure if, like, I don't feel like I can trust the results." Obviously that's a big problem if you can't trust the results that you're measuring. And then of course, you know, people feel a little bit uncomfortable interpreting the results and making adjustments because they just don't have that background. Okay, so I was listening to a podcast recently "How I Built This," and Brian Lam was featured, and he is the founder of Wirecutter. And he said something that really just sort of lit the light bulb in my head. He said, "A piece of gear," he was just talking about his relationship with equipment, "A piece of gear that you can depend on is honestly a big part of my mental and emotional security."

Okay? So, and I think they were talking about this in context of like these really small old walkmans that they came out with. And of course, you know, we're looking at this in the context of all of our equipment, whether it's on the assessment side, or the treatment side, you know, the dizziness side. And of course we're not all like this. I'm not like this, I'm not that much of a gear-head, for sure. I wouldn't even consider myself a gear-head. So, but it's just interesting, you know, we all do have a relationship with our equipment. So I ask you this, what is your relationship with your equipment? Like, where do you fit on this scale?

Okay? All the way over on the left we have: I only have or want the minimum knowledge I need to get by. And then on the other side is the complete gear-head, and they want to know every little feature, and spec and everything else. And then of course you have some people who are right in the middle. I would place myself, you know, somewhere at like a six and a half, or like maybe a seven or something like that. I am not a complete gear-head. But I have seen that, you know, just the vast majority of clinicians that I have worked with, especially on, well, on both the assessment and the treatment side, but definitely the treatment with Real Ear Measurements are definitely on the left side, you know, of number five there.

And some people being, you know, very much closer to one, which is fine, and a lot of you might be in that same situation. But what I'm hoping to do with today's session is make some of you feel more comfortable and to just kind of inch you over towards that number five, if you're way over on the left, bring you a little bit more into the middle. Okay, so why am I on the right side of the five? Well, you know, before I became an audiologist, long before, I was an aspiring musician, in fact, I was a guitar player in a rather heavy rock band, which sometimes surprises my colleagues if they find out about it because I'm sort of like dressed up in attire or something, but.

But, you know, as such, through that experience, I've just kind of always had to deal with equipment. You know, you've got guitars, you've got amplifiers, you've got pedals, you've got patch cords, you've got all sorts of things, to be honest, that could potentially go wrong and often did when you were on stage, And so what you frequently had to do was figure out why is my guitar cutting out? Is it, you know, my amp? Is it one of these tiny little patch cords connecting my pedals? Is it the guitar itself? And so, you know, that was kind of nice to have that experience because it predisposed me to be ready to work more comfortably with equipment.

And everyone comes from different backgrounds and I definitely have friends, for example, who are complete, you know, gear-heads, and, you know, just make me, you know, I feel silly talking to them. And then I also have friends in audiology, they just wanna be able to do the basics, and as long as they can do what they need to do, then that's totally fine. But what I'm pleading with you to do is to lean into your equipment a little bit if you place yourself more on the left side of that scale, okay? Because equipment is a part of audiology, we cannot get around it. So one of the best things you could do if you do work with other people is to ask a more experienced colleague, if you've got someone who's always doing REM in your office, for example, to just give you an overview of the equipment that there is nothing that is more powerful than that.

And that's kind of what I'm hoping to do today with the webinar in a sort of broader sense with more people. But you should really use, you know, canceled appointments as an opportunity to learn a new feature or troubleshoot something that came up in the clinic earlier that day or earlier that week. You should try and take a little bit of time if you can over lunch, just take, you know, 10 minutes after you've eaten your lunch to, I don't know, look at the user guide or something, try and figure this thing out or just, you know, play with the equipment. The biggest recommendation I have is to be curious and to get in there and kind of have fun with it.

And, you know, really your REM system should be your best friend, so you just gotta kind of get to know it. Having a CARL in your office is really handy for that as well so you don't have to grab, you know, the receptionist or something. So just a disclosure, honestly, I haven't been using Inventis equipment for all that long, so I am not, you know, it's not like I worked in like their tech support or something like that. In fact, I'm more used to using a different manufacturer and I've recently switched over to using Inventis as my main REM equipment. And of course each brand is different. Change is hard. I don't like change more than anyone else.

It's been a learning curve, and I'm still learning as you'll see in the demonstrations today. But the best way to learn is by doing it. So part two, we are going to fit CARL. And due to just logistical reasons, I can't really have, to do this live because it just the way that the Trumpet works with the computer, it would be an absolute nightmare. So I've recorded a series of videos, but, okay, let's talk about CARL. Again, he's a patient simulator but most importantly, especially for what we're doing today, he has realistic ear canal acoustics. They're sort of human-like, they're not completely normal 'cause he doesn't have an eardrum and three little bones attached to it.

But anyway, he's been really great, and he is great for the office, for, you know, REM, wax removals, ear impressions, all the stuff that you might wanna practice. Here is his audiogram for today. I decided to make him a hunter 'cause I seem like I've been seeing a lot of these guys recently, right-handed rifle users. So he is got this heavy noise notch on the left side and it's an asymmetrical loss which is much trickier to fit. So step one, you need to first set up the patient and equalize for the room. And all that really does is modifies like the frequency response of the speaker based on the acoustics of the room. And you could do that weekly, daily or anytime you change your space.

The second thing that we're gonna look at is probe tube calibration, which makes the resonance of the probe tubes acoustically invisible. And also, that's probably fine to do once a week. So here, let's get in and do this. I'm just gonna play a little video here for you. Okay, enjoy. So here we are, I've got CARL sitting next to me, I've got the Trumpet about a meter away from him. And the first thing we should probably do is check our setup here. So we've got Maestro opened up that's just within Noah. You just click it here. You can pull it up. So we'll have a look in CARL's ear. That's a pretty good place to start.

Okay, there's CARL's eardrum. Looks pretty blank but that's normal. At this point what we're really doing is getting an idea of the direction of his ear canal, and we're thinking about where we are gonna place that probe tube. These are our microphones for our probe mic system. There's a reference mic out here and then this is the mic that we're gonna attach the probe tube to that's gonna record from the inside of the canal. You can see that there's a left and a right and with this particular setup it is possible to get that reversed. So you wanna be really careful that you got the right on the right side. We're gonna get probe tubes right on here.

Just loosen this up a touch here. Okay. So you wanna snug it up a little bit but not too much 'cause you definitely don't want to crimp the probe tube. And now CARL is pretty well set up. I will just say that normally you'd wanna have your Trumpet or your REM speaker out from the wall more than this, and normally we'd be working the other way. I just set it up like this 'cause I thought it would be a little bit easier for you to see. Gonna get our Trumpet connected here. So we're in the otoscopy module and we're just switching over. Okay, so let's do our room calibration. So again, it's saying about one meter apart, press the start button.

So equalization completed successfully. Really what this is just doing is accounting for the distance from the wall, the positioning of the people and so on. So now we're just gonna calibrate for the probe tubes and make sure we can make those invisible acoustically. Again, you can do this every time if you want to. You could probably get away with doing it once a week too. So calibration successful. But it is showing that on the right side. This is a little bit weird so I'm gonna want to just check to make sure that that is sitting just so it's a little bit peaky. We'll just try that again. Left probe mic. All right, so these are the things that you can run into, which is why I like to do this when the patient isn't there and just get it away and just do it once a week, 'cause to me a probe tube is a probe tube is a probe tube unless you've cut it or modified it in some way.

All right, so we're still getting that, something a bit weird there on the right side. So just for fun, let's actually try a different probe tube. Let's just grab another one. Yeah, so I'm pretty sure that that's just because I'm a little bit close to that wall there, and it's accepting it anyway, so we know we're good. All right, so you can see that that's pretty real life. You know, these are the things that come up. And if I was doing this with you in your office, these would be the issues we'd run into as well. So I'm just gonna keep moving along because we do have a number of things to get through. So the next thing

is of course probe tube insertion, which is a big thing that sometimes people don't feel comfortable with.

So we'll just play the video. But basically, you know, you wanna use the lanyard to hold it in place, and you wanna make sure that you go deep because if you don't, you're not gonna get accurate results. And I've never heard of anyone perforating an eardrum with a probe tube, so I don't be too concerned about that. If you poke someone's ear, it's a little uncomfortable, but it's not the end of the world. You've gotta make sure you always check your placement with otoscopy. And, you know, with CARL it's a little easier because he doesn't have wax, bendy canals, hairy canals, thin canals. So yeah, I mean, but let's give it a go. One of the nice things about the Trumpet is right on the actual earpieces themselves, there's a little measurement tool.

Typically average canal is about 30 millimeters. So you can set that with the little slider here. To insert a probe tube, it's quite straightforward. A great trick is just to pull the lanyard back a little bit and put the probe tube on the bottom of the canal just in front of the lanyard and then the lanyards gonna hold that in place. All right. so I'll just quickly do that on the other side too, pulling it forward. Get it in nice and deep there. And that's it. Except, you really have to check your placement because it's absolutely essential that you get the probe tube up nice and close to the eardrum. You don't want to touch it, but when you wanna have it nice and close to make sure you're getting a good high frequency response.

So we'll check that again, and hey look at that. We got it right on the ridge that slopes down to the eardrum. And that's because you can see the little markers, right sort of at the intertragal notch. It would peak at the other side too while we're at it. Awkward for me here. Hey, that's pretty good placement on that side as well. Perfect. Okay, and I apologize there, I had the light on the horoscope a little low so it's a little bit hard to see. But basically your next step is to go into your software and make sure you got all

your fitting parameters set up. So that's choosing your prescriptive targets and hearing aid styles and all the acoustics.

And then, I mean, this step is optional, you can actually just go to a Real Ear aided response. But you can go in and measure with pink noise, an open response, and you can also measure the occluded response to see how much the hearing aid is acting as an earplug. And of course this is kind of a good opportunity to troubleshoot, you know, if you've got a shallow probe tube placement, if you've got a block probe tube, you're probably gonna see it here. So let's run the video on that. So why don't we just do a quick little screen tour here so we know what we're looking at. We've got single-sided or bilateral, we have the input signal, input level, input level here and the input signal here.

We can just do a quick shot of it or we can do an average, which is five seconds, which is all we need for a Real Ear unaided response. And if you have a look on this side, this is where it shows you. So we're dealing in SPL, we're looking at the response. We're not looking at HO, we're not looking at gain. You can show a table view as well, which is kind of cool. Of course we don't have our measurements yet, but I like that feature. And the fitting rule, we've got DSL5. And before we even get started on anything, we're definitely gonna wanna peek at the settings for that, 'cause one thing is is that it does default to pediatric, and of course CARL is an adult here.

So we're just gonna wanna double check a few things here. So we're using an insert tip or we're gonna use bone conduction with sensory neural, so it doesn't really matter. I don't even have bone condition put in. If it was conductive you'd definitely want to say yes there. Predicted UCL, yes, because I haven't measured one. Predicted RACD, yes, also, because I haven't measured one. CARL's got a pretty average ear. So eal Ear unaided gain, well, we can actually just use measure it here 'cause we are just gonna measure it really quickly. And I'm sure as we'll see in a second that's good because

CARL's ear is a little atypical in terms of its peakiness 'cause he doesn't have a real eardrum there.

RACD type, we don't need to worry about that 'cause we're using average. All right, and zero dB azimuth. With Inventis, they also let you put in a few specs on the hearing aid itself. I'm not sure how important this is but we definitely wanna be on binaural. We definitely wanna tell it where the microphones are. So behind the ear. But, yeah, these ones I'm not as sure how important they're, how many channels it's processing in. We'll just say 16 there. And venting, well, we'll just say, and again, it's a binaural fitting so it's kind of hard to say but we'll just say that that's open 'cause at least one of the ears is gonna be open. All right, so why don't we just run an occluded response with pink noise?

Here we go. All right, so you can see that CARL's ears maybe a little bit atypical. Again, this right side, we had something a little weird going on with the probe tube. I think it's probably just the distance from the wall there, so it's a little bit more peaky here. But of course sometimes people's ears are just like that. Obviously, you'd wanna have this all pre-set up before the patient comes in. I always love to pre fit my hearing aids beforehand so that I'm not doing it on the fly and I'm not running into any strange issues like, oh, there's a firmware update, check the acoustics office here. So it is recommending open, and 50 DB receiver, so we'll just best fit all the memories there.

An occluded response is going to be with the hearing aids in, but the hearing aid's muted, so we'll just mute those right now and we can go back to our software. We'll insert the hearing aids and then we'll just see how it differs and how occluding these devices are. They shouldn't be terribly occluding 'cause they're open domes on there. All righty, so I've got the hearing aids muted and let's take a peek at what the response looks like with them in the ears. The response essentially looks identical. Having the

receiver in the ear with those open domes, you can see it's cutting out a little bit of that ear canal resonance without any amplification. All right, right on.

So we're gonna move right along to running aided speech. So this is after you've best fit your hearing aids with your favorite, you know, fitting formula, you're going to complete your level calibration, which I'm gonna go over in the video and you're gonna start your aided measurements. You know, once you've got those aided measurements or we're gonna run unaided as well, you're gonna want to interpret the results and because we've done everything, we've done all our calibrations, we know that this is a true reflection of audibility in the patients here so we can feel really good about that. This is what they're actually getting. And so, you know, ask yourself questions like what does a fit-to target look like?

How much improvement in audibility is there? Can you improve audibility? Like bump it up a little bit while keeping average speech for a new user comfortable but slightly loud. So let's just get into it. This is the fun part. So let's click on the aided screen, which is where all the action happens. I like to use actual speech ideally in the language that the person knows and understands. I don't like using the international speech passage because for a lot of people, well, for anyone, it's unintelligible. And since we're trying to get people to understand speech better, it'd be great if they could understand what is actually being said, so I'm just gonna use the rainbow passage.

We definitely wanna have a look over on the right side and make sure everything looks good here. The key key key here is that we've chose open fit as the the calibration type. Now, with the current software on Inventis, what they do do is when you click open fit, basically all that means is that it's still gonna calibrate before each run but before that calibration it's gonna remind you to mute the hearing aids before the calibration. I kind of prefer, like, just doing the calibration once beforehand and telling the patient not to move, which is no problem with CARL. And then only if the patient

moves to rerun that calibration. The reason why you wanna mute the hearing aids is because if there's enough gain, as there certainly will be on our left side, you could have sound leaking out of the ear canal and getting into the reference microphone and that's gonna contaminate the measurement because then the loud speaker is gonna reduce in response to that 'cause it thinks it's getting a louder response during that calibration, whatever system you're using, the main thing you wanna know is does it use this sort of stored equalization where it does a calibration and then it keeps that for the whole measurement?

Or is it a concurrent equalization where the loudspeaker can increase and decrease, 'cause you can run into some trouble there for sure. Most systems now are using some version of a stored calibration. So why don't we do a run, see what this looks like. So watch what's gonna happen. I'm gonna start the run and it's gonna say, "You're doing an open fitting. Be sure to mute the hearing aid microphones," which I already have. I'm gonna say, okay.

- [Narrator] And the sunlight strikes raindrops-

- It does the calibration and now I can turn on the hearing aid microphones and record it.

- [Narrator] With its path high above and its two ends apparently beyond the horizon. When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch.

- So the response actually looks pretty decent, okay? We've got a reasonable match-to-target, right, in the ear canal resonance here. We could certainly work a little bit harder to get the right side look at a little bit better. Again, I think it's partially because we've

got these dips 'cause we're kind of close to the wall there, but, so we'll make a few adjustments and then we can rerun it. The really, really great thing that you can see here is that Inventis is actually doing the difference calibration or the difference in SII is actually shown here. So here is unaided, here is aided and they automatically do the difference for you. So on the right side, yeah 5DB improvement is a little bit smaller than we'd like to see, although it's saying that the unaided is pretty high as it is.

So like SII is 59. So sometimes when you have a milder loss like we do on the right side, it's a good idea just to do your unaided response like actually in the aided response screen, not just with pink noise but with speech. And so you can get an actual measurement on that 'cause my guess is that 79 might be a little bit high. Let's try that right now. Okay, so I've just actually taken the hearing aid out, both hearing aids out, and I'm gonna do an actual unaided response. I'll just do it down here. It's gonna say do you wanna mute the hearing aids? But I don't have mins so I don't have anything to mute.

- [Narrator] When the sunlight strikes raindrops in the air, when the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch.

- So the other nice thing about doing an unaided response is that you can see that these kind of weird dips here are in the unaided response when there's no hearing aid in the ear. So again, it could be just a positioning thing. One interesting thing to notice is that when we actually measure the unaided response for CARL, that SII is significantly lower. So that's six points lower in terms of the SII when we measure that. So all of a sudden, you know, jumping up to an aided SII of 84, that's looking a lot better, 11 point boost. So sometimes, you know, these estimates are pretty good but everyone's ear's different. We see a really nice separation on the left side where the loss is more significant from the unaided response to the aided response.

And of course we see a more significant improvement in the SII. Just noticed a quick correction there. I said, well, at one point I said 5DB improvement but I meant a 5. improvement in SII. So it's time to make some adjustments. Just gonna let the video do all the talking 'cause we don't have a ton of time. Okay, so let's do this. One thing that I love about having a computer-based REM system is the ability to just switch to the on top mode. Okay so there's our fitting software and there's our on top mode like that. And you can actually just sit your REM curves right on top of the predicted curves because the REM curves are really what matters.

You can really just open up your fitting software here, and then you can make your fine tuning adjustments to see if you can improve things a little more. With a significantly asymmetrical losses, we'll separate the sides and do one at a time. With Starkey, you can actually do auto REM, which would be a heck of a lot quicker. Just increase this high frequency gain a little bit here. Of course we're gonna be wanting to check in with the patient to see how they're doing. So we've got this big dip right around 2000 hertz and again this is really more of a wall thing but, or something like that. But let's see if we can kind of program that out a little bit.

And of course at a thousand hertz we're under target but there's no way we would meet that 'cause we've got a fully open dome. One really cool thing here is that they're actually, they're showing you the aided SII, the unaided SII and the difference right here, even in the on top mode, which I really love. Open fitting calibration is starting turn off the hearing aids. Well, we don't have the hearing aids in yet. This is another way you can do it.

- [Narrator] When the sunlight strikes raindrops-

- And then it's running and you can just put the hearing aids in, then do it. Then capture it.

- [Narrator] The rainbow is a... There is, according to legend, his friends say he is looking for the pot of gold at the end of the rain when the sunlight strikes raindrops in the air-

- All right. So you can see I've maybe gone a little bit too crazy with this high frequency gain here. We were able to definitely get a better response though, where we had these notches here right around 2000 hertz. We're now sort of right on target, but, you know, you can put your cursor right over top and see exactly where that is. So around 26, 2700 hertz. So we just take 2,700 hertz down, right? This is where we wanna be and this is where we are. So we could actually take that down fairly significantly. The left side though, you know, is pretty darn good. Might wanna see if we can get a little bit closer to target at 4,000 hertz and well we are seeing a bit of a breakaway even at a thousand hertz, so that must be including somewhat.

That's good. If you want it to be really fussy, you could take 3000 down just a hair. We're probably not gonna get a ton of amplification up here anywhere near target. Little bit of feedback here if I do that, but Starkey tends to be pretty good. So why don't we actually run the feedback calibration on the hearing aids? Yeah, not too bad though. And look at that. We pretty much have no feedback from this side. Excellent. All right. And it looks like we haven't really cut into the gain at all.

- [Narrator] When the sunlight strikes raindrops in air-

- Unmute.

- [Narrator] They act like a prism and form a rainbow. When the sunlight strikes raindrops in the air-

- The response is looking pretty good. The thing to keep in mind is that CARL doesn't have an eardrum. So you're gonna get some of this peakiness for sure. We also know that the setup isn't perfect. But, so we can see there now based on the predicted unaided response, we've now got a 14 point boost, which is an average boost, which we know they're gonna be doing well. And on the left side we got a 23 point boost, which is good bordering on very good. And if we took the actual unaided response, that would definitely be very good. And then you can go ahead and of course run soft speech and loud speech. With Inventis, the MPO is a completely separate sort of screen here, so let's try this.

And not unexpectedly, you could see right in CARL's ear canal resonance, I mean this isn't bad, we take this down just a little bit here, you know, but on the right side here, is that gonna create a problem for the patient in terms of loudness and loudness discomfort. You betcha! Because that's like 15 DB over in the ear canal resonance, so you're gonna really wanna take that down. So why don't we do that? MPO is right here, it's 20. And just for time's sake, I'm gonna cut that one a little bit short 'cause I know that you guys are gonna have to run back to your clinics, well, depending on where you are in the world. So, so we'll just get right into our video on troubleshooting because probably a lot of you are wondering what to do when something doesn't look very good.

Here we go. Let's see what happens when we pull it out even further. Oh, I see the right side didn't actually... Okay, here, the right side actually just popped outta the ear and this one's very shallow. Let's look at the difference now. Wanna overwrite. So obviously if you saw a response like this, you'd be very concerned, you'd know there's an issue, you'd wanna check your probe tubes, for sure, because that's not the type of

response that you wanna see. So just very quickly adjusting those, getting them into the right spot, even without looking is probably gonna make a big difference there. Another common issue you might see is if you had wax in the probe tube, if the patient's got a little bit of wax in your ears, not enough to take out, especially soft wax, it'll get right in there.

Here, let's for fun, why don't we just take a little bit of putty and block up the left probe tube? So this is gonna be our wax. See what you gotta love about CARL? So we've got wax in the air. Let's take a look at what happens to this. In fact, let's just go to the single side and just look at this here. So we saw what that looked like before. Let's look at it now. So if you see response like that, you know there's a serious problem, you know, you gotta take the probe tube out and have a look at it, see what's going on there. It's often, you can't really clean the probe tube, so you could use Gus Mueller's trick, which is just to take some scissors and just snip off the end.

Of course, if you do that, you're gonna quickly wanna recalibrate the probe tube mics, oops, because it's gotten a little bit shorter and you want to account for that. Okay, right on. So most troubleshooting issues tend to be around probe tubes, probe tube placement blockage. So I wanna talk a little bit about mistakes. You can make mistakes with your REM system or you could make mistakes with the hearing aid. And what's beautiful about REM is that allows you to catch mistakes. So let's talk about mistakes. No one ever talks about their mistakes. I'm gonna talk about one that I made. Let's do this. Why don't we just see what happens in the aided response screen if we were having a bad day and we happened to flip these microphones here?

so we're gonna take the right and put it on the left side, but we don't realize this and poor CARL here has a very asymmetrical loss. So this is going to look very strange. And of course the beautiful thing about Real Ear is you see these strange things as they're happening. You see the problem so that you can fix them. In this case it's a

measurement problem. That's something that we need to fix. It's not a problem with the hearing aids. We don't know there's a problem yet, but we've got these transducers flipped. Let's do the CARL.

- [Narrator] Strikes raindrops in the air. They act like into many beautiful colors. When the sunlight strikes raindrops in the air.

- If you're doing your Real Ear and you see a response like this and you go, "Whoa, that's weird. The right ear is totally over amplifying and the left ear is completely under amplifying and you've got this differential loss, you know, between ears," then that's when you wanna stop and think, hmm, something weird is going on here before you try to program this out. Which of course is going to completely mess up the patient's hearing aid fitting, it's because the problem's not with the hearing aids, it's with the fact that you've switched, you've got the wrong side. So you see something like this, you stop, you make sure everything's right. And in this case we're gonna, we're gonna say, oh my goodness, hold on a second, we're gonna flip back that back over and rerun the measurements and they're gonna look a heck of a lot better, because right now what we're doing is we're reading the SPL from the left ear but the Real Ear system believes it's the right ear and that's a big problem.

But the beautiful thing about Real Ear Measurements is that when you do have these set up properly, you can catch errors that could be happening within the hearing aids as I did once when I was a brand new clinician and someone had an asymmetrical loss just like this. And what I had done is because I wasn't preparing and pre-fitting my hearing aids beforehand, I was doing it on the fly, I had accidentally put the left receiver on the right hearing aid and vice versa. And so even though I had the transducers in the microphone set up properly, I was getting a response like this. And that was a real response that was happening in the patient's ear.

And if you send a patient off who's got asymmetrical hearing loss and you're over amplifying their good ear and under amplifying their left, well, that's gonna cause all sorts of problems and heck that could even cause a lawsuit. That's why we do Real Ear. We wanna optimize things for the patients and we wanna catch any potential mistakes that we've made as well. You can't catch that unless you've done Real Ear. All right, awesome. So just to conclude, 'cause I know we're outta time. In summary, Real Ear measurements are essential for improving patient outcomes and I just hope that, you know, REM shouldn't be viewed as this overly technical thing. You know, really it's not that hard.

You can almost just show this video to a technician and say, here, learn how to do this and just do it and, you know, and I'll interpret it. To feel comfortable, you know, we need to lean into our gear, we need to get to know it, we need to roll up our sleeves and try things out. And CARL is a great patient to have an office to practice on. And, you know, I encourage you to start a friendship with your Real Ear system and your friendship that will last a lifetime. Very quickly, I just wanna mention that today we were using Base CARL, which is just a great patient. There's also Camera CARL, which is a module that comes, that gives you visual feedback about where you are in the ear canal. I've used it, it's really great. And there's also Audio CARL now where you can do hearing tests on CARL. So Anna, I think I'm gonna turn it over to you and I can stick around for five or 10 minutes and answer a few questions if anyone has them.

- Sure. First of all, thank you very much, Clayton. And I truly hope you all enjoy this fantastic learning opportunity. I'm getting a lot of question. I'm getting several question mainly focus on Maestro software. I'm responding from time to time, but in case you didn't get feedback, okay, please feel free to email to support@inventis.it, support@inventis.it. Clayton, some question for you. Okay, not a lot, I promise. Okay, so just a moment. Let me check the question for you, Clayton.

- Yeah, and I'll just say that if anyone has any questions that we don't get to or they don't feel comfortable asking, my email addresses up there, info@treatyourhearing.ca and I'll be happy to respond to you that way too.

- Okay, so thank you, Clayton. So Theodora says, "By holding the probe tube, is there a risk of changing the tube response because of the banding and pinching? Please excuse my English, I'm not a native speaker." Theodore, please do not apologize. I'm not a native speaker as well. Clayton, what do you think about Theodore questions?

- So I think I got some of it. So definitely bending, having the probe to bend in the ear canal is not going to change the response. But yeah, if you did something like if you're modifying it in some way, like snipping it, like I said, to save a probe tube, if there's wax in the tip, and that's the only way to do that because the wax, you can't clean it out, then you do need to recalibrate it because you have a slightly different probe tube length.

- Okay, great. Another questions. "Does REM have a place? Okay, so have a role in the fitting of basic level hearing aid? Or should it be reserved for premium, advanced and essential?"

- No.

- "Living hearing aid?"

- No, yeah, okay.

- Okay. Okay, no, no, no, that's a great question. REM is, you should be fitting REM on every single hearing aid you put in a patient's ear and every single fitting. You know, if anything, you just wanna know the settings, even if it's just the typical settings that you

use, how much audibility is the patient walking out of your office with? And so doesn't matter what technology or type of hearing aid, you just wanna know what's the improvement in audibility. Forget all the advanced features. You can verify some of those. But we're just talking about simply verifying audibility. That's the most basic and important use for Real Ear. So all for sure.

- Okay, fantastic. Thank you, Clayton. Ashmin says, "When muting the hearing aid, we can have a rainy sound. Rainy sound. Is it normal?"

- When muting the hearing aids, so I'm not sure what he's referring to, but definitely when you're getting that rain sound like, you know, the pink noise, if it's an open fitting, you definitely need to mute the hearing aids while doing that. And to be honest, the way that Inventis does it with constantly prompting you is actually the most accurate way before each measurement because the patient's probably moved a little bit and they prompt you and you mute it and then you run the pink noise and then you unmute it. It's a little bit annoying to have to do that every time, but it is the most accurate way to do it.

- Okay. Thank you, Clayton. And, okay, this is a question for Maestro, I would say. "So how do you calibrate one ear that is open fit and the other that is not open fit? Can you separate the ears when you-"

- Great question, yeah.

- Yeah, when you fit... Yeah.

- If you're doing a binaural fitting and you wanna do the measurements simultaneously, you just choose open 'cause you have the one ear that's open and if the other ears occluded, it doesn't matter as long as the patient doesn't move. The open is just, if you

have one open ear, you have to choose open and just mute the hearing aids for that calibration. Yeah, that's a great question.

- Okay. Fantastic. Dan, "Another question. Do you suggest doing the hearing aid programming or adjustment while REM so using the on top mode or after finishing the recording?"

- No, oh yeah. So, yeah, I mean, you could sort of keep it running before you capture it and do your adjustments there. I know some people do that. I've always just found it a little bit difficult to do that. I think it depends on how quickly it's averaging. So typically what I do is I do my adjustments and, you know, I do another measurement and then I do my adjustments and another measurement. But definitely another webinar topic would be using the auto REM, which quite frankly just makes our lives way easier and it just does that automatically for you. So there's not this back and forth, back and forth, back and forth. But I typically do it, I don't do it while it's running. I do it and then I take a capture. Yeah, so it's just work better for me.

- Okay. "What is the name of your YouTube channel?" Clayton, another question for you, but.

- Yeah. Right. So it's called "Hearing Health Awareness." And I think if you just go on YouTube and search "Hearing Health Awareness," you'll find it for sure. You could also probably find if you, you know, search some Inventis stuff or Verifit stuff, Real Ear Measurement stuff. Hopefully you can pull me up that way as well. "Hearing Health Awareness."

- Okay, fantastic. Oh, how can do, okay, so "Should we do, can we do REM in children?"

- Yeah, definitely. I mean, if child is old enough to sit there, let's say they're school age and they can sit there quietly, you should be doing Real Ear Measurements right in your ear. It's really the gold standard. And if they were younger than that and they can't sit still, if you're fitting infants, then you're gonna need to have a test box, something like the Drum. And you're just gonna measure an RACD and you're gonna do simulated Real Ear Measurements in the test box.

- Fantastic. So in case of questions regarding fitting on pediatrics, please feel free to contact the Inventis distributors of your area. Check our website, okay? And take a look at our dealers, okay, on a dedicated session. Okay, Clayton, another question. "If I have only one hearing aid, where should I put the Trumpet?" Okay, always in front of the patient, I will say, but, Clayton-

- Yes, zero degrees azimuth, doesn't matter if it's one or both, you just basically have it right in front of them about a meter away, and then ideally a meter from each of the walls. As you could see, just for my fitting with CARL with demonstration purposes, having his right side right beside the wall was a pretty big issue for the fitting because we're getting lots of reflections there. We're getting these weird notches. So right in front of the patient, doesn't matter, one ear or two, and ideally, yeah, out from the walls.

- Okay. Fantastic. "Can we reduce the time for the stimuli given in REM while doing the measurement?"

- Yeah, in Maestro you have the option of shortening that. I think it's like five seconds, 15 seconds.

- Yes.

- Yeah. So you can use a shorter one, which is really handy. I don't know if it makes any, or much of a difference. I'm just use used to using the slightly longer one, but you can definitely shorten that up and just do a quick capture of it.

- Great. "What was the Inventis support email again? I'm sorry I missed that part." support@inventis.it in case of question regarding Maestro software and the Trumpet or the Drum in general. Okay. "Do you have any video already using the Drum? How do you get our..." Okay. Other questions.

- I don't have any videos on using the Drum yet, but I'd love to get one up. So maybe that'll be something we do in the future.

- Okay, fantastic. Work in progress, Clayton. Okay, even on Inventis side. Then one more question and then I think that we can stop the webinar. "Which prescriptive formula do you suggest while using the REM? Because most of the hearing aid have the specific prescriptive formula, okay, which is different from NAL or DSL, of course."

- Yeah, so I mean, the great thing is that you can choose whatever prescriptive formula you want to fit to in your Real Ear, like on the Trumpet. So today I was using DSL, and that's my preferred. But within the manufacturer's fitting software, you can also choose whatever you want. So if you wanted to match targets, you know, more easily you could choose DSL in the fitting software and match those two up. But what I was doing today, and it was a good question, so I was using Starkey hearing aids, I was actually just using the manufacturer's best fit, e-STAT, which is actually closer to to an NAL, and I was adjusting that to match the Real Ear targets of DSL.

So it is possible to have a mismatch like that when you're doing REM manually. If you are doing auto REM, you cannot have a mismatch. You need to make sure that if you're fitting to DSL on the Trumpet or the Real Ear, you're also fitting to DSL on the

manufacturer's software. And I can confirm that that's like that for every system that I've experienced, almost every system that I've experienced that allows for auto REM.

- Okay. No more question.

- Good questions.

- Okay. So if you have other question, feel free to contact us at support@inventis.it for questions regarding Maestro software and Inventis equipment. If you wanted to get the recording of the webinar, okay, and marketing material, please write an email to webinar@inventis.it. Clayton, thank you very much again for your participation in this fantastic webinar. I truly hope you all enjoyed this fantastic learning opportunity. Couple of notes, you'll receive soon a survey I kindly ask you to fill out. The survey will help us to understand your needs and your suggestions. Next appointment we've Inventis Academia, the last one for this 2022, next December, the first the balance expert, Amy Lennox, from the UK, will manage the webinar: "Visually Induced Business." I warmly invite all of you to subscribe from the Inventis social media pages. You can even email me at webinar@inventis.it and I will be more than glad to provide all the informations to you. So thanks a lot. Thank you very much, Clayton, and-

- You're welcome. I hope to see you, all of you soon with Inventis Academia. Bye

- Bye.